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Marketing Efforts to Reengage Consumers in Cancer Screenings during the COVID-19 Pandemic

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
and that any and all revisions required by
the review committee have been made.

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Abstract

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MS, University of St. Francis, 2012

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Doctoral Study Submitted in Partial Fulfillment

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Doctor of Healthcare Administration

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Abstract

In 2020, U.S. hospitals became overwhelmed by patients with the viral illness COVID-19. Health systems were advised by the U.S. Surgeon General and Centers for Disease Control and Prevention to suspend elective procedures, including mammograms, colonoscopies, and lung computed tomography scans. The purpose of this quantitative study was to investigate whether there was a significant difference in completed appointments, cancer screenings, and cancer diagnoses in consumers receiving targeted direct mail and email communications during the COVID-19 pandemic, based on age, gender, and geographic location. The elaboration likelihood model of persuasion, which emphasized the use of marketing to change consumer behaviors related to health, provided the theoretical framework for this study. Secondary data from 2021 from an Illinois health system were analyzed using multiple linear regression. The results demonstrate that there was a significant difference ($p < 0.001$) in response to completed appointments, cancer screenings, and cancer diagnoses by age, gender, or geography from consumers receiving targeted direct mail messages versus targeted email messages during the COVID-19 pandemic. These findings indicate that targeting women for cancer screenings may yield better results, as women were more likely to respond after receiving email and direct mail marketing messages. Motivating consumers may be best accomplished through direct mail for those age 65 to 74 and email for those age 55 to 64. Positive social change implications include the potential for greater long-term awareness of needed cancer screenings, which may lead to increases in completed screenings, earlier diagnosis of cancers, better quality of life, and decreased cost of care.

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Dedication

This study, as well as all of the work along my doctoral journey, is lovingly dedicated to my late mother, Linda Hughes. As my biggest cheerleader and greatest supporter, she encouraged me to pursue my doctoral vision from the day I first mentioned it. A passionate proponent of continuing education and of advancement for women, Mom understood how much it meant to me to pursue a doctorate in health care administration. Her passing in 2016 at age 69 after a three-and-a-half-year battle with sarcoma and later lung cancer fueled my desire to apply to the Walden University Doctor of Healthcare Administration program and complete this important work in a way that would honor her legacy while highlighting the life-changing work of my strategic marketing and communications colleagues. I have felt my mom with me each step of this journey, and I know she is beaming with pride as you read.

Acknowledgments

I am incredibly thankful for Dr. Diana Naser, who served as my dissertation committee chairperson. She spent countless hours providing guidance and clear, timely feedback throughout this journey, and I appreciate her very much. In addition, I want to acknowledge Committee Member Dr. Suzanne Moss Richins and University Research Reviewer Dr. Michael Furukawa for the time and attention they gave my study.

I am proud of the life-changing work of my colleagues who contributed to the 2021 strategic marketing campaign on which this study is based, including Stacy Campbell, David Pruitt, Scott Lungwitz, Andrew McGlothlen, and Joel Matzenbacher. I am also proud of the health care marketing professionals throughout the United States who work tirelessly each and every day to help ensure that patients understand and access the services they need to be healthy and well.

Finally, I would like to thank Brad Zimmerman, who encouraged me when I was feeling frustrated or uncertain; high-fived me at each new milestone; and, with great patience and love, engaged in this passion with me—by not just listening to me talk about it, but taking the time to truly understand the work and its importance to me. I appreciate him beyond measure for the person he is.

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Section 1: Foundation of the Study and Literature Review

As the number of cases of COVID-19 soared in early 2020, hospitals around the United States quickly became overwhelmed, both by the number of patients coming to them with COVID-19 symptoms and the number of clinical staff unable to work because of exposure to the virus (Byrne, 2021). Health systems were advised by the United States Surgeon General and Centers for Disease Control and Prevention (CDC) to eliminate elective procedures, including breast, colon, and lung cancer screenings; to reduce the risk of exposure of patients and clinical staff to COVID-19; and to help reduce additional spread of the coronavirus (Byrne, 2021). At the same time, many patients expressed uncertainty about seeking medical care because of potential exposure (CDC, 2021).

According to IQVIA Institute for Human Data Science, nationally, more than 22 million tests for five common cancers were estimated to have been disrupted in 2020 due to COVID-19 (Healthesystems, n.d.). Mammograms were down 87% by April 10 compared to February 2020; pap smears were down 83%; colonoscopies, 90%; lung computed tomography (CT) scans, 39%; and prostate-specific antigen tests, 60% (Healthesystems, n.d.). These disruptions risked delayed or missed cancer diagnoses for upwards of 80,000 patients, including 36,000 breast cancer, 2,500 cervical cancer, 18,800 colorectal cancer, 450 lung cancer and 22,600 prostate cancer diagnoses (Healthesystems, n.d.). Predictive modeling therefore warned of 5,500 excess breast cancer and 4,500 colorectal cancer deaths between 2020 and 2030 (Healthesystems, n.d.). These staggering statistics and their long-term impact on the health of our communities fueled my desire to

study the impact marketing communications had on consumers' return to cancer screenings.

In Section 1, I will present the research problem, along with the research variables and research questions (RQs) and hypotheses. The study's relationship to the elaboration likelihood model of persuasion will be discussed, along with the model's logical connections to the RQs, study design, and data analysis. An in-depth literature review will provide information related to this study's variables and RQs. Finally, a discussion of definitions, assumptions, and limitations, as well as the significance of the study and its implications for positive social change, will be presented.

Problem Statement

The Center for Systems Science and Engineering at Johns Hopkins University (2022) released a report of the number of COVID-19 cases in the United States as of March 1, 2020. At that time, there were only 32 cases nationally. By April 1 of that year, there were 26,893 reported cases, the Center noted. By November 15, 2020, there were more than 115,000. As the number of cases of COVID-19 soared in early 2020, hospitals around the country quickly became overwhelmed by both the number of patients seeking care for COVID-19 symptoms, but also by the number of clinical staff exposed to the virus (Byrne, 2021).

Health systems were advised by the United States Surgeon General and the CDC to eliminate elective procedures (including, but not limited to breast, colon, and lung cancer screenings) in order to reduce the risk of exposure to patients and staff and to help reduce the spread of the coronavirus (Byrne, 2021). In addition, many patients expressed

fear and uncertainty about seeking medical care because of potential exposure (CDC, 2021). In this study, I addressed the impact marketing and communications have had on reengaging targeted consumers in recommended routine cancer screenings during the COVID-19 pandemic. This study could address a gap in knowledge on how the decline in cancer screenings because of the COVID-19 pandemic is affecting patients long-term and how marketing communications efforts to help increase reengagement in these screenings is affecting population health. This study was needed because it could determine the impact that effective, targeted marketing communications can have on the long-term population health of the individuals and communities served by a health system, as well as its impact on the cost of caring for patients with cancer.

Purpose of the Study

The purpose of this quantitative study was to investigate whether there is a significant difference in scheduled breast, colon, and lung cancer screenings in consumers receiving targeted direct mail and email marketing communications following the COVID-19 pandemic, based on age, gender, and geographic location. I analyzed use secondary data from a health system headquartered in Peoria, Illinois, including customer relationship management (CRM) data and strategic marketing campaign creative and results from 2021. I used a correlational study designed to assess the prevalence of particular variables in population samples. The independent variables of this study included the type of marketing communication deployed as well as the recipient's age, gender, and geographic location. The dependent variables were breast, colon, and lung cancer screening appointment volumes as well as cancer diagnoses.

Research Questions and Hypotheses

The purpose of this quantitative study was to investigate whether there was a significant difference in scheduled breast, colon, and lung cancer screenings in consumers receiving targeted direct mail and email marketing communications following the COVID-19 pandemic, based on age, gender, and geographic location.

RQ1: Is there a significant difference in response to breast, colon, or lung cancer screening appointments by age, gender, or geographic location from consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic?

$H_0$1: There is no significant difference in response to lung, colon, or breast cancer screening appointments by age, gender, or geographic location from consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic.

$H_1$1: There is a significant difference in response to lung, colon, or breast cancer screening appointments by age, gender, or geographic location from consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic.

RQ2: What is the association between targeted direct mail versus email marketing campaigns promoting colon, lung, and breast cancer screenings after the COVID-19 pandemic and conversions to patient appointments?

$H_0$2: There is no association between targeted direct mail versus targeted email marketing campaigns promoting colon, lung, and breast cancer screenings after the COVID-19 pandemic and conversions to patient appointments.

$H_1$2: There is an association between targeted direct mail versus targeted email marketing campaigns promoting colon, lung, and breast cancer screenings after the COVID-19 pandemic and conversions to patient appointments.

RQ3: Is there a significant difference in new diagnoses for lung, colon, or breast cancer in consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic?

$H_0$3: There is no significant difference in new diagnoses for lung, colon, or breast cancer in consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic.

$H_1$3: There is a significant difference in new diagnoses for lung, colon, or breast cancer in consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic.

Theoretical Framework

The theoretical framework that supported this study was the elaboration likelihood model of persuasion. The framework emphasizes the use, and interpretation of the impact, of persuasive, targeted marketing communications to change consumer attitudes and behaviors related to health (Petty 2009). There are several factors that affect whether a person's attitude and behaviors regarding health will change. These include social norms, the strength of the person's attitude, and how competent the person feels

about leading their own change, as well as any prior behaviors and habits the person has had (Petty, 2009). The elaboration likelihood model of persuasion was appropriate for this study because it is related to the function of marketing communications and the work that is done to persuade consumers to change beliefs, attitudes, and actions towards their overall health.

The purpose of this quantitative study was to investigate whether there was a significant difference in scheduled breast, colon, and lung cancer screenings in consumers receiving targeted direct mail and email marketing communications following the COVID-19 pandemic, based on age, gender, and geographic location. I examined a cross-section of consumers targeted by one health care system's marketing communications to determine how their behaviors related to breast, colon, and lung cancer screenings have been changed by receiving the marketing messages. The elaboration likelihood model was therefore appropriate.

Furthermore, the elaboration likelihood model fit well with the study's independent variables. More than 34% of the United States population is age 50 and older (Donahue, 2022). That number continues to increase with the aging of the baby boom generation (Donahue, 2022). In 2019, there were 54.1 million adults (or 16% of the entire population) age 65 or older living in the United States (CDC, 2022d). That number is expected to grow to 80.8 million by 2040 and to 94.7 million by 2060 (CDC, 2022d). The risk of chronic diseases, including cancer, increases with age (CDC, 2022d). Moreover, chronic diseases are the leading drivers of illness, disability, death, and health care costs in the United States (CDC, 2022d). Early detection of cancer, when treatment is more

effective, is needed to help reduce these drivers (CDC, 2022d). It is important to connect with consumers in our target age groups in a way that is meaningful and motivates them to action.

The lifetime probability of developing cancer is about 45% for men and 38% for women (Dorak, 2012). Cancer mortality rates are also higher in men at 223.0 versus 153.2 for women, a ratio of 1.46 (Dorak, 2012). The cancers with the highest male-to-female ratio include colorectal cancers (ratio = 1.35) and lung (ratio = 1.52; Dorak, 2012). By understanding the differences in risk of developing cancer by gender, health researchers and practitioners can better target those at highest risk to encourage cancer screenings.

Cancer risk factors are also more prevalent in rural populations (Hirko, 2022). Rural populations have a higher prevalence of obesity when compared to urban populations (2.4% vs. 1.5%), physical inactivity (2.9% vs. 2.5%), and binge alcohol use (3.4% vs. 0.4%), all of which are risk factors for cancer (Hirko, 2022). In addition, colorectal (4.4% vs. 3.8%) and breast cancer screenings (6.8% vs. 4.0%) decreased with increasing rurality (Hirko, 2022). These statistics demonstrate the importance of understanding cancer risks by rurality so health researchers and practitioners can best message to this audience and encouraging screening.

In this study, I sought to identify which of the dependent variables (breast, colon, and lung cancer screening appointments), and independent variables (the type of marketing communication deployed and well as the recipient's age, gender, and geographic location) most influenced the success of the health system's marketing

campaign. Understanding what most influenced the success of the campaign may help marketing professionals to develop more persuasive communications. This can lead to consumer changes in beliefs, attitudes, and actions towards their overall health in future marketing campaigns.

Nature of the Study

This quantitative study features analysis of secondary data from a health system based in Peoria, Illinois, and includes results collected from its CRM database, as well as creative and results data from its January through April 2021 cancer screening marketing campaign. Quantitative researchers determine statistically significant conclusions about a population by studying a representative sample of the population; they analyze data that can be counted on a numeric scale and analyzed using statistical software such as SPSS (Lowhorn, 2007). Quantitative research methods include experiments, observations that are recorded as numbers, and surveys with responses that can be reported using scales (Lowhorn, 2007).

To address the three RQs in this quantitative study, I used a correlational research design. By using a correlational design, a researcher is able to determine whether there are differences in the characteristics of a population depending on whether its members have been exposed to a particular element (Lau, 2017). For this study, those elements were the marketing medium used to target the recipient (direct mail vs. email).

There are three types of correlational studies, including cohort studies, cross-sectional studies, and case-control studies (Lau 2017). A cross-sectional study was most applicable to this research, as it involves examining a particular group of people at a

single point in time (Setia, 2016). A cross-sectional design enabled an investigation of the responses to various elements of the health system's marketing campaign and analyses of those responses by the recipient's gender, age, and geographical location, as well as by the marketing medium used to target the recipient. Cross-sectional study designs are helpful in public health planning, monitoring, and evaluation (Setia, 2016).

Variables for this study included age, geography, gender, and the type of marketing communication medium received (direct mail, email, or both), as well as whether the recipient had engaged with a marketing communication; made a mammography and/or primary care appointment; completed a breast, colon, or lung cancer screening; and received a cancer diagnosis. The study includes nominal variables that, using SPSS statistical software, will be analyzed using multiple linear regression.

Literature Search Strategy

The library databases used to find literature for this study include those focusing on communications and mass media, health care cost and utilization, public health, and marketing. I also used the search engine Google Scholar. Key searches were limited to articles from 2018 and newer. Because of the use of COVID-19 data in this study, much of the information is from 2020 and later.

Key search terms and phrases included *consumer engagement in screening for cancer*, *number of patients getting cancer screenings*, *mammography utilization pre-COVID-19*, *colonoscopy utilization pre-COVID-19*, and *lung cancer screening pre-COVID-19*, as well as *mammography utilization during the COVID-19 pandemic*, *colonoscopy utilization during the COVID-19 pandemic*, and *lung cancer screening*

during the COVID-19 pandemic. Other terms and phrases included *cancer statistics*, *cancer statistics related to COVID-19*, *COVID-19 impact on hospitals*, and *COVID-19 impact on cancer screening*. Finally, search terms related to cancer incidence by type and cancer incidence pre- and during the COVID-19 pandemic were used as well.

These searches yielded thousands of articles. Broad search phrases like "*consumer engagement in screening for cancer* and *number of patients getting cancer screenings* yielded 17,600 and 16,600 articles, respectively. Narrower searches, such as *mammography utilization during the COVID-19 pandemic* and *colon screening pre-COVID-19*, yielded hundreds of articles. Specifically, *mammography utilization during the COVID-19 pandemic* returned 1,220 articles. *Mammography utilization during the COVID-19 pandemic* returned 291 articles. *Colon screening pre-COVID-19* yielded 1,060 articles. *Colon screening during the COVID-19 pandemic* returned 1,800 articles. *Lung screening pre-COVID-19* returned 4,200 articles. *Lung cancer results during the COVID-19 pandemic* yielded 2,680 articles.

To narrow down the articles, I first reviewed them to determine what the most applicable articles might be and narrowed them down to only those that were peer reviewed. Next, I read the abstract of each article to further determine its applicability. Finally, I read in detail the remaining articles and noted key takeaways related to the study, including the effect of the COVID-19 pandemic on cancer screening volumes, marketing communications' role in engaging consumers to return to routine cancer screenings, the means for accurately measuring the response to CRM marketing campaigns (email and direct mail) to report campaign success, the importance of

appropriate and accurate targeting with a marketing message in order to achieve success, the impact of marketing and consumer education on health literacy and engagement in the management of one's health, and marketing's impact on consumer health through the use of effective marketing communications. The literature research returned many articles important to this study as they supported the need for marketing and communications to engage consumers in their overall health and to help them return to routine breast, colon, and lung cancer screenings.

Literature Search Related to Key Variables and/or Concepts

Breast, Colon, and Lung Cancer

The National Cancer Institute (n.d.-c) defined cancer as a group of cells that grow uncontrollably and form a tumor. Cancer can be found nearly anywhere in the body and can spread to other areas (metastasize) to form new tumors (National Cancer Institute, n.d.-c.). Some cancers form solid tumors; others, such as leukemia, are in the blood (National Cancer Institute, n.d.-c.). Cancer is a significant public health problem throughout the world and is second only to heart disease as a leading cause of death in the United States (Siegel, 2022).

Incidence and Mortality

Approximately 1.9 million new cancer diagnoses and nearly 610,000 cancer deaths were projected for 2022 in the United States (Siegel, 2022). The rate of new cancer cases, or cancer incidence, was projected at 442.4 per 100,000 men and women per year, and the death rate from cancer, or mortality rate, was projected at 158.3 per 100,000 men and women per year (National Cancer Institute, n.d.a). According to the

National Cancer Institute's Surveillance, Epidemiology, and End Results Program (SEER, n.d.-a), the overall cancer mortality rate in the United States has steadily declined since the early 1990s. Specifically, cancer death rates decreased by 1.8% per year among men from 2001 to 2017, by 1.4 % per year among women from 2001 to 2017, and by 1.4% per year among children ages 0 to 14 between 2013 and 2017 (SEER, n.d.-a). Mortality rates for breast and lung cancer have also declined in the last decade, coinciding with increases in breast and lung cancer screenings (Siegel, 2022). Rates for new colorectal cancer cases have fallen an average of 1.8% each year for 2010 to 2019 (SEER, n.d.-b). Later in this section, I will present evidence of the COVID-19 pandemic's effect on breast, colon, and lung cancer screenings in the United States during 2020. However, understanding annual cancer incidence and mortality rates from the 2 years prior to the COVID-19 pandemic (2018-2019) and 2 years since (2021 and 2022) is an important first consideration.

The American Cancer Society (2022) noted that approximately 1.7 million new cases of cancer were diagnosed in 2018. Prostate cancer (19%) was the most common cancer among men, followed by lung cancer (14%) and colorectal cancer (9%). Among women, breast cancer (30%) was the most common, followed by lung cancer (13%) and colorectal cancer (7%). Lung cancer was the leading cause of cancer death among men in 2018, followed by prostate and colorectal cancers. Among women that year, lung, breast, and colorectal cancers were the leading causes of cancer death.

In 2019, more than 1.7 million new cases of cancer were diagnosed, according to the American Cancer Society (2022). Prostate cancer (20%) was the most common

cancer among men, followed by lung cancer (13%) and colorectal cancer (9%). Among women in 2019, breast (30%), lung (13%) and colorectal (7%) cancers were the most common. Lung cancer was the leading cause of cancer death among men that year, followed by prostate and colorectal cancers. Among women, lung, breast, and colorectal cancers were the leading causes of cancer death.

More than 1.8 million new cases of cancer were diagnosed in 2020, the American Cancer Society (2022) noted. Prostate cancer (21%) was the most common cancer among men, followed by lung cancer (13%) and colorectal cancer (9%). Among women, breast (30%), lung (12%) and colorectal (8%) cancers are the most common. Lung cancer (23%) led cancer deaths among men that year, followed by prostate cancer (10%) and colorectal cancer (9%). Top cancer causes among women in 2020 included lung (22%), breast (15%) and colorectal (9%). Lung cancer (22%) was the leading cause of cancer death among men in 2020, followed by prostate cancer (11%) and colorectal cancer (9%). For women, lung (22%), breast (15%) and colorectal (8%) cancers were the leading causes of cancer death.

The American Cancer Society (2022) stated that, in 2021, nearly 1.9 million new cases of cancer were diagnosed. Prostate cancer (26%) was the most common cancer among men, followed by lung cancer (12%) and colorectal cancer (8%). Among women that year, breast (30%), lung (13%) and colorectal (8%) cancers were the most common. Information on the leading causes of cancer death for 2022 is not yet published.

The American Cancer Society (n.d.-a) estimated that more than 1.9 million new cases of cancer would be diagnosed in 2022. Prostate cancer was projected to be the most

common cancer among men (27%), followed by lung cancer (12%) and colorectal cancer (8%). For women, breast (31%), lung (13%) and colorectal (8%) cancers were projected to be the most common. In 2022, lung cancer was expected to remain as the leading cause of cancer death among men at 21%, followed by prostate cancer (11%) and colorectal cancer (9%). Among women, lung cancer (21%), breast cancer (15%) and colorectal cancer (8%) were expected to lead the causes of cancer death.

In summary, the number of new cases of cancer from 2018 to 2022 was projected to increase by nearly 12%. By 2040, the number of new cancer cases per year in the United States is projected to rise to 29.5 million, and the number of cancer-related deaths to 16.4 million (National Cancer Institute, n.d.a). As the number of new cancer diagnoses increases, more efforts around cancer education, as well as screening and early detection, are needed to help facilitate the continued reductions in cancer mortality seen over the last several years (Siegel, 2022). For men, prostate cancer remains the most common type of cancer diagnosed, followed by lung and colorectal cancers. For women, breast was the most frequently diagnosed cancer each year, followed by lung and colorectal cancers. Breast, colon, and lung cancer screenings were the focus of this study.

Risk Factors for Developing Cancer

There are several known risk factors for developing cancer in general. These risk factors include age, alcohol and tobacco use, poor diet, unhealthy weight, and unprotected exposure to sunlight (National Cancer Institute, 2015). By helping consumers understand their personal risk factors for cancer, as well as the screening and early

detection opportunities available to them, health systems can help empower and engage consumers in managing their health and risk factors (National Cancer Institute, 2015).

Risks for Developing Breast Cancer

The CDC has identified the controllable and uncontrollable risk factors for developing breast cancer.

Uncontrollable Risk Factors for Developing Breast Cancer. According to the CDC (2021b), age is the first uncontrollable risk factor for developing breast cancer, as most breast cancers are diagnosed in women aged 50 and older. Second, women who have the mutated genes BRCA1 or BRCA2 have a higher risk of developing breast cancer. Women who started their menstrual cycles before the age of 12 and those who do not go through menopause until after age 55 also have an increased risk of developing breast cancer.

A fourth risk factor, according to the CDC (2021b) is having dense breasts, as dense breast tissues can make tumors more difficult to see on a mammogram. This means a tumor may be more advanced by the time it is detected. A personal history of breast cancer is the fifth risk factor, as women who have had breast cancer in the past are more likely to develop breast cancer again. Family history of breast or ovarian cancer can also increase a woman's risk of breast cancer, the CDC noted. Finally, past exposure to radiation therapy to the chest or breasts increases a woman's risk of developing breast cancer.

Controllable Risk Factors for Developing Breast Cancer. Some controllable risk factors for developing breast cancer exist, according to the CDC (2021b) Women

who are not physically active higher risk of getting breast cancer, and being overweight can exacerbate this risk. A third controllable risk factor for developing breast cancer is the use of hormone replacement therapy or certain oral contraceptives. Having a first pregnancy after the age of 30, never breastfeeding, and never having a full-term pregnancy can also raise a woman's risk of developing breast cancer. Finally, drinking alcohol can increase a woman's risk for developing breast cancer.

Risks for Developing Colon Cancer

The CDC (2022a) has published 10 risk factors that contribute to a person's risk of developing colorectal cancer. The first is age, as a person's risk increases as they get older. Other risk factors include being diagnosed with an inflammatory bowel disease such as Crohn's disease or ulcerative colitis or having a personal or family history of colorectal cancer. The fourth risk is having a genetic syndrome such as familial adenomatous polyposis or hereditary nonpolyposis colorectal cancer (Lynch syndrome). The remaining risk factors are related to lifestyle, including lack of regular exercise, not having a diet rich in fruits and vegetables or having a diet that is low in fiber and high in fats, being overweight, and using alcohol and tobacco.

Risks for Developing Lung Cancer

The CDC (2021c) has identified several risk factors that may increase a person's chances of developing lung cancer. Perhaps the most obvious is the use of tobacco. In the United States, cigarette smoking contributes to at least 80% of lung cancer deaths (CDC, 2021c). Exposure to smoke from other people's cigarettes, or secondhand smoke, also increases a person's risk of developing lung cancer (CDC, 2021c).

The second leading cause of lung cancer in the United States, according to the CDC (2021c) is exposure to radon. The U.S. Environmental Protection Agency estimated that radon causes about 21,000 lung cancer deaths each year and that nearly 1 out of every 15 homes in the United States has high radon levels (CDC, 2021c). A third risk is exposure to dangerous chemicals (typically found in a person's workplace), such as asbestos, arsenic, diesel exhaust and some forms of silica and chromium.

A personal or family history of lung cancer is the fourth risk factor that increases a person's risk of developing lung cancer, CDC (2021c) data show. Cancer survivors who have had past radiation therapy to the chest are also at an increased risk, the CDC noted. Finally, poor diet and exposure to arsenic and radon in drinking water from private wells can affect a person's risk of developing lung cancer.

Breast, Colon, and Lung Cancer Screening Recommendations

In 2022, the United States Preventive Services Task Force offered recommendations related to routine screenings for colon, breast, and lung cancer. Screening mammography is recommended for women aged 50 to 74 years every 2 years (CDC, 2022c). A woman may choose to start screening mammography earlier than age 50 after discussing her risks with her primary care provider.

The recommendation for colon screenings is that adults aged 45 to 75 seek routine screenings (CDC, 2022b). Several screening tests can be used to test for colorectal cancer, including stool tests, flexible sigmoidoscopy, CT colonography, or virtual or standard colonoscopy (CDC, 2022b). Adults aged 50 to 80 years who have a 20 pack-year or more smoking history and are currently smoking or have quit within the past 15

years should be screened for lung cancer with low-dose CT every year (U.S. Preventive Services Taskforce, 2021). A pack-year is defined by the National Cancer Institute (n.d.-b) as the number of cigarettes smoked per day by the number of years the person has smoked. A 20 pack-year, therefore, is the equivalent of smoking one pack per day for 20 years, or two packs per day for 10 years, for example.

Impact of Breast, Colon, and Lung Cancer Screenings on Population Health

Routine breast, colon, and lung cancer screenings enable physicians to diagnose and treat cancer in its earliest stages (Petty, 2009). Despite provider efforts to encourage screenings for those at risk for these cancers, many patients have historically delayed or avoided recommended screenings out of fear of receiving a cancer diagnosis, fear of physical discomfort from the screening itself and perceived disruptions in their day by traveling to an appointment, parking, navigating a large hospital campus, and so forth. (Petty, 2009). Regular marketing communications that are impactful, targeted to the right receiving consumer and that address some of these fears are critical to contributing to population health improvements.

The Health Information National Trends Survey emphasizes the importance improving health literacy and health outcomes by not only encouraging patients to engage in managing their health, including cancer screenings, but also by ensuring that health care providers make it as convenient as possible to schedule an appointment (Hesse, 2017). One recommendation included in the survey is to creating a national communication database to help with health literacy. Such a database would provide a way for clinicians to provide patients with important education they need about routine

health screenings. Understanding a patient's health literacy is a critical first step to determining their capacity to comprehend information (Hesse, 2017). Based on their health literacy and knowledge of recommended screenings, physicians could design the education and counseling the patient needs. Ensuring patients are provided with the right education helps with compliance with needed cancer screenings and therefore, with improved health outcomes. In addition to being tailored for demographic information such as age, geography and gender, marketing messages can be even more tailored when we understand the health literacy of the patient.

Impacts of Breast Cancer Screenings on Population Health

Smith (2019) found that screening mammography is associated with earlier detection of malignancies and therefore reduced mortality from breast cancer. The reductions vary across the many study designs but range from 15% to 54% fewer breast cancer deaths associated with screening mammography (Smith, 2019). Duffy (2020) validated that the number of deaths from breast cancer and the number of advanced stage breast cancers were reduced in women participated in regular screening mammography as opposed to those who did not have a screening mammogram. Women who participated in screening mammography had a 41% reduction in their risk of dying of breast cancer within 10 years (relative risk, 0.59; 95% confidence interval, 0.51-0.68 [$p < .001$]) and a 25% reduction in the rate of advanced breast cancers (relative risk, 0.75; 95% confidence interval, 0.66-0.84 [$p < .001$]) (Duffy, 2020).

Impacts of Colon Cancer Screenings on Population Health

In 2019, the American Cancer Society estimated that 145,600 new cases of colorectal cancer would be diagnosed throughout the United States, and that 51,020 women and men would die from the disease (Smith, 2019). Colorectal cancer diagnoses and deaths have declined over the past 2 decades among adults aged 50 years and older, which is largely attributable to increased screening and prevention and early detection efforts (Smith, 2019). Colorectal cancer incidence has declined by 32% between 2000 and 2013, and colorectal mortality has declined by 34% between 2000 and 2014 (Smith, 2019). Colorectal cancer remains high among African American adults than among any other racial/ethnic group, with incidence rates 20% higher and mortality rates 40% higher, meaning more focused marketing communications efforts for this consumer segment could prove beneficial for overall population health (Smith, 2019). By encouraging consumers to engage in routine colorectal cancer screenings, we can have a tremendous positive impact on population health.

Levin (2018) reported that higher rates of colorectal cancer screening were associated with a 25.5% reduction in colorectal cancer diagnoses between 2000 and 2015, from 95.8 cases/100,000 to 71.4 cases/100,000 ($p < .01$), and a 52.4% reduction in cancer mortality, from 30.9 deaths/100,000 to 14.7 deaths/100,000 ($p < .01$). Advanced-stage colorectal cancer incidence rates decreased 36.2% from 45.9 cases/100,000 to 29.3 cases/100,000 ($p < .01$) and early-stage colorectal cancer incidence rates decreased 14.5% from 48.2 cases/100,000 to 41.2 cases/100,000 ($p < .04$) (Levin, 2018).

Impacts of Lung Cancer Screenings on Population Health

Smith (2019) validates a statistically significant reduction in lung cancer deaths in high-risk, current, and former smokers who received lung cancer screenings compared with a similar group that did not (Smith, 2019). These results add to other evidence demonstrating the value of lung cancer screening in detecting lung cancer in earlier stages and in reducing lung cancer deaths (Smith, 2019). The efficacy of lung cancer screening in high-risk current and former smokers makes identifying and marketing to adults who meet screening criteria a population health priority.

Impacts of the COVID-19 Pandemic

COVID-19 is defined by the National Center for Biotechnology Information as a highly contagious viral illness and is caused by severe acute respiratory syndrome coronavirus 2 (CDC, n.d.). The World Health Organization declared it a global pandemic on March 11, 2020 (CDC, n.d.). Since then, it has become one of the deadliest global health crises since the influenza pandemic of 1918 (CDC, n.d.). As of August 24, 2022, a total of 1,037,381 COVID-19 deaths had been reported in the United States (CDC, n.d.).

COVID-19's Impact on 2020 U.S. Hospital Volumes

In March 2020, there was a dramatic increase in the number of COVID-19 cases in the United States (Byrne, 2021). This caused public health leaders to recommend that members of the public shelter in place by staying home as much as possible and that businesses temporarily shut down or significantly alter their operations, such as eliminating indoor seating in restaurants, closing hair salons, and reducing hours of operation for grocery and retail stores (Byrne, 2021). The CDC recommended that health

care facilities delay all non-emergency patient visits and elective procedures, including cancer screenings, such as colonoscopies, low-dose lung CT scans and mammograms (Byrne, 2021). The American College of Radiology also urged imaging centers throughout the country to delay all non-urgent imaging procedures, including low-dose lung CT cancer screenings (Byrne, 2021). These recommendations were to not only reduce patient and health care workers' potential exposure to COVID-19, but to better prepare hospitals for the anticipated surges in the number of complex inpatient cases related to COVID-19.

In the early days of the COVID-19 pandemic, hospital admissions in the United States fell drastically. In a 2020 study published in *Health Affairs*, authors looked at 1,056,951 admissions to a large, nationally representative hospitalist group in 201 hospitals in 36 states. They found declines of more than 20% in non-COVID-19 patient admissions from February to April 2020 (Birkmeyer, 2020). By early July 2020, non-COVID-19 patient admissions had rebounded slightly but were still averaging about 16% below pre-COVID numbers (Birkmeyer, 2020). These declines are relative to the average weekly admissions during February 2020. Admissions declined in all patient types by age, race and ethnicity, Medicaid and self-pay status and income (Birkmeyer, 2020).

These declines in inpatient admissions were largely due to the CDC's recommendations that hospitals delay noncritical medical services to avoid unnecessary exposure to COVID-19 and to meet the needs of critically ill patients with COVID-19 (Birkmeyer, 2020). Unfortunately, hospitals also reported declines in admissions for acute medical needs like stroke and heart attack, indicative of the public's fear of going to

a hospital setting because of potential exposure to COVID-19 (Birkmeyer, 2020). Encouraging patients to call 9-1-1 and get to a hospital emergency room as quickly as possible when experiencing symptoms of a heart attack and stroke was another important marketing communications effort for the health system in this study during and after the COVID-19 pandemic.

Impact of the COVID-19 Pandemic on Breast, Colon, and Lung Cancer Screenings in the United States in 2020

In 2020, the diagnosis and treatment of cancer was adversely affected by the COVID-19 pandemic (Seigel, 2022). In April 2020 and during the early months of the COVID-19 pandemic, elective procedures such as colon screenings, lung screenings and mammograms were suspended (CDC, 2021a). Reduced access to care because of health care setting closures and fear of COVID-19 exposure resulted in delays in diagnosis and treatment that may lead to a short-term drop in cancer incidence followed by an uptick in advanced-stage disease and, ultimately, increased mortality (Seigel, 2022).

Even if screenings had been available, consumers living throughout the United States were required or strongly recommended to shelter in place by staying at home to avoid contact with anyone affected by COVID-19 (CDC, 2021a). When elective procedures were made available again, many consumers were still not comfortable returning to health care settings because of possible exposure to COVID-19. These factors combined to contribute to significant delays in cancer diagnoses and increases in health disparities (CDC, 2021a).

A retrospective cohort study investigated the impact of COVID-19 on screening, diagnoses, and mortality rates of the five leading causes of cancer death (lung, colorectal, pancreas, breast and prostate) from 2019 to 2021 (Concepcion, 2022). Screenings decreased by 24.98% for colorectal cancer and 16.01% for breast cancer from 2019 to 2020 (Concepcion, 2022). Compared to 2019, there was a 0.29% increase in lung cancer diagnoses, a 19.72% increase in colorectal cancer diagnoses and a 2.89% increase in breast cancer diagnoses in 2020 (all $p < .01$) (Concepcion, 2022). There was an increase in the total estimated number of deaths from colorectal, pancreatic, breast, and prostate cancers from 2019 to 2021 (Concepcion, 2022).

There was a decrease in the screening rates for breast and colorectal cancer, along with an increase in the estimated incidence and mortality rate among the five leading causes of cancer deaths from 2019 to 2021 (Concepcion, 2022). The findings suggest that the COVID-19 pandemic is associated with impaired cancer screening, diagnosis, and care, and further emphasizes the need for proactive screening and follow-up to prevent subsequent cancer morbidity and mortality.

The National Cancer Institute (n.d.d) defined tumor burden as the number of cancer cells, the size of a tumor, or the amount of cancer in a patient. During the COVID-19 pandemic, tumor burden was statistically higher in patients diagnosed during the COVID-19 lockdown compared to those diagnosed pre-lockdown (119.2 ng/mL vs. 17.3 ng/mL; $p < 0.0001$; CDC, 2021a). Once screenings were made available again in 2020, the CDC encouraged health care providers to continue education efforts to help adults return to regular cancer screenings, making marketing communications a necessary

vehicle to encouraging consumer compliance with routine screenings. Quantifying these and other secondary consequences of the pandemic at the population level will take several years because of the lag in dissemination of population-based surveillance data (Seigel, 2022). For example, reported cancer incidence and mortality are only currently available through 2018 and 2019, whereas numbers from 2020 through 2022 are estimates (Seigel, 2022).

Impact on Breast Cancer Screenings. In April 2020, screenings for breast, colon, and lung cancers declined by 85%, 75%, and 56%, respectively (Amornsiripanitch, 2021). Because of these delays in screenings, there have been delays in cancer diagnoses. (Amornsiripanitch, 2021). Mastectomies declined between April and July 2020 and colectomies declined in April and May 2020, supporting other reports regarding concerns for patient outcomes due to delayed cancer diagnoses related to temporary suspensions in cancer screenings (Amornsiripanitch, 2021).

Recent research studied appointment cancellations and no-shows by patients for screening mammograms once elective procedures were made available again versus prior to the start of the pandemic. The rate after reopening elective procedures was higher than before shutdown (7,663/16,595, or 46% vs. 5,807/15,792, or 37%; $p < 0.001$) (Amornsiripanitch, 2021). Cancellations after reopening increased with age (1.20 vs 1.27 vs 1.36 for 53, 61 and 70 years, respectively, $p < 0.001$) (Amornsiripanitch, 2021). Cancellations were also higher in hospitals compared to outpatient settings both during shutdown and after reopening (0.62 vs 0.54, $p = 0.005$ and 1.29 vs 1.03, $p < 0.001$, respectively) (Amornsiripanitch, 2021), which is indicative of the public's fear of

exposure to COVID-19 in hospital settings. In addition, the study showed an increase in cancellations for screening mammograms by minority race/ethnicity (Amornsiripanitch, 2021).

National Breast and Cervical Cancer Early Detection Program (NBCCEDP)-funded breast cancer screenings declined by 87% during April 2020 compared with the previous 5-year averages for that month (DeGroff, 2021). Screening volumes began to recover in May and, by June 2020, were only 39% below the 5-year average for that month (DeGroff, 2021). However, breast cancer screening remained 50% below the 5-year average among women in rural areas (DeGroff, 2021).

A report published by the IQVIA Institute for Human Data Science reviewed insurance claims in the United States and found an 80% drop in weekly mammography claims in early April 2020 (DeGroff, 2021). Over the course of the following 3-month period ending June 5, 2020, there was a 70% drop in breast cancer screenings (DeGroff, 2021). This resulted in about 38,500 women experiencing a delayed cancer diagnosis, which may have led to worsened health outcomes for them (DeGroff, 2021).

The decline could especially be seen when data was stratified by rurality. In April, the number of screening tests for breast cancer declined in metro (86%), urban (88%), and rural (89%) areas when compared with the respective 5-year averages (DeGroff, 2021). Volume began trending upward in May and June across all three categories, however, rural areas recovered the least with breast cancer test volume remaining 52% below the 5-year average (DeGroff, 2021). Comparatively, metro, and urban areas

experienced far greater improvement, with screening mammograms at just 38% and 37% below the 5-year average, respectively (DeGroff, 2021).

Impact on Colon Cancer Screenings. A 2020 report validated the impact of the COVID-19 pandemic and the recommended temporary suspension of colon cancer screenings early in the pandemic on colorectal cancer diagnoses and outcomes (Del Vecchio Blanco, 2020). Delays in colon screenings led to delays in cancer diagnoses, and when found, cancers were being diagnosed in more advanced stages of disease (Del Vecchio Blanco, 2020). Prioritization of consumers by risk was recommended as the United States returned to colon cancer screenings to ensure the optimization of resources, including health care workers, equipment and spaces dedicated to performing screening colonoscopies (Del Vecchio Blanco, 2020)

A study involving 28 million patients across 20 medical centers showed a 38.4% decrease in colorectal cancer screenings in March 2020 compared to March 2019, and an 84.5% decrease in colorectal cancer screenings in April 2020 compared to April 2019 (Del Vecchio Blanco, 2020). These decreases were due to the recommended temporary suspension of elective procedures, including colonoscopies (Del Vecchio Blanco, 2020). The study further reviewed 80 patients with *metastatic* (cancer that has spread from where it started to another part of the body, National Cancer Institute, n.d.e) colorectal cancer demonstrates that patients who received their colorectal cancer diagnosis after elective procedures such as colonoscopy had been suspended had tumors in more advanced stages when patients were finally able to be screened and diagnosed (Del Vecchio Blanco, 2020). In addition, prognosis for survival was lower compared to

patients who had been diagnosed prior to elective procedures being shut down (Del Vecchio Blanco, 2020).

Impact on Lung Cancer Screenings. A 2021 study reported that because of the significant disruption the COVID-19 pandemic caused in lung cancer screening, there was an increase in malignant lung nodule diagnoses once screenings resumed (Van Haren, 2021). In addition, cancers diagnosed after the disruption (Van Haren, 2021). This research demonstrates the consequences related to the pandemic for cancer screening programs, early detection, and subsequent cancer care.

Consumer Sentiment Regarding Fear of Exposure When Visiting Hospitals during the COVID-19 Pandemic

A survey about consumer attitudes related to challenges during the COVID-19 pandemic included 591 health care consumers from across the United States during the week of April 27, 2020. It was found that 41% of consumers felt unsafe visiting a hospital and 40% felt unsafe at urgent care due to the risk of exposure to COVID-19 (Sage Growth Partners, n.d.). Only 13% of respondents reported being “extremely likely” and 20% “somewhat likely” to return to their doctor’s office for non-urgent care in the following 2 months (Sage Growth Partners, n.d.). Twenty-four percent stated they were “extremely unlikely” to return, 43% reported that virtual visits were as effective as in-person appointments with a health care provider, and 31% said virtual visits were better than in-person appointments (Sage Growth Partners, n.d.).

A survey of 3,551 non-health care workers in the United States reported that health care workers should have had “severe restrictions” early in the COVID-19

pandemic, such as being kept in isolation from close contact with their neighbors and families (Taylor, 2020). Over a third of respondents avoided contact with health care workers out of fear of exposure to the COVID-19 virus (Taylor, 2020). This further demonstrates the public's fear of health care settings during and after the COVID-19 pandemic.

Health Literacy

Health literacy is the ability of a person to access, understand and use health information (Batterham 2016). People with lower health literacy levels are typically not as healthy and/or have poorer health outcomes compared to those with a higher health literacy (Batterham, 2016). Having higher a higher health literacy allows a person to understand the health services you need and how to seek them out (DePolo, 2022). It is important for health services organizations to understand the wide range of health literacy levels in the patients that come to them for care each day, and to work to improve the health literacy and therefore the health outcomes of those individuals.

The 2003 National Assessment of Adult Literacy study was administered by the United States Department of Education to a representative sample of 19,000 adults from around the United States (Cutilli 2009). Participants' scores ranged between zero and 500, where a score of zero to 184 was considered below basic, 185 to 225 was considered basic, 226 to 309 was intermediate, and 310 to 500 was a proficient health literacy level (Cutilli, 2009). Fifty-three percent of participants were found to have an intermediate level of health literacy, 22% a basic health literacy, and 14% a below basic health

literacy. Only 12% scored in the proficient range. This means more than one third of participants had basic or below basic health literacy skills.

Understanding the benefits associated with recommended cancer screenings is important to making decisions about whether to participate in them (Oldach, 2014). Inadequate understanding of these benefits, or lower health literacy rates about the importance of completing routine cancer screenings may contribute to lower cancer screening rates (Oldach, 2014). Efforts to address the health literacy of patients are necessary to help patients get the recommended cancer screenings they need.

Impact of Marketing on Health Literacy

The discipline of health care marketing has significant opportunity to affect the health literacy and health outcomes of the communities they serve (Lorin Purcarea, 2019). Effective marketing approaches are developed after an in-depth investigation of the community's overall health needs, identifying any latent health needs, educating consumers about the importance of addressing those health needs, and communicating health services that address those health needs (Lorin Purcarea, 2019). The American Medical Association and the Agency for Healthcare Research and Quality have encouraged health care marketers to develop strategic goals related to improving health literacy in their communities (Modern Marketing Partners, 2019).

According to IQVIA Institute for Human Data Science, nationally, more than 22 million tests for five common cancers were estimated to have been disrupted in 2020 due to COVID-19 (Healthesystems, n.d.). Mammograms were down 87% by April 10 compared to February 2020; pap smears were down 83%; colonoscopies, 90%; lung CT

scans, 39%; and prostate-specific antigen tests, 60% (Healthesystems, n.d.). These disruptions risked delayed or missed cancer diagnoses for upwards of 80,000 patients, including 36,000 breast cancer, 2,500 cervical cancer, 18,800 colorectal cancer, 450 lung cancer and 22,600 prostate cancer diagnoses (Healthesystems, n.d.). Predictive modeling therefore warned of 5,500 excess breast cancer and 4,500 colorectal cancer deaths between 2020 and 2030 (Healthesystems, n.d.). Knowing that cancer screening levels had also declined throughout its 15 hospital markets, a health system based in Peoria, Illinois engaged its marketing and communication team in late 2020 to help educate the public on the importance of returning to routine cancer screenings.

Definitions

Age: The recipient's age is an independent variable of this study. Targeted consumers were grouped into the age categories of less than 45 years of age, 45-54 years of age, 55-64 years of age, 65-74 years of age, and 75 or more years of age.

Breast, colon, and lung cancer screening appointments are the dependent variables of this study. Those who received an email or direct mail regarding breast cancer screenings were asked to self-schedule their mammogram by either clicking on the "schedule online" button within the email or by visiting a unique website address – osfhealthcare.org/breast-screening – from a direct mail piece. Those who received an email or direct mail regarding colon cancer screenings were asked to talk to their healthcare provider about screening options or to visit the unique website address osfhealthcare.org/colon-screening. Lung cancer screening recipients were asked to follow the recommended screening guidelines and visit the unique website address

osfhealthcare.org/lung-screening. From both the colon and lung cancer screening landing pages, respondents could schedule appointments with a primary care provider.

Direct mail: Direct mail is an independent variable of this study. There direct mail pieces included in this study were two-sided, 6" x 9" postcards mailed targeted consumers in ten Illinois and one Michigan markets.

Email: Email is an independent variable of this study. Marketing email messages were sent to targeted consumers in ten Illinois and one Michigan markets.

Gender: The recipient's gender is an independent variable of this study, with the groups being male or female.

Geographic location: The recipient's geographic location is an independent variable of this study. Cities were grouped into Urban (Evergreen Park), Suburban (Bloomington, Danville, Peoria, Rockford, and Urbana) and Rural (Alton, Mendota, Ottawa, Pontiac, and Escanaba).

Impressions: Impressions represent the number of times an advertisement is served to its intended audience (Lovett, 2019). For example, each time an ad is played on the radio or TV, each time it is served on a mobile device, each time it is seen on a billboard while driving by, are all counted as advertising impressions.

Marketing communications: Marketing communications are promotional messages delivered to an intended audience through one or more channels, such as television, radio, billboard, direct mail, digital ad or print ad (American Marketing Association, n.d.).

Multi-media marketing: Multi-media marketing is the use of several existing mediums, such as television, radio, billboards, or social media, to deliver a marketing campaign message to its intended audience (Bratić, 2020). This allows for marketers to better segment and target their audiences when and where they are consuming information (Bratić, 2020).

Traditional media: While the multi-media marketing campaign included traditional media, such as broadcast and cable TV, connected TV, traditional and streaming radio, billboards and print ads in local newspapers and magazines, direct mail and email were also deployed.

Assumptions

In conducting this study, I assumed that the CRM data were accurately recorded in the database. Accuracy of this data affects the mailing and email lists used to send targeted marketing communications. It also affects the ability to pull the right audience target and report accurate results from the campaign, such as whether the recipient had engaged with a marketing communication; made a mammography and/or primary care appointment; completed a breast, colon, or lung cancer screening; and received a cancer diagnosis.

Scope and Delimitations

The validity of a research study refers to how well the results from the study participants can be applied to similar individuals outside the study (Patino, 2018). The validity of a research study includes two domains: internal and external validity. Data points for this study include age, geography, gender, and the type of marketing

communication medium received (direct mail, email, or both), as well as whether or not the recipient engaged with a marketing communication, whether or not they made a mammography and/or primary care appointment, whether or not they completed a breast, colon, or lung cancer screening and whether or not they received a cancer diagnosis. Because the targeted group of consumers being studied are within the age (and if applicable, gender) for the recommended cancer screening offered to them, and the quantity of data points reviewed by the study, we can assume internal validity. I chose these data points to help demonstrate the value marketing communications bring to not only the growth of health care systems, but the impact it has on the health and wellness of the communities served by health systems.

For breast cancer screening, the study reviewed marketing campaign results targeting 37,868 women 50 to 64 years of age with “elevated, high or extreme risk” of breast cancer (as defined in the CRM database) and excluded patients who had received a mammogram within the previous 18 months or who had a current diagnosis of breast cancer. For colon cancer screening, the study reviewed marketing campaign results targeting 4,925 men and women 59 to 64 years of age with “elevated, high or extreme” risk for colon cancer (also as defined in the CRM database) and excluded patients who had previously received a colonoscopy or who had a current colon cancer diagnosis. For lung cancer screening, the study reviewed marketing campaign results targeting 73,591 men and women 50 to 64 years of age who are known or likely smokers (based on predictive modeling), and/or those who are known or likely to have (based on predictive

modeling), chronic obstructive pulmonary disease and/or emphysema, and excluded anyone who had a current lung cancer diagnosis.

External validity is determined by asking whether the study results can be applied to similar individuals not included in the study, or a larger population of like individuals (Patino, 2018). Because of the precise targeting of the marketing messages and the quantity of impressions, or number of times the campaign message was seen, the study results can be applied to similar individuals not included in the study and therefore external validity can be assumed.

Generalizability refers to the ability to make predictions about how likely something is to happen in the future based on whether it has happened in the past (Kubull, 2012). Although it is unlikely that we will experience COVID-19-related delays of cancer screenings again in the future, the performance of the marketing campaign in this study seems to indicate that effective and targeted marketing messages would invoke similar re-engagement in routine cancer screenings in the future.

Limitations

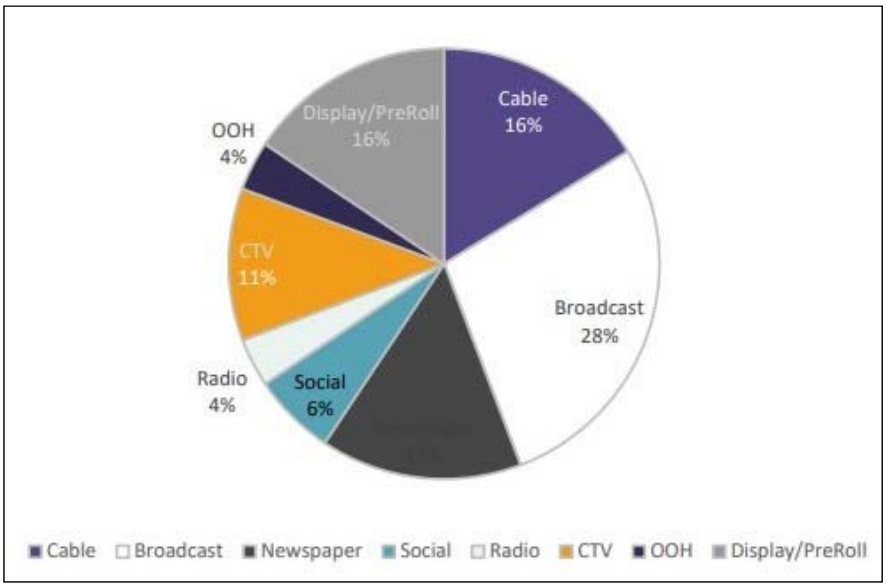
There are several limitations of the study. The first limitation of the study is that the collection of data reflects only a single point in time rather than serving as an ongoing reflection of marketing's impact on consumer behavior. Therefore, one cannot assume that if replicated, the marketing campaign's performance would be exactly the same. It may be more successful, with an increased number of responses. It may not.

The impact of other media impressions is another limitation. Impressions represent the number of times an advertisement is served to its intended audience (Lovett,

2019). Although the paid advertisements (cable, broadcast and connected TV, radio, etc.) within the campaign complement the direct mail and email marketing messages, it is difficult to determine how they impacted a consumer's choice to respond to a direct mail or email. For example, one consumer may have simply received a direct mail piece and decided to make a cancer screening appointment from it alone. Another may have driven past a billboard, heard a radio spot or watched a TV ad from the campaign prior to receiving an email. These exposures may have created their desire for a cancer screening before the email was ever received. A summary of the paid media impressions for the entire marketing campaign is included in Figure 1.

Figure 1

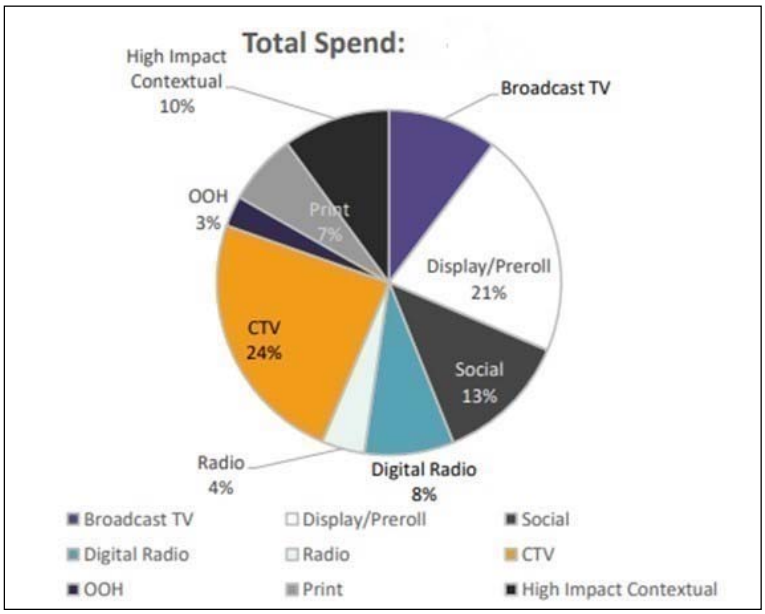
Northern Region Media Mix



In the Northern region, which includes Rockford, Mendota and Ottawa, Illinois, the campaign included 6.8 million paid media impressions, including a Green Bay Packers at Chicago Bears game on January 3, 2021.

Figure 2

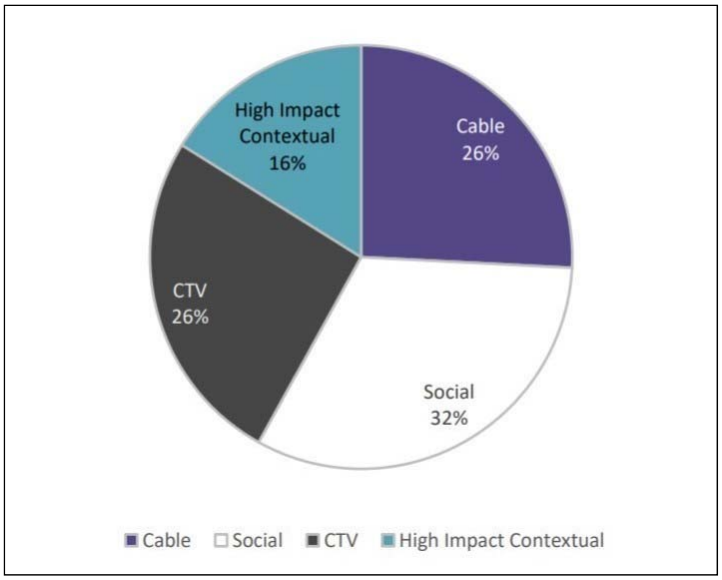
Eastern Region Media Mix



In the Eastern region, which includes Urbana, Danville, Pontiac and Bloomington, Illinois, there were 14.5 million paid media impressions, including an ad in local broacast TV during the 2021 Super Bowl.

Figure 3

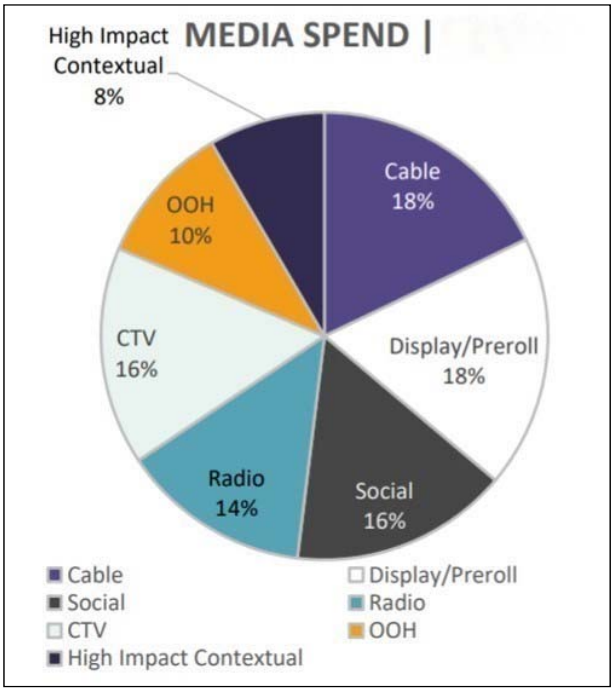
Alton Market Media Mix



In the Alton, Illinois market, there were 1.6 million paid media impressions during the marketing campaign.

Figure 4

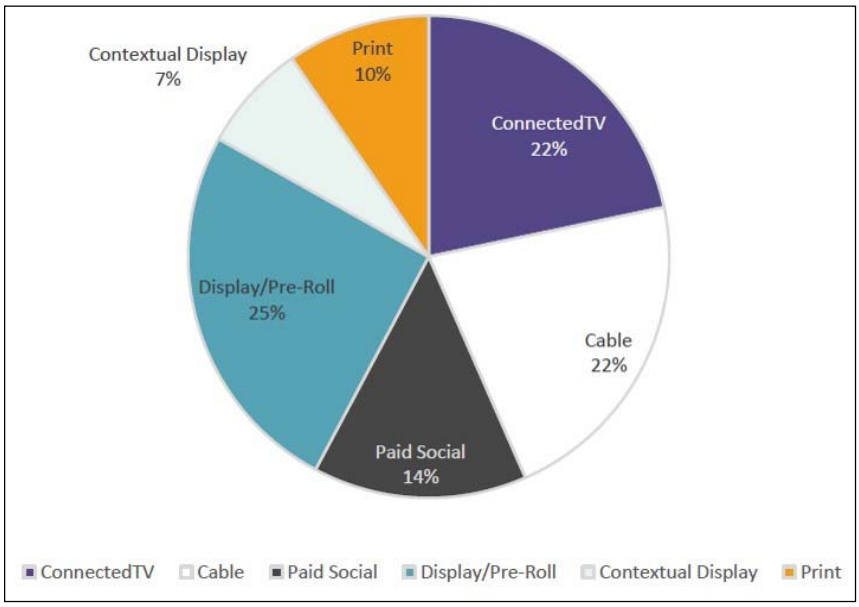
Central Region Media Mix



The Central region, which includes the community of Peoria, Illinois, had 8.2 million media impressions during the campaign, including a local broadcast TV spot during the 2021 Super Bowl.

Figure 5

Metro Region Media Mix



The Metro region, which includes the community of Evergreen Park, Illinois, saw 13.6 million paid media impressions during the marketing camapign. In addition to these paid media impressions, the overall marketing campaign was also supported by organic social media posts and blogs featuring patient testiomials about the importance of cancer screenings.

A third limitation of the study is the limited ability to demonstrate whether someone who responded to the colon and lung screening campaigns and scheduled an appointment eventually followed through and had a screening. While the call-to-action for the mammography marketing campaign allowed the respondent to directly schedule their mammogram appointment, the colon and lung screening campaigns created a bit of detour, as respondents had to first be seen by a primary care provider to determine their

eligibility for a colon or lung screening. This additional step creates some reporting challenges as we follow respondents through their journey in our CRM database.

Another limitation was CRM reporting issues. The CRM database used for these marketing campaigns is somewhat limited in our ability to follow individual respondent's journeys. It is possible to see how many of a particular segment of responders acted (i.e., "Twenty-seven women ages 51-52 living in rural communities made mammography appointments."). However, it is not possible to attribute those actions to 27 individual patient records and follow their individual journeys. Rather, there are market-level, aggregated totals, so they are grouped together, and generalizations must be made about the group.

Significance

Walden University defines social change as the efforts to create and apply ideas, strategies and actions that promote the worth, dignity and development of people, communities, organizations, and societies. Through positive social change, one can improve human and social conditions, including health (Walden University, 2023). People with inadequate health education have been found to have higher mortality rates (Woolf, 2007). In fact, a 2007 study found that the social change impact of better health education could save more lives than other medical advances such as new procedures, technologies, or drug therapies (Woolf, 2007). The findings of this study could be significant in that the study may demonstrate the importance of marketing communications in motivating health literacy for patients regarding re-engagement in breast, colon, and lung cancer screenings, ultimately helping to promote social change

through earlier cancer diagnoses at earlier stages to improve patient outcomes. This is also helpful in supporting the need for marketing communications that are strategically planned, targeted, and appropriately funded to ensure change in consumer attitudes and behaviors towards managing their health and ultimately, improvements in population health in the communities served by health systems.

Other potential positive social change implications from this study include a long-term, increased awareness of the importance of cancer screenings in adults, as well as the ability to articulate what screenings consumers should get and when, and how to schedule them. Further, potential positive social change implications include life-long compliance with recommended cancer screenings, and even advocating cancer screenings with family and friends. Ultimately, this impacts earlier detection of cancers, reduced cost of care, and long-term survival rates.

Summary and Conclusions

As COVID-19 cases quickly rose during the first quarter of 2020, health systems throughout the United States were overwhelmed by the number of people coming in with COVID-19 symptoms (Byrne, 2021). In March of that year, the CDC strongly recommended hospitals eliminate elective procedures, including breast, colon, and lung cancer screenings to help reduce the spread of the virus (Byrne, 2021) While this certainly helped reduce exposure to the COVD-19 virus and therefore likely its spread as well, many consumers fell behind in getting needed cancer screenings as a result.

Even without a worldwide pandemic it can be challenging to get Americans to get routine cancer screenings. An American Cancer Society (2016) survey of more than

2,000 unscreened adults identified the top five reasons they do not get screened, including: they heard the test is difficult or painful; they felt embarrassed to discuss colorectal cancer screening with their doctor; they have no family history of colorectal cancer and therefore think they don't need to be screened; they think screening is only for those who have symptoms of colorectal cancer; they are concerned about the out-of-pocket cost of the test; they are concerned about the complexity of a colorectal cancer screening, including taking time off from work, doing the prep the day before, getting a ride home, and so forth. The top five reasons for avoiding lung screening include knowledge avoidance (not wanting to know that my lungs are damaged or that I have cancer); perceived low value of the screening; fear of a false-positive result; the complexity of the screening (scheduling the appointment, taking time off from work, driving to the screening location, etc.) and misunderstanding the need for the screening (Carter-Harris, 2017). Add to these the fear and uncertainty consumers were feeling about medical facilities because of potential exposure to COVID-19, and something had to be done to encourage consumers to get back to routine cancer screenings.

The impact of marketing communications on re-engaging consumers in these screenings in mid- to late-2021 is not something that has been widely reported. This study seeks to help define marketing's impact and further define how efforts to re-engage consumers has had a positive impact on the overall health of the community. In Section 2, information about the research design and data collection will be discussed, including the study design and rationale and the research methodology, such as the target

population, survey instrumentation, operationalization of the research and the data analysis plan.

Section 2: Research Design and Data Collection

Introduction

The purpose of this quantitative study was to investigate whether there was a significant difference in scheduled breast, colon, and lung cancer screenings in consumers receiving targeted direct mail and email marketing communications following the COVID-19 pandemic, based on age, gender, and geographic location. I analyzed secondary data from a health system headquartered in Peoria, Illinois, including CRM data and strategic marketing campaign creative and results from early 2021. In Section 2, I will discuss the research design and data collection, including the rationale for the research design. The methodology, including the target population, survey instrumentation, operationalization of study variables, and data analysis plan, will also be discussed.

Research Design and Rationale

Researchers conduct quantitative investigations to draw statistically significant conclusions about a population by studying a representative sample of the population (Lowhorn, 2007). These studies include data that can be counted on a numeric scale and analyzed using statistical software such as SPSS (Lowhorn, 2007). They are typically experimental, in which a hypothesis is tested by determining the effect of an independent variable on a dependent variable (Lowhorn, 2007). Because I analyzed numeric data from a particular consumer population, I used the quantitative method.

To address the three RQs in this quantitative study, I used a correlational research design. Correlational research designs are helpful in determining whether there are

differences in the characteristics of a population depending on whether its members have been exposed to a particular element (Lau, 2017). For this study, those elements were the marketing medium used to target the recipient (direct mail vs. email).

There are three types of correlational studies: cohort studies, cross-sectional studies, and case-control studies (Lau 2017). A cross-sectional study was most applicable to this research, as it involves looking at a particular group of people at a single point in time (Setia, 2016). By using a cross-sectional design, I was able to investigate the responses to various elements of the health system's marketing campaign and analyze those responses by the recipient's gender, age, and geographical location, as well as by the marketing medium used to target the recipient. Cross-sectional study designs are helpful in public health planning, monitoring, and evaluation (Setia, 2016). Variables for this study included age, geographic location, gender, and the type of marketing communication medium received (direct mail, email, or both), as well as whether the recipient engaged with a marketing communication, made a mammography and/or primary care appointment, completed a breast, colon, or lung cancer screening, and received a cancer diagnosis. There were no anticipated time or resource constraints for the study.

Methodology

Population

The health system's CRM database showed that the breast cancer screening campaign targeted 37,688 women between the ages of 50 and 64 living in the Illinois markets of Alton, Bloomington, Danville, Evergreen Park, Mendota, Ottawa, Peoria,

Pontiac, Rockford, and Urbana, as well as the community of Escanaba, Michigan. Based on the current diagnoses and comorbidities of current patients, as well as predictive modeling for nonpatients, only those determined to be at extreme, high, or elevated risk were included. In addition, there were several International Classification of Diseases, Ninth Revision (ICD-9) procedures (PX) codes (see Appendix A), ICD-9 diagnosis (DX) codes (see Appendix B), and Current Procedural Terminology (CPT) codes (see Appendix C) recommended as best practice by the CRM vendor Welltok. I used these to eliminate patients who had already had a breast cancer diagnosis, surgery, and/or treatment or had completed a mammogram within the prior 18 months. A breakdown of the consumer targets for the breast cancer screening campaign is included in Table 1.

Table 1

Breast Cancer Screening Campaign Consumer Targets

City (Illinois, unless otherwise noted)	No. of targeted emails sent	No. of targeted direct mails sent	Total per city
Alton	1,905	1,030	2,935
Bloomington	3,897	1,289	5,186
Danville	1,246	692	1,938
Evergreen Park	1,180	1,184	3,064
Mendota	150	87	237
Ottawa	1,358	635	1,993
Peoria	6,362	2,426	8,788
Pontiac	511	198	709
Rockford	5,218	3,195	8,413
Urbana	3,120	1,574	4,694
Escanaba (Michigan)	412	19	571
Total per medium	25,359	12,329	37,688

Note. This table summarizes the number of emails and direct mails sent during the breast cancer screening campaign by city.

Colon Cancer Screening Population

Using the CRM database, the colon cancer screening campaign targeted 4,295 men and women between the ages of 51 and 64 living in the following Illinois markets: Alton, Bloomington, Danville, Evergreen Park, Mendota, Ottawa, Peoria, Pontiac, Rockford, and Urbana; as well as the community of Escanaba, Michigan. Based on the current diagnoses and co-morbidities of current patients, as well as predictive modeling for non-patients, only those determined to be at extreme, high or elevated risk were included. In addition, there were several Diagnosis-Related Group codes (see Appendix D), ICD-9 codes (see Appendix E), International Classification of Diseases, 10th Revision (ICD-10) DX codes (see Appendix F), ICD-10 PX codes (see Appendix G), and CPT codes (see Appendix H) recommended as best practice by Welltok used to eliminate patients who have already had a colon cancer diagnosis, colon surgery or treatment, and/or a colonoscopy within the prior 12 months. A summary of the colon cancer screening campaign consumer targets is included in Table 7.

Table 2

Colon Cancer Screening Campaign Consumer Targets

City (Illinois, unless otherwise noted)	No. of targeted emails sent	No. of targeted direct mails sent	Total per city
Alton	288	58	346
Bloomington	669	50	730
Danville	244	45	289
Evergreen Park	181	78	78
Mendota	35	7	42
Ottawa	298	52	350
Peoria	1,198	151	1,350
Pontiac	137	7	198
Rockford	772	165	937
Urbana	324	37	361
Escanaba (Michigan)	110	19	129
Total per medium	4,256	669	4,925

Note. This table summarizes the number of emails and direct mails sent during the colon cancer screening campaign by city.

Lung Cancer Screening Population

Using the CRM database, the lung cancer screening campaign targeted 75,222 men and women between the ages of 50 and 64 living in the following Illinois markets: Alton, Bloomington, Danville, Evergreen Park, Mendota, Ottawa, Peoria, Pontiac, Rockford, and Urbana; as well as Escanaba, Michigan. Based on the current diagnoses and co-morbidities of current patients, as well as predictive modeling for non-patients, only those determined to be at extreme, high, or elevated risk were included. Also included were anyone who had a self-reported diagnosis of emphysema, chronic obstructive pulmonary disease (COPD), or anyone who was a self-reported smoker or assumed to be a smoker based on past consumer spending, such as purchases of tobacco

or smoking cessation products. In addition, there were ICD-9 PX codes (see Appendix I), ICD10 DX codes (see Appendix J), ICD 10 PX codes (see Appendix K), ICD 10 PX codes (see Appendix L), and CPT codes (see Appendix M) recommended by Welltok used to eliminate patients who have already had a lung cancer diagnosis, surgery, or treatment and/or a lung screening within the prior 12 months. A summary of the lung cancer screening campaign consumer targets is included in Table 3.

Table 3

Lung Cancer Screening Campaign Consumer Targets

City (Illinois, unless otherwise noted)	No. of targeted emails sent	No. of targeted direct mails sent	Total per city
Alton	2,478	3,357	5,835
Bloomington	4,175	3,663	7,839
Danville	2,180	2,875	5,055
Evergreen Park	994	2,330	3,324
Mendota	515	7	1095
Ottawa	3,450	4,268	7,720
Peoria	13,255	13,134	26,390
Pontiac	1,657	1,768	3,425
Rockford	6928	395	16,597
Urbana	2,018	2,350	4,368
Escanaba (Michigan)	782	1,012	1,794
Total per medium	38,432	35,159	873,591

Note. This table summarizes the number of emails and direct mails sent during the lung cancer screening campaign by city.

Sampling and Sampling Procedures

A significance (α), or threshold for significance of $p<0.05$, will be used to reject the null hypothesis ($\alpha=0.05$). Power is defined as the probability that we reject the null hypothesis when it is false (Kang, 2021). The G Power calculation is used for multiple

linear regression (Kang, 2021). The equation is shown in Equation 1 (Kang 2021). Using a downloaded G Power calculator, the "F tests" test family was chosen, as well as the "linear multiple regression, fixed model, R^2 deviation from zero" statistical test. Finally, "A priori: Compute required sample size – given α, power and effect sizes," was chosen as the type of power analysis. The effect size (F^2) used is 0.15. The error probability (α) used is .05, making the power (1- β) 0.95. Because the primary endpoint is dichotomous, meaning there are only two possible outcomes (the respondent either made an appointment for a cancer screening or they did not), the number of predictors used is 2. This results in a sample size of 107. This is the minimum number of data points required to test each hypothesis in this study.

Equation 1

G-Power Formula for Determining Sample Size

Power = 1- β = P (Reject H_0 | H_0 is false)

Figure 6

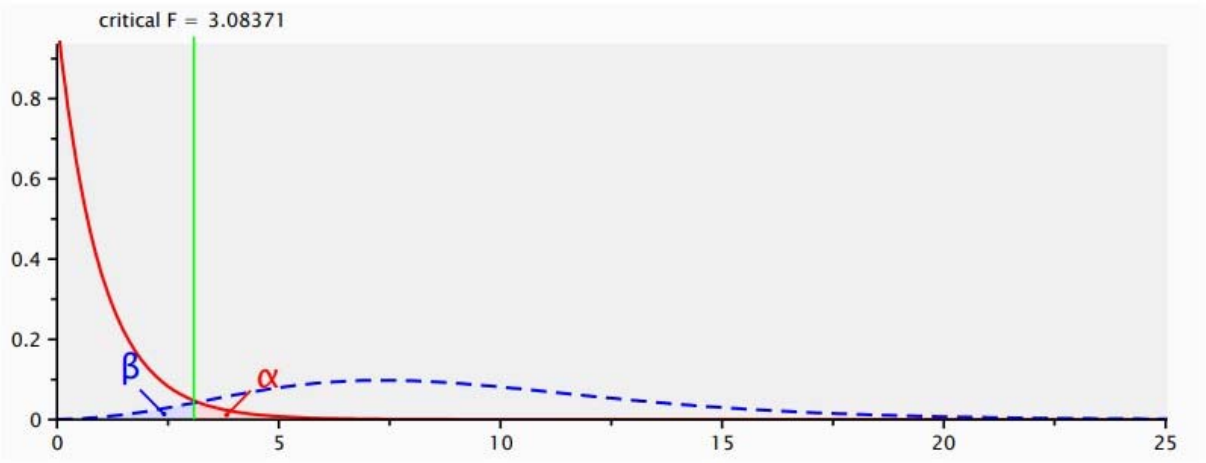
G-Power Input and Output

F tests – Linear multiple regression: Fixed model, R^2 deviation from zero

Analysis:	A priori: Compute required sample size	
Input:	Effect size f^2	= 0.15
	α err prob	= 0.05
	Power (1–β err prob)	= 0.95
	Number of predictors	= 2
Output:	Noncentrality parameter λ	= 16.0500000
	Critical F	= 3.0837059
	Numerator df	= 2
	Denominator df	= 104
	Total sample size	= 107
	Actual power	= 0.9518556

Figure 7

G-Power Output



The audience sizes used for email and direct mail for each of the three cancer screenings are included in the next several tables.

Table 4

Breast Cancer Screening – Email Audience Sizes

Market	Medium	Quantity
Rockford	Email	5,218
Mendota	Email	150
Ottawa	Email	1,358
Escanaba	Email	412
Danville	Email	1,246
Bloomington	Email	3,897
Pontiac	Email	511
Evergreen Park	Email	1,180
Peoria	Email	6,362
Urbana	Email	3,120
Alton	Email	1,905
Total number of breast screening emails		**25,359**

Note. This table summarizes the number of emails sent during the breast cancer screening campaign by city.

Table 5

Breast Cancer Screening – Direct Mail Audience Sizes

Market	Medium	Quantity
Rockford	Direct mail	3,195
Ottawa	Direct mail	635
Escanaba	Direct mail	19
Alton	Direct mail	1,030
Danville	Direct mail	692
Bloomington	Direct mail	1,289
Pontiac	Direct mail	198
Evergreen Park	Direct mail	1,184
Peoria	Direct mail	2,426
Mendota	Direct mail	87
Urbana	Direct mail	1,574
Total number of breast screening direct mails		**12,329**

Note. This table summarizes the number of direct mail pieces sent during the breast cancer screening campaign by city.

Breast Screening

Average breast cancer screening rates for each of the counties in Illinois and Michigan included in the study were determined and filtered with the parameters, "Had a mammogram in the past two years," "Includes all races," and "Women aged 40 years old and older," (State Cancer Profiles, n.d.). For the urban market of Cook County, Illinois, there is an average participation rate among the population of 70.2%. The breast cancer screening rates in our Suburban markets are McLean County - 71.5%, Peoria County - 72.0%, Champaign County - 65.7%, Madison County - 63.3%, and Winnebago County - 75.0%. The breast cancer screening rates in rural Illinois markets are LaSalle County -

64.2%, Vermillion County - 69.1% and Livingston County - 69.6%. The percentage in Delta County, Michigan is 67.0%.

Colon Screening

Average colon cancer screening rates for each of the counties in Illinois and Michigan included in the study were determined and filtered with the parameters, "Ever had a colorectal endoscopy (sigmoidoscopy or colonoscopy)," "All races," "Both sexes," "Person is 50 and older," (State Cancer Profiles, n.d.). The audience sizes used for email and direct mail for each of the three cancer screenings are included in Tables 6 and 7.

Table 6

Colon Cancer Screening – Email Audience Sizes

Market	Medium	Quantity
Pontiac	Email	137
Evergreen Park	Email	181
Escanaba	Email	110
Danville	Email	244
Rockford	Email	772
Mendota	Email	35
Ottawa	Email	298
Peoria	Email	1,199
Urbana	Email	324
Alton	Email	288
Bloomington	Email	669
Total number of colon screening emails		**4,265**

Note. This table summarizes the number of emails sent during the colon cancer screening campaign by city.

Table 7

Colon Cancer Screening – Direct Mail Audience Sizes

Market	Medium	Quantity
Bloomington	Direct mail	60
Pontiac	Direct mail	7
Escanaba	Direct mail	19
Alton	Direct mail	58
Rockford	Direct mail	165
Mendota	Direct mail	7
Ottawa	Direct mail	52
Danville	Direct mail	45
Peoria	Direct mail	151
Evergreen Park	Direct mail	78
Urbana	Direct mail	37
Total number of colon screening direct mails		**669**

Note. This table summarizes the number of direct mails sent during the colon cancer screening campaign by city.

The colon cancer screening rates in our Suburban markets are McLean County - 66.6%, Peoria County - 59.1%, Champaign County - 64.8%, Madison County - 60.9%, and Winnebago - 61.6%. The colon cancer screening rates in our rural Illinois markets are LaSalle County - 56.8%, Vermillion County - 56.6%, and Livingston County - 59.2%. The colon cancer screening rate in Delta County, Michigan is 63.6%.

Lung Cancer Screenings

Lung cancer screening rates are much lower than breast and colon cancer screening rates (American Society of Clinical Oncology, 2016). While the exact reasons are not known, they could include lower primary care referrals for patients who have a

history of smoking, or patient fears surrounding negative public opinions of smoking as well as an actual cancer diagnosis (American Society of Clinical Oncology, 2016). In the United States, there are 1,796 accredited lung cancer screening sites and 7,612,975 eligible current and former smokers who could be screened (American Society of Clinical Oncology, 2016). On average, however, only about 1.9% of eligible people get lung cancer screenings (American Society of Clinical Oncology, 2016). Regionally, the southern states average 1.6% and the west 1.0% (American Society of Clinical Oncology, 2016). The highest screening rate was in the Northeast region of the United States at 3.5% (American Society of Clinical Oncology, 2016). The Midwest had the second-highest rate of 1.9%.

Table 8

Lung Cancer Screening – Email Audience Sizes

Market	Medium	Quantity
Rockford	Email	6,928
Mendota	Email	515
Ottawa	Email	3,450
Escanaba	Email	782
Danville	Email	2,180
Bloomington	Email	4,175
Pontiac	Email	1,657
Evergreen Park	Email	994
Peoria	Email	13,255
Urbana	Email	2,018
Alton	Email	2,478
Total Number of Lung Screening Emails		**38,432**

Note. This table summarizes the number of emails sent during the lung cancer screening campaign by city.

Table 9

Lung Cancer Screening – Direct Mail Audience Sizes

Market	Medium	Quantity
Peoria	Direct mail	13,134
Rockford	Direct mail	395
Mendota	Direct mail	7
Ottawa	Direct mail	4,268
Escanaba	Direct mail	1,012
Alton	Direct mail	3,357
Danville	Direct mail	2,875
Bloomington	Direct mail	3,663
Pontiac	Direct mail	1,768
Evergreen Park	Direct mail	2,330
Urbana	Direct mail	2,350
Total number of lung screening direct mails		**35,159**

Note. This table summarizes the number of direct mails sent during the lung cancer screening campaign by city.

Data Collection

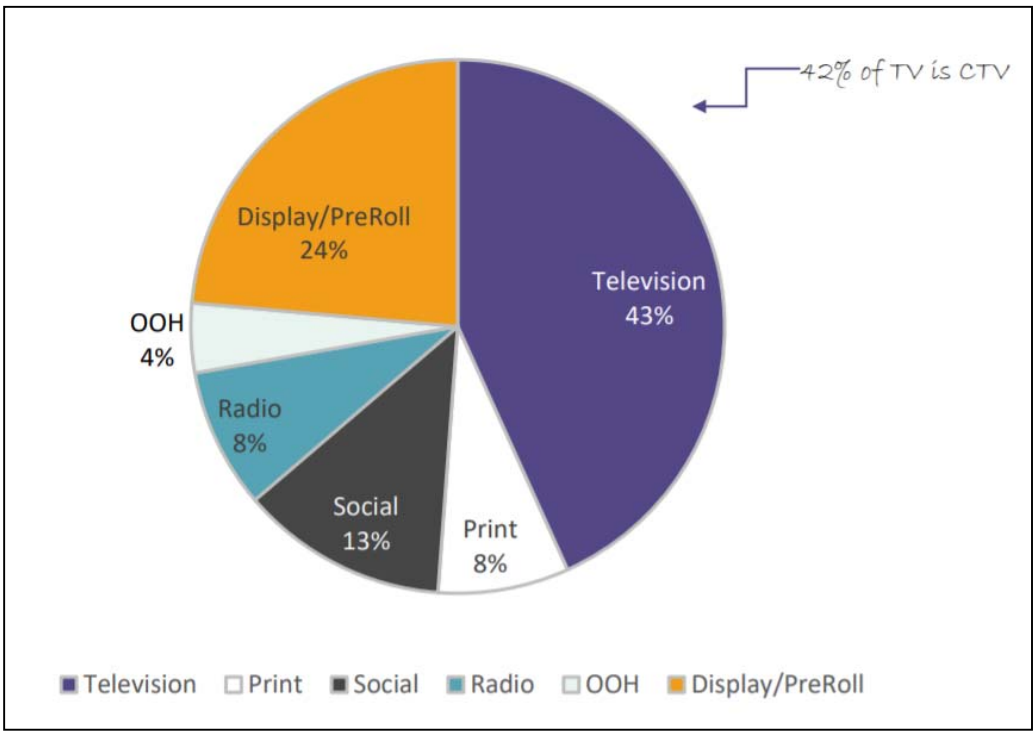
A consumer marketing campaign was launched on Sunday, January 3, 2021, with the purpose of reminding consumers of the importance of cancer screenings (with special focus on breast, colon, and lung), easing fears about safely returning to health care offices, and encouraging patients to schedule appointments for screening mammograms as well as colon cancer screenings, and lung cancer screenings. The campaign stayed in market through April 4, 2021. The creative development team used humor to break through the clutter and make the message relatable to those going through the many life changes brought on by the COVID-19 pandemic, including hording toilet paper, giving

our own haircuts, and working out in our living rooms while local gyms were closed (see Appendix N).

This was a multi-media campaign, including broadcast, cable, and connected TV (with a focus on premium sports placements, such as the 2021 NFL SuperBowl and the 2021 NCAA men's and women's basketball tournament), traditional and streaming radio, digital advertising, social media advertising, out-of-home advertising, such as billboards and transit advertising, and print. A breakdown of the traditional media allocation throughout the duration of the campaign is included in Figure 8.

Figure 8

Traditional Media Allocation



While the campaign delivered nearly 30 million impressions throughout all the markets over the course of the 4 months it was in market, the focus of this research study will be

on two targeted mediums – direct mail and email. The entirety of the campaign influenced people to action, but the most detailed tracking and reporting metrics were available through the CRM database.

Those who received an email or direct mail regarding breast cancer screenings were asked to self-schedule their mammogram by either clicking on the "schedule online" button within the email or by visiting a unique website address from a direct mail piece. Those who received an email or direct mail regarding colon cancer screenings were asked to talk to their health care provider about screening options or to visit a unique website address. Lung cancer screening recipients were asked to follow the recommended screening guidelines and visit a unique website address. From both the colon and lung cancer screening landing pages, respondents could schedule appointments with a primary care provider.

Using the CRM database, it is possible to attribute responses to the campaign (click throughs to the campaign landing pages as well as mammography and primary care appointments made) to a marketing campaign within the CRM database. This allows tracking of how many patients made screening appointments, and how many followed through and completed their cancer screening, as well as how many eventually received a cancer diagnosis. While the information is not attributed to an individual record, aggregate numbers can be viewed by age, by gender and by market, as well as by the type of marketing communication received.

The extracted data was pulled from the CRM database using the Reports functionality. A separate report was pulled for each of the email and direct mail sets listed

in the tables 4-9..From each of those reports, targeted consumers were grouped into the age categories of less than 45 years of age, 45–54 years of age, 55–64 years of age, 65–74 years of age, and 75 or more years of age. The same was done for gender (with the groups being male or female) and the type of marketing communication medium received (email vs. direct mail). For geography, cities were grouped into Urban (Evergreen Park), Suburban (Bloomington, Danville, Peoria, Rockford, and Urbana) and Rural (Alton, Mendota, Ottawa, Pontiac, and Escanaba). All the extracted records will be included in the analysis rather than incorporating sampling.

The extracted data was pulled from the health system's password-protected CRM database using the Reports functionality. SPSS is used to analyze whether the recipient engaged with a marketing communication by making a mammography and/or primary care appointment, as well as whether they eventually completed a breast, colon, or lung cancer screening, and if they received a cancer diagnosis.

The institutional review boards of both the health system and Walden University granted me permission to conduct the study (see Appendix O). To obtain this permission, I completed and submitted a new research application to both organizations, along with an abstract of the study, including the RQs and hypotheses. Once approval was received, I logged into the database, identified the needed data sets, and downloaded them as Microsoft Excel files. Each Microsoft Excel file was also password protected, and those passwords were provided in separate, protected communications. After entering the password for each file, the data were deidentified, so that the only fields used in the

analysis were each recipient's age, gender, and zip code, as well as whether they received an email and/or direct mail communication from the health system.

Instrumentation and Operationalization of Constructs

Variables for this study include age, geography, gender, and the type of marketing communication medium received (direct mail, email, or both), as well as whether the recipient engaged with a marketing communication, if they made a mammography and/or primary care appointment, whether they completed a breast, colon, or lung cancer screening, and if they received a cancer diagnosis. A separate set of reports was pulled for each of the email and direct mail sets listed in Tables 1-3. From each of those reports, targeted consumers were grouped into the age categories of less than 45 years of age, 45–54 years of age, 55–64 years of age, 65–74 years of age, and 75 or more years of age. The same was done for gender (with the groups being male and female) and the type of marketing communication medium received (email vs. direct mail). For geography, cities were grouped into Urban (Evergreen Park), Suburban (Bloomington, Danville, Peoria, Rockford, and Urbana), and Rural (Alton, Mendota, Ottawa, Pontiac, and Escanaba). Table 4 provides a description of the variables.

Table 10

Study Variables

Variable name	Variable type	Level of measurement	Response options
Age	Independent	Ordinal	Less than 45 years of age, 45-54 years of age, 55-64 years of age, 65-74 years of age, 75 or more years of age
Geography	Independent	Nominal	Urban vs. suburban vs. rural
Gender	Independent	Nominal	Male or female
Marketing medium	Dependent	Nominal	Email or direct mail
Breast cancer screenings	Dependent	Nominal	Complete or incomplete
Colon cancer screenings	Dependent	Nominal	Complete or incomplete
Lung cancer screenings	Dependent	Nominal	Complete or incomplete
Primary care or mammography appointment	Dependent	Nominal	Scheduled or not scheduled
Received a cancer diagnosis	Dependent	Nominal	Diagnosed or not diagnosed

Note. This table summarizes the independent and dependent variables of the study.

The study includes nominal variables that, using SPSS statistical software, will be studied for the number of observations within each category. For example, age, gender, and geography will be reported by the aggregated total number of emails with the total number of screening appointments and total number of cancer diagnoses for each market. The study includes nominal variables that, using SPSS statistical software, will be studied for the number of observations within each category. For example, age, gender, and

geography will be reported by the number and percentage of respondents in each category. Because the dependent variable (number of screening appointments) is a continuous variable, multiple linear regression will be used as the data analysis technique, and the t-test will be used as the statistical test of the hypotheses. The threshold for significance of $p<0.05$ will be used to reject the null hypothesis.

Data Analysis Plan

To prepare the data for analysis, data will be extracted from the CRM database into separate Excel spreadsheets. This quantitative research study seeks to determine if, following the COVID-19 pandemic, there has been a significant difference in re-engagement in breast, colon, and lung cancer screenings by consumers receiving targeted direct mail and email marketing communications, based on age, gender, and geographic location. The zip codes included in each of the 11 markets are included in Appendices S, T and U. The data will be analyzed by each of four time periods, including fiscal year (FY) 2021 (which includes the first 6 months of the marketing campaign), calendar year (CY) 2022 (which covers the entirety of the marketing campaign time line), FY 2022 (which includes the last 6 months of the marketing campaign), and FY 2023 to date (the health system's current FY). This analysis includes a total of 132 data points, which is more than the required 107 data points needed for sufficient statistical power to test each hypothesis. The RQs and hypotheses were as follows:

RQ1: Is there a significant difference in response to lung, colon, or breast cancer screening appointments by age, gender, or geographic location from consumers receiving

targeted direct mail messages versus targeted email messages after the COVID-19 pandemic?

$H_0$1: There is no significant difference in response to lung, colon, or breast cancer screening appointments by age, gender, or geographic location from consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic.

$H_1$1: There is a significant difference in response to lung, colon, or breast cancer screening appointments by age, gender, or geographic location from consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic.

RQ2: What is the association between targeted direct mail versus email marketing campaigns promoting colon, lung, and breast cancer screenings after the COVID-19 pandemic and conversions to patient appointments?

$H_0$2: There is no association between targeted direct mail versus targeted email marketing campaigns promoting colon, lung, and breast cancer screenings after the COVID-19 pandemic and conversions to patient appointments.

$H_1$2: There is an association between targeted direct mail versus targeted email marketing campaigns promoting colon, lung, and breast cancer screenings after the COVID-19 pandemic and conversions to patient appointments.

RQ3: Is there a significant difference in new diagnoses for lung, colon, or breast cancer by age, gender, or geographic location in consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic?

$H_0$3: There is no significant difference in new diagnoses for lung, colon, or breast cancer in consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic.

$H_1$3: There is a significant difference in new diagnoses for lung, colon, or breast cancer in consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic.

I used multiple linear regression as the data analysis technique. The threshold for significance of $p < 0.05$ was used to test the hypotheses.

Threats to Validity

External validity is determined by whether the study results can be applied to similar individuals not included in the study, or a larger population of like individuals (Patino, 2018). Because of the precise targeting of the marketing messages and the quantity of impressions, or number of times the campaign message was seen, the study results can be applied to similar individuals not included in the study and therefore external validity can be assumed. Internal validity represents the extent to which the calculated results of the study are true and not in error due to methodology errors (Patino, 2018). There are no anticipated threats to internal validity. Statistical conclusion validity is demonstrated when the conclusions of a research study are drawn only after complete and accurate analysis of the data (García-Pérez, 2012).

The two types of errors that can result from such threats to validity include a type I error – the probably associated with rejecting a null hypothesis when it is true; and a type II error – the probability associated with failing to reject a null hypothesis when it is

false (Frankfort-Nachmias, 2020). While the quantities of each of the three direct mail and three email target audience lists are varied, the entire lists are included in the data analysis, rather than samples. This helps maximize the significance of the results and avoids type I and type II errors.

Ethical Procedures

I obtained institutional review board approval from both the health system (nos. 688 and 689) and Walden University (no. 05-15-23-0751040). The deidentified data collected from this secondary data set, for the purpose of this research study, will be stored on a password protected laptop for a period of 5 years. I will be the only person who has access to this laptop and the data.

Summary

This is a quantitative study using secondary data from a health system based in Illinois, and includes results collected from its CRM database, including data from its January through April 2021 cancer screening marketing campaign. To address the three RQs in this quantitative study, the specific research design used is a correlational design. Multiple linear regression will be used as the data analysis technique, and the t-test will be used as the statistical test of the hypotheses. The threshold for significance of $p<0.05$ will be used to reject the null hypothesis. Variables for this study include age, geography, gender, and the type of marketing communication medium received (direct mail, email, or both), as well as whether the recipient engaged with a marketing communication. In Section 3, I will discuss data collection, results of its analyses, and provide a summary of findings.

Section 3: Presentation of the Results and Findings

Introduction

The purpose of this quantitative study was to investigate whether there was a significant difference in scheduled breast, colon, and lung cancer screenings in consumers receiving targeted direct mail and email marketing communications following the COVID-19 pandemic, based on age, gender, and geographic location. I analyzed secondary data from a health system headquartered in Peoria, Illinois, including CRM data and strategic marketing campaign creative and results from 2021. I used a correlational research design to assess the prevalence of variables in population samples and to address the three RQs in this quantitative study. The independent variables of this study included the type of marketing communication deployed as well as the recipient's age, gender, and geographic location. The dependent variable was breast, colon, and lung cancer screening volumes.

In this quantitative research study, I sought to determine whether there had been a significant difference in reengagement in breast, colon, and lung cancer screenings by consumers receiving targeted direct mail and email marketing communications during the COVID-19 pandemic, based on age, gender, and geographic location. The RQs and hypotheses for the study were as follows:

RQ1: Is there a significant difference in response to lung, colon, or breast cancer screening appointments by age, gender or geographic location from consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic?

$H_0$1: There is no significant difference in response to lung, colon, or breast cancer screening appointments by age, gender or geographic location from consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic.

$H_1$1: There is a significant difference in response to lung, colon, or breast cancer screening appointments by age, gender or geographic location from consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic.

RQ2: What is the association between targeted direct mail versus email marketing campaigns promoting colon, lung, and breast cancer screenings after the COVID-19 pandemic and conversions to patient appointments?

$H_0$2: There is no association between targeted direct mail versus targeted email marketing campaigns promoting colon, lung, and breast cancer screenings after the COVID-19 pandemic and conversions to patient appointments.

$H_1$2: There is an association between targeted direct mail versus targeted email marketing campaigns promoting colon, lung, and breast cancer screenings after the COVID-19 pandemic and conversions to patient appointments.

RQ3: Is there a significant difference in new diagnoses for lung, colon, or breast cancer by age, gender or geographic location in consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic?

$H_0$3: There is no significant difference in new diagnoses for lung, colon, or breast cancer in consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic.

$H_1$3: There is a significant difference in new diagnoses for lung, colon, or breast cancer in consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic.

In Section 3, I will further discuss data collection and present the results of the data analyses.

Data Collection of Secondary Data Set

I extracted data from the health system's CRM database using the reports functionality. A separate report was pulled for each of the email and direct mail lists. The breast cancer screening direct mail and email campaigns were received by consumers on or around January 25, 2021. The colon cancer screening direct mail and email campaigns were received by consumers on or about February 25, 2021. The lung cancer screening direct mail and email campaigns were received by consumers on or about March 25, 2021.

From each of the reports pulled, targeted consumers were grouped into the age categories of less than 45 years of age, 45–54 years of age, 55–64 years of age, 65–74 years of age, and 75 or more years of age. The same was done for gender (with the groups being male or female) and the type of marketing communication medium received (email vs. direct mail). For geography, cities were grouped into urban (Evergreen Park), suburban (Bloomington, Danville, Peoria, Rockford, and Urbana) and rural (Alton,

Mendota, Ottawa, Pontiac, and Escanaba). These groupings were determined based on U.S. Census Bureau data, where any market with a census of more than one million residents was placed in the urban category. Any market with census between 150,000 and 1,000,000 residents was grouped into the suburban category, and any market with less than 150,000 residents was grouped into the rural category. All the extracted records were included in the analysis rather than incorporating sampling.

The health system's CRM database is a password-protected database. After I extracted the data, the data were deidentified in Microsoft Excel before being uploaded into SPSS. SPSS was used to analyze whether the recipient engaged with a marketing communication by making a mammography and/or primary care appointment. Data also included whether they eventually completed a breast, colon, or lung cancer screening, and received a cancer diagnosis.

Time Frame for Data Collection

Data in the health system's CRM database have been collected from the point in time each individual first engaged with the health system. Individuals who have had a clinical encounter with the health system are categorized as a patient within the CRM database, and their record begins on the date of their first clinical encounter. Individuals who have interacted in other ways (e.g., by attending a class or event hosted by the health system or by downloading information from the health system's website) are categorized as "friends and family" within the CRM database. Their record begins on the date of their first nonclinical encounter with the health system. Should they become a patient, their record is recategorized as patient at the time of that clinical encounter.

A third category within the CRM database is pure prospects. These are purchased consumer lists for those who have not had any encounter with the health system, and include such data as shopper loyalty card information from retail pharmacies, magazine subscriptions, catalog mailing lists, census data, and so forth. All the records within each category – patient, friends and family, and pure prospects, was used in the analysis and therefore sample was not incorporated.

Descriptive and Demographic Characteristics of the Data

For breast cancer screening, targeted consumers were grouped into the age categories of less than 45 years of age, 45–54 years of age, 55–64 years of age, 65–74 years of age, and 75 or more years of age. The same was done for gender (with the groups being male or female) and the type of marketing communication medium received (email vs. direct mail). For geography, cities were grouped based on census data, where any market with a census of more than one million residents was placed in the urban category. Any market with census between 150,000 and one million residents was grouped into the suburban category, and any market with less than 150,000 residents was grouped into the rural category. All the extracted records were included in the analysis rather than incorporating sampling.

Table 11

Market Categories

Market type	Community	County	County population
Urban markets	Evergreen Park, Illinois	Cook County	5,173,146
Suburban markets	Bloomington, Illinois	McLean County	170,889
	Peoria, Illinois	Peoria County	179,432
	Urbana, Illinois	Champaign County	205,943
	Alton, Illinois	Madison County	264,490
	Rockford, Illinois	Winnebago County	283,119
Rural markets	Mendota, Illinois	LaSalle County	108,965
	Ottawa, Illinois	LaSalle County	108,965
	Danville, Illinois	Vermilion County	73,095
	Escanaba, Michigan	Delta County	36,826
	Pontiac, Illinois	Livingston County	35,664

Note. This table shows the population of each county included in the study in order to support the definitions of urban, suburban and rural markets.

Table 12

CRM Tactics by Market

		Breast screening		Colon screening		Lung screening	
Market type	**Market**	**Direct mail**	**Email**	**Direct mail**	**Email**	**Direct mail**	**Email**
Urban	Evergreen Park	1,184	1,180	78	181	2,330	994
	Subtotal – Urban	**1,184**	**1,180**	**78**	**181**	**2,330**	**994**
Suburban	Alton	1,030	1,905	58	288	3,357	2,478
	Bloomington	1,289	3,897	50	669	3,663	4,175
	Peoria	2,426	6,362	151	1,198	13,134	13,255
	Rockford	3,195	5,218	165	772	395	6,928
	Urbana	1,574	3,120	37	324	2,350	2,018
	Subtotal – Suburban	**9,514**	**20,502**	**461**	**3251**	**22,899**	**28,854**
Rural	Danville	692	1,246	45	244	2,875	2,180
	Mendota	87	150	7	35	7	515
	Ottawa	635	1,358	52	298	4,268	3,450
	Pontiac	198	511	7	137	1,768	1,657
	Escanaba	19	412	19	110	1,012	782
	Subtotal – Rural	**1,631**	**3,677**	**130**	**824**	**9,930**	**8,584**
	Total	12,329	25,359	669	4,256	35,159	38,432
	Total by screening	37,688		4,925		73,591	
	Cumulative total			**116,204**			

Note. This table shows the email and direct quantities sent by market and by cancer screening.

Table 13

Breast Cancer Screening

		Breast Screening	
Market type	**Market**	**Direct mail**	**Email**
Urban	Evergreen Park	1,184	1,180
	Subtotal - Urban	**1,184**	**1,180**
Suburban	Alton	1,030	1,905
	Bloomington	1,289	3,897
	Peoria	2,426	6,362
	Rockford	3,195	5,218
	Urbana	1,574	3,120
	Subtotal - Suburban	**9,514**	**20,502**
Rural	Danville	692	1,246
	Mendota	87	150
	Ottawa	635	1,358
	Pontiac	198	511
	Escanaba	19	412
	Subtotal - Rural	**1,631**	**3,677**
	Total	12,329	25,359

Note. This table shows the email and direct quantities sent by market for breast cancer screening.

Mammography Direct Mail (Urban)

A total of 1,884 people in the urban market (Evergreen Park, Illinois) received the mammography direct mail. One hundred percent of the recipients were women, which makes sense based on the targeting for the message. Many recipients (99.74%) were between the ages of 55 and 64. Recipients between the ages of 45-54 accounted for just 0.26%.

Mammography Direct Mail (Suburban)

A total of 9,514 people in the suburban markets (Alton, Bloomington, Peoria, Rockford and Urbana, Illinois) received the mammography direct mail. One hundred percent of the recipients were women, as appropriate based on the targeting for the message. Most recipients (99.73%) were between the ages of 55-64. The remaining category, ages 45-54, accounted for 0.27%.

Mammography Direct Mail (Rural)

A total of 1,631 people in the rural markets (Danville, Mendota, Ottawa and Pontiac, Illinois, as well as Escanaba, Michigan) received the mammography direct mail. One hundred percent of the recipients were women, as appropriate based on the targeting for the message. Many recipients (99.89%) are ages 55-64. The second category, ages 45-54, had just 0.11%.

Table 14

Mammography Respondents by Gender (Direct Mail)

Market type	Gender	Percentage
Urban markets	Female	100%
Suburban markets	Female	100%
Rural markets	Female	100%

Note. This table shows the mammography direct mail respondents by gender.

Table 15

Mammography Respondents by Age (Direct Mail)

Market type	Age	Percentage
Urban markets	45-54	17.31%
	55-64	92.69%
Suburban markets	45-54	17.53%
	55-64	82.47%
Rural markets	45-54	17.57%
	54-64	82.43%

Note. This table shows the mammography direct mail respondents by age.

Mammography Email (Urban)

A total of 1,180 people in the urban market (Evergreen Park, Illinois) received the mammography email. One hundred percent of the recipients were women, which makes good sense based on the targeting for the message. The largest group of recipients were age 55–64 (82.69%), followed by 45–54 at 17.31%.

Mammography Email (Suburban)

A total of 20,502 people in the suburban markets (Alton, Bloomington, Peoria, Rockford and Urbana, Illinois) received the mammography email. One hundred percent of the recipients were women, as appropriate based on the targeting for the message. The largest age group for recipients was 55-64 (82.47%), followed by 45-54 at 17.53%.

Mammography Direct Mail (Rural)

A total of 3,677 people in the rural markets (Danville, Mendota, Ottawa and Pontiac, Illinois, as well as Escanaba, Michigan) received the mammography email. One hundred percent of the recipients were women, as appropriate based on the targeting for

the message. The largest age category for recipients is 55–64 (82.43%), followed by 45–54 (17.57%).

Table 16

Mammography Respondents by Gender (Email)

Market type	Gender	Percentage
Urban Markets	Female	100%
Suburban Markets	Female	100%
Rural Markets	Female	100%

Note. This table shows the mammography email respondents by gender.

Table 17

Mammography Respondents by Age (email)

Market type	Age	Percentage
Urban markets	45-54	17.31%
	55-64	92.69%
Suburban markets	45-54	17.53%
	55-64	82.47%
Rural markets	45-54	17.57%
	54-64	82.43%

Note. This table shows the mammography email respondents by age.

Table 18

Colon Cancer Screenings

		Colon screening	
Market type	**Market**	**Direct mail**	**Email**
Urban	Evergreen Park	78	181
	Subtotal - Urban	**78**	**181**
Suburban	Alton	58	288
	Bloomington	50	669
	Peoria	151	1,198
	Rockford	165	772
	Urbana	37	324
	Subtotal - Suburban	**461**	**3251**
Rural	Danville	45	244
	Mendota	7	35
	Ottawa	52	298
	Pontiac	7	137
	Escanaba	19	110
	Subtotal - Rural	**130**	**824**
	Total	669	4,256

Note. This table shows the email and direct quantities sent by market for colon cancer screening.

Colon Direct Mail (Urban)

A total of 78 people in the urban market (Evergreen Park, Illinois) received the colon screening direct mail. Seventy-two percent of recipients were female, and 28 percent were male. Most recipients were age 55–64 (72.34%), followed by ages 45–54 (27.66%).

Colon Direct Mail (Suburban)

A total of 461 people in the suburban markets (Alton, Bloomington, Peoria, Rockford and Urbana, Illinois) received the colon screening direct mail. Fifty-seven percent of the recipients were female, and 43% were male. Most recipients (89.55%) were age 55–64, followed by 45–54 (10.45%).

Colon Direct Mail (Rural)

A total of 130 people in the rural markets (Danville, Mendota, Ottawa and Pontiac, Illinois, as well as Escanaba, Michigan) received the colon screening direct mail. Fifty-four percent of recipients were male, and 46% were female. The largest age group of recipients is 55–64 (82.93%), followed by 45–54 (17.07%).

Table 19

Colon Respondents by Age (Direct Mail)

Market type	Age	Percentage
Urban markets	45-54	27.66%
	55-64	72.34%
Suburban markets	45-54	10.45%
	55-64	89.55%
Rural markets	45-54	17.07%
	54-64	82.93%

Note. This table shows the colon direct mail respondents by age.

Table 20

Colon Respondents by Gender (Direct Mail)

Market type	Gender	Percentage
Urban markets	Male	28.00%
	Female	72.00%
Suburban markets	Male	43.00%
	Female	57.00%
Rural markets	Male	54.00%
	Female	46.00%

Note. This table shows the colon direct mail respondents by gender

Colon Email (Urban)

There were 181 screening emails sent to the Evergreen Park market. Seventy-five percent of recipients were female, and 25% were male. The largest age category of recipients was 55–65 (89.80%), followed by 45–54 (10.2%).

Colon Email (Suburban)

A total of 3,251 people in the suburban markets (Alton, Bloomington, Peoria, Rockford and Urbana, Illinois) received the colon screening email. Fifty-eight percent of recipients were female, and 42% were male. Most recipients (98.86%) were ages 55–64, followed by ages 45–54 at 1.14%.

Colon Email (Rural)

A total of 824 people in the rural markets (Danville, Mendota, Ottawa and Pontiac, Illinois, as well as Escanaba, Michigan) received the colon screening email. Fifty-nine percent or recipients were female, and 41% were male. Most recipients (96.44%) were ages 55–64, followed by 45–54 at 3.56%.

Table 21

Colon Respondents by Age (Email)

Market type	Age	Percentage
Urban markets	45-54	10.20%
	55-64	89.80%
Suburban markets	45-54	1.14%
	55-64	98.86%
Rural markets	45-54	3.56%
	54-64	96.44%

Note. This table shows the colon email respondents by age.

Table 22

Colon Respondents by Gender (Email)

Market type	Gender	Percentage
Urban markets	Male	45.49%
	Female	25.51%
Suburban markets	Male	42.00%
	Female	58.00%
Rural markets	Male	41.00%
	Female	59.00%

Note. This table shows the colon email respondents by gender.

Table 23

Lung Cancer Screenings

		Lung Screening	
Market Type	**Market**	**Direct mail**	**Email**
Urban	Evergreen Park	2,330	994
	Subtotal – Urban	**2,330**	**994**
Suburban	Alton	3,357	2,478
	Bloomington	3,663	4,175
	Peoria	13,134	13,255
	Rockford	395	6,928
	Urbana	2,350	2,018
	Subtotal – Suburban	**22,899**	**28,854**
Rural	Danville	2,875	2,180
	Mendota	7	515
	Ottawa	4,268	3,450
	Pontiac	1,768	1,657
	Escanaba	1,012	782
	Subtotal – Rural	**9,930**	**8,584**
	Total	35,159	38,432

Note. This table shows the email and direct quantities sent by market for lung cancer screening.

Lung Direct Mail (Urban)

A total of 2,330 people in the urban market (Evergreen Park, Illinois) received the lung screening direct mail. Sixty-six percent of recipients were female and 34% male. One hundred percent of recipients were aged 55–65.

Lung Direct Mail (Suburban)

A total of 22,899 people in the suburban markets (Alton, Bloomington, Peoria, Rockford and Urbana, Illinois) received the lung screening direct mail. Fifty-four percent

of recipients were female, and 46% were male. The largest age group of recipients was 55–64 at 98.54%, followed by 45–54 at 1.46%.

Lung Direct Mail (Rural)

A total of 10,686 people in the rural markets (Danville, Mendota, Ottawa and Pontiac, Illinois, as well as Escanaba, Michigan) received the lung screening direct mail. A little over 55% of recipients were female, and slightly more than 44% were male. All of the recipients were between the ages of 55–64.

Table 24

Lung Respondents by Age (Direct Mail)

Market type	Age	Percentage
Urban markets	55-65	100.00%
Suburban markets	45-54	10.46%
	55-64	89.54%
Rural markets	55-64	100.00%

Note. This table shows the lung direct mail respondents by age.

Table 25

Lung Respondents by Gender (Direct Mail)

Market type	Gender	Percentage
Urban markets	Male	34.00%
	Female	66.00%
Suburban markets	Male	46.00%
	Female	54.00%
Rural markets	Male	44.78%
	Female	55.22%

Note. This table shows the lung direct mail respondents by gender.

Lung Email (Urban)

A total of 994 people in the urban market (Evergreen Park, Illinois) received the lung screening email. Eighty-one percent of recipients were female, and 19% were male. All of the recipients were ages 55–64.

Lung Email (Suburban)

A total of 28,854 people in the suburban markets (Alton, Bloomington, Peoria, Rockford and Urbana, Illinois) received the lung screening email. Sixty-two percent of recipients were female, and just under 38% were male. The largest age category of recipients was 55–64 at 88.64%, followed by 45–54 at 11.36%.

Lung Email (Rural)

A total of 9,459 people in the rural markets (Danville, Mendota, Ottawa and Pontiac, Illinois, as well as Escanaba, Michigan) received the lung cancer screening email. Just over 60% of recipients were female, and just under 40% of recipients were male. All of the recipients were ages 55-64.

Table 26

Lung Respondents by Age (Email)

Market type	Age	Percentage
Urban markets	55-65	100.00%
Suburban markets	45-54	11.36%
	55-64	88.64%
Rural markets	55-64	100.00%

Note. This table shows the lung email respondents by age.

Table 27

Lung Respondents by Gender (Email)

Market type	Gender	Percentage
Urban markets	Male	19.00%
	Female	81.00%
Suburban markets	Male	37.96%
	Female	62.04%
Rural markets	Male	39.64%
	Female	60.36%

Note. This table shows the lung email respondents by gender.

Response Rates

Another descriptive statistic used to analyze the success of the marketing campaign is response rates within the CRM database. Response rates indicate the number of people who clicked on the marketing campaign landing page to schedule a primary care or mammography appointment. This does not, however, mean that they completed the appointment. Completed appointments will be studied later in the multiple linear regression analyses. Clicks to schedule an appointment simply show the number of people who responded to the direct mail and email creative and attempted to schedule or scheduled a primary care appointment.

Breast Cancer Screening Campaign Response Rates (Direct Mail)

At 15.79%, Escanaba, Michigan had the highest response rate (number of people clicking to schedule a mammogram appointment) for the breast screening direct mail marketing campaign. Urbana had the lowest response rate at 1.08%. Following is a breakdown of response rates by market.

Table 28

Breast Cancer Screening Reponses Rates – Direct Mail

Medium	Market	Number targeted	Responses	Response rate
Direct mail	Evergreen Park	1,884	157	8.33%
	Alton	1,030	38	3.69%
	Bloomington	1,289	47	3.65%
	Peoria	2,426	256	10.55%
	Rockford	3,195	131	4.10%
	Urbana	1,574	17	1.08%
	Danville	692	54	7.80%
	Mendota	87	10	11.49%
	Ottawa	635	53	8.35%
	Pontiac	198	27	13.64%
	Escanaba	19	3	15.79%

Note. This table shows the responses to the breast cancer direct mail campaign by market.

Urban Market. In the Evergreen Park market, the breast screening direct mail marketing campaign received 157 responses, for an overall response rate of 8.33%.

Suburban Markets. In the Alton market, the breast screening direct mail marketing campaign received 38 responses, for a response rate of 3.69%. In the Bloomington market, the campaign received 47 responses, for a response rate of 3.65%. In the Peoria market, the breast screening direct mail marketing campaign received 256 responses, for a response rate of 10.55%. In the Rockford market, the campaign received 131 responses, or a response rate of 4.10%. In the Urbana market, the breast screening direct mail marketing campaign received 17 responses, for a response rate of 1.08%.

Rural Markets. In the Danville market, the breast screening direct mail marketing campaign received 54 responses, or a response rate of 7.80%. Mendota

received 10 responses, for an overall response rate of 11.49%. Ottawa received 53 responses, for an overall response rate of 8.35%. Pontiac received 27 responses, for an overall response rate of 13.64%. In the Escanaba market, the breast screening direct mail marketing campaign received three responses, for an overall response rate of 15.79%.

Breast Cancer Screening Campaign Response Rates (Email)

At 33.74%, Escanaba, Michigan had the highest response rate (number of people clicking to schedule a mammogram appointment) for the breast screening email marketing campaign. Rockford had the lowest response rate at 1.54%. Table 37 includes a breakdown of response rates by market.

Table 29

Breast Screening Response Rates – Email

Medium	Market	Number targeted	Responses	Response rate
Email	Evergreen Park	1,180	361	30.59%
	Alton	1,905	135	7.09%
	Bloomington	3,897	393	10.08%
	Peoria	6,361	1,379	21.68%
	Rockford	5,218	544	10.43%
	Urbana	3,120	48	1.54%
	Danville	1,246	209	16.77%
	Mendota	150	34	22.67%
	Ottawa	1,358	269	19.81%
	Pontiac	511	132	25.83%
	Escanaba	412	139	33.74%

Note. This table shows the responses to the breast cancer email campaign by market.

Urban Market. In the Evergreen Park market, the breast screening email marketing campaign received 361 responses, for an overall response rate of 30.59%.

Suburban Markets. In the Alton market, the breast screening email marketing campaign received 135 responses, for an overall response rate of 7.09%. Bloomington received 393 responses, for a response rate of 10.08%. In the Peoria market, the campaign received 1,379 responses, or a 21.68% response rate. Rockford received 544 responses, for a response rate of 10.43%. Urbana received 48 responses, for an overall response rate of 1.54%.

Rural Markets. In the Danville market, the breast screening email marketing campaign received 209 responses or a response rate of 16.77%. Mendota received 150

responses, for an overall response rate of 22.67%. In the Ottawa market, the breast screening email marketing campaign received 269 responses, for a response rate of 19.81%. Pontiac received 132 responses, for a response rate of 25.83%. In the Escanaba market, the breast screening email marketing campaign received 139 responses, for an overall response rate of 33.74%.

Colon Cancer Screening Campaign Response Rates (Direct Mail)

At 17.31%, Ottawa had the highest response rate (number of people clicking to schedule a primary care appointment) for the colon screening direct mail marketing campaign. Pontiac, Mendota, and Urbana had the lowest response rate at 0% each. Following is a breakdown of response rates by market.

Table 30

Colon Screening Response Rates – Direct Mail

Medium	Market	Number targeted	Responses	Response Rate
Direct mail	Evergreen Park	78	3	3.85%
	Alton	58	3	5.17%
	Bloomington	50	1	2.00%
	Peoria	151	16	10.60%
	Rockford	165	10	6.06%
	Urbana	37	0	0.00%
	Danville	45	5	11.11%
	Mendota	7	0	0.00%
	Ottawa	52	9	17.31%
	Pontiac	7	0	0.00%
	Escanaba	19	3	15.79%

Note. This table shows the responses to the breast cancer email campaign by market.

Urban Market. In the Evergreen Park market, the colon screening direct mail marketing campaign received 78 responses (clicks to schedule a primary care appointment), for an overall response rate of 3.85%.

Suburban Markets. In the Alton market, the colon screening direct mail marketing campaign received 3 responses, for an overall response rate of 5.17%. In the Bloomington market, the colon screening direct mail marketing campaign received one response, for a response rate of 2.0%. Peoria received 16 responses, for an overall response rate of 10.6%. In the Rockford market, the colon screening direct mail marketing campaign received 10 responses, for an overall response rate of 6.06%. In the

Urbana market, the colon screening direct mail marketing campaign received no responses, or an overall response rate of 0%.

Rural Markets. In the Danville market, the colon screening direct mail marketing campaign received 5 responses, for an overall response rate of 11.11%. Mendota received no responses, or a response rate of 0%. In the Ottawa market, the colon screening direct mail marketing campaign received nine responses, for an overall response rate of 17.31%. In the Pontiac market, the colon screening direct mail marketing campaign received no responses, or a response rate of 0%. In the Escanaba, Michigan market, the colon screening direct mail marketing campaign received three responses, for an overall response rate of 15.29%.

Colon Cancer Screening Campaign Response Rates (Email)

At 57.14%, Mendota had the highest response rate (number of people clicking to schedule a primary care appointment) for the colon screening email marketing campaign. Urbana had the lowest response rate at 7.10%. Following is a breakdown of response rates by market.

Table 31

Colon Screening Response Rates – Email

Medium	Market	Number targeted	Responses	Response rate
Email	Evergreen Park	181	27	14.92%
	Alton	288	72	25.00%
	Bloomington	669	274	40.96%
	Peoria	1,198	492	41.07%
	Rockford	772	190	24.61%
	Urbana	324	23	7.10%
	Danville	244	71	29.10%
	Mendota	35	20	57.14%
	Ottawa	298	152	51.01%
	Pontiac	137	61	44.53%
	Escanaba	110	55	50.00%

Note. This table shows the responses to the breast cancer email campaign by market.

Urban Market. In the Evergreen Park market, the colon screening email marketing campaign received 27 responses (clicks to schedule a primary care appointment), for an overall response rate of 14.92%.

Suburban Markets. In the Alton market, the colon screening email marketing campaign received 72 responses, for an overall response rate of 25.0%. In the Bloomington market, the colon screening email marketing campaign received 274 responses, for a response rate of 40.96%. Peoria received 492 responses, for a response rate of 41.07%. In the Rockford market, the colon screening email marketing campaign received 190 responses, for an overall response rate of 24.61%. Urbana received 23 responses for a response rate of 7.10%.

Rural Markets. In the Danville market, the colon screening email marketing campaign received 71 responses, for an overall response rate of 29.10%. In Mendota, the colon screening email marketing campaign received 20 responses, for an overall response rate of 57.14%. Ottawa received 152 responses, for an overall response rate of 51.01%. In the Pontiac market, the colon screening email marketing campaign received 61 responses, for a response rate of 44.53%. In Escanaba, Michigan the campaign received 55 responses, for an overall response rate of 50.0%.

Lung Cancer Screening Campaign Response Rates (Direct Mail)

At 12.65%, Escanaba, Michigan had the highest response rate (number of people clicking to schedule a primary care appointment) for the lung screening direct mail marketing campaign. Mendota had the lowest response rate at 0.0%. Following is a breakdown of response rates by market.

Table 32

Lung Screening Response Rate – Direct Mail

Medium	Market	Number targeted	Responses	Response Rate
Direct mail	Evergreen Park	2,330	134	5.75%
	Alton	3,357	131	3.90%
	Bloomington	3,663	191	5.21%
	Peoria	13,134	1,226	9.33%
	Rockford	9,669	395	4.09%
	Urbana	2,350	69	2.94%
	Danville	2,875	239	8.31%
	Mendota	7	0	0.00%
	Ottawa	4,268	373	8.74%
	Pontiac	1,768	129	7.30%
	Escanaba	1,102	128	12.65%

Note. This table shows the responses to the lung screening email campaign by market.

Urban Market. In the Evergreen Park market, the lung screening direct mail marketing campaign received 134 responses (clicks to schedule a primary care appointment), for an overall response rate of 5.75%.

Suburban Markets. In the Alton market, the lung screening direct mail marketing campaign received 131 responses, for an overall response rate of 3.90%. In the Bloomington market, the lung screening direct mail marketing campaign received 191 responses, for a response rate of 5.21%. Peoria received 1,226 responses, for an overall response rate of 9.33%. In the Rockford market, the campaign received 395 responses, for an overall response rate of 4.09% percent. In the Urbana market, the lung screening direct mail marketing campaign received 69 responses, for an overall response rate of 2.94%.

Rural Markets. In the Danville market, the lung screening direct mail marketing campaign received 239 responses, for an overall response rate of 8.31%. Mendota market received no responses, for an overall response rate of 0%. In the Ottawa market, the campaign received 373 responses, for an overall response rate of 8.74%. In the Pontiac market, the lung screening direct mail marketing campaign received 129 responses or a response rate of 7.30%. In the Escanaba market, the lung screening direct mail marketing campaign received 128 responses, for an overall response rate of 12.65%.

Lung Cancer Screening Campaign Response Rates (Email)

At 12.58%, Evergreen Park had the highest response rate (number of people clicking to schedule a primary care appointment) for the colon screening email marketing campaign. Urbana had the lowest response rate at 3.22%. Following is a breakdown of response rates by market.

Table 33

Lung Screening Response Rate – Direct Mail

Medium	Market	Number targeted	Responses	Response rate
Email	Evergreen Park	994	125	12.58%
	Alton	2,478	176	7.10%
	Bloomington	4,175	213	5.10%
	Peoria	13,255	1,299	9.80%
	Rockford	6,928	366	5.28%
	Urbana	2,018	65	3.22%
	Danville	2,180	197	9.04%
	Mendota	515	44	8.54%
	Ottawa	3,450	332	9.62%
	Pontiac	1,657	123	7.42%
	Escanaba	782	90	11.51%

Note. This table shows the responses to the lung cancer email campaign by market.

Urban Market. In the Evergreen Park market, the lung screening email marketing campaign received 125 responses (clicks to schedule a primary care appointment), for an overall response rate of 12.58%.

Suburban Markets. In the Alton market, the lung screening email marketing campaign received 176 responses, for an overall response rate of 7.10%. In Bloomington, the campaign received 213 responses, for an overall response rate of 5.10%. In the Peoria market, the campaign received 1,299 responses, or a response rate of 9.80%. In the Rockford market, the lung screening email marketing campaign received 366 responses, for an overall response rate of 5.28%. In the Urbana market, the campaign received 65 responses, for an overall response rate of 3.22%.

Rural Markets. In the Danville market, the lung screening email marketing campaign received 197 responses, for an overall response rate of 9.04%. In Mendota market, the campaign received 44 responses, for a response rate of 8.54%. Ottawa received 332 responses, for an overall response rate of 9.62%. In the Pontiac market, the lung screening email marketing campaign received 123 responses, for a response rate of 7.42%. In the Escanaba, Michigan market, the lung screening email marketing campaign received 90 responses, for an overall response rate of 11.51%.

Results

A spreadsheet with each of the data points from the CRM database was created. The spreadsheet has been broken down in the following figures for ease of reading, but included 132 lines of data, including the type of screening (breast, colon, or lung), the marketing medium (direct mail or email), the ages of respondents (under 45 years, 45–54 years old, 55–64 years old, 65–74 years old and 75 years old and older), as well as the gender of respondents (male or female), completed primary care and mammography appointments, completed cancer screenings and cancer diagnoses.

Table 34

Breast Screening Direct Mail – FY 2021

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	1	0	22	9	0	0	32	31	31	1
Bloomington	0	0	2	4	0	0	6	5	5	1
Danville	0	0	1	3	0	0	4	3	3	1
Peoria	0	0	10	14	0	0	24	24	24	0
Rockford	0	0	3	14	0	0	17	16	16	1
Urbana	0	0	1	0	0	0	1	1	1	0
Alton	0	0	3	12	0	0	15	15	15	1
Mendota	0	0	0	1	0	0	1	1	1	0
Ottawa	0	0	1	6	0	0	7	7	7	0
Pontiac	0	0	1	2	0	0	3	3	3	0
Escanaba	0	0	2	3	0	0	5	5	5	1

Note. This table shows the number of responses to the breast screening direct mail campaign in fiscal year 2021 by age category, gender, the number of completed primary care and mammography appointments, the number of completed mammograms and the number of cancer diagnoses.

Table 35

Breast Screening Direct Mail – CY 2022

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	0	10	10	0	0	20	19	19	2
Bloomington	0	0	3	7	0	0	10	10	10	1
Danville	0	0	1	2	0	0	3	3	3	0
Peoria	0	0	2	16	0	0	18	18	18	1
Rockford	0	0	3	14	0	0	17	16	16	1
Urbana	0	0	1	3	0	0	4	4	4	0
Alton	0	0	2	2	0	0	4	3	3	1
Mendota	0	0	0	0	0	0	0	0	0	0
Ottawa	0	0	3	2	0	0	5	5	5	0
Pontiac	0	0	1	2	0	0	3	3	3	0
Escanaba	0	0	1	1	0	0	2	1	1	1

Note. This table shows the number of responses to the breast screening direct mail campaign in calendar year 2022 by age category, gender, the number of completed primary care and mammography appointments, the number of completed mammograms and the number of cancer diagnoses.

Table 36

Breast Screening Direct Mail – FY 2022

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	0	22	18	0	0	40	38	38	3
Bloomington	0	0	8	10	0	0	18	18	18	2
Danville	0	0	2	4	0	0	6	6	6	0
Peoria	0	0	16	38	0	0	54	41	41	4
Rockford	0	0	4	6	0	0	10	7	7	3
Urbana	0	0	1	6	0	0	7	7	7	0
Alton	0	0	4	5	0	0	9	7	7	2
Mendota	0	0	0	1	0	0	1	1	1	0
Ottawa	0	0	1	6	0	0	7	7	7	0
Pontiac	0	0	3	5	0	0	8	8	8	0
Escanaba	0	0	3	4	0	0	7	6	6	2

Note. This table shows the number of responses to the breast screening direct mail campaign in fiscal year 2022 by age category, gender, the number of completed primary care and mammography appointments, the number of completed mammograms and the number of cancer diagnoses.

Table 37

Breast Screening Direct Mail – FY 2023 YTD

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	1	0	19	26	0	0	46	43	43	5
Bloomington	0	0	8	15	0	0	23	21	21	3
Danville	0	1	7	7	0	0	15	14	14	1
Peoria	0	0	28	53	9	0	81	75	75	7
Rockford	0	0	13	23	0	0	36	34	34	4
Urbana	0	0	3	3	0	0	5	4	4	1
Alton	0	0	2	5	0	0	7	6	6	3
Mendota	0	0	4	2	0	0	6	6	6	0
Ottawa	0	0	3	2	0	0	5	5	5	0
Pontiac	0	0	5	5	0	0	10	10	10	0
Escanaba	9	9	4	5	0	0	9	9	9	1

Note. This table shows the number of responses to the breast screening direct mail campaign in fiscal year 2023 to date by age category, gender, the number of completed primary care and mammography appointments, the number of completed mammograms and the number of cancer diagnoses.

Table 38

Colon Screening Direct Mail – FY 2021

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	0	1	0	0	0	1	0	1	0
Bloomington	0	0	1	0	0	0	1	1	0	0
Danville	0	0	1	0	0	0	1	0	0	0
Peoria	0	0	2	0	0	0	2	1	1	0
Rockford	0	0	0	0	0	0	0	0	0	0
Urbana	0	1	0	0	0	1	0	0	0	0
Alton	0	0	1	0	0	0	1	0	0	0
Mendota	0	0	1	0	0	0	1	0	0	0
Ottawa	0	0	0	0	0	0	0	0	0	0
Pontiac	0	0	0	0	0	0	0	0	0	0
Escanaba	0	1	4	0	0	4	1	0	0	0

Note. This table shows the number of responses to the colon screening direct mail campaign in fiscal year 2021 by age category, gender, the number of completed primary care appointments, the number of completed colon cancer screenings and the number of cancer diagnoses.

Table 39

Colon Screening Direct Mail – CY 2022

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	0	0	0	0	0	0	0	0	0
Bloomington	0	0	0	0	0	0	0	0	0	0
Danville	0	0	0	0	0	0	0	0	0	0
Peoria	0	0	1	0	0	0	1	1	0	0
Rockford	0	0	0	0	0	0	0	0	0	0
Urbana	0	0	0	0	0	0	0	0	0	0
Alton	0	0	0	0	0	0	0	0	0	0
Mendota	0	0	0	0	0	0	0	0	0	0
Ottawa	0	0	1	0	0	1	0	0	0	0
Pontiac	0	0	0	0	0	0	0	0	0	0
Escanaba	0	0	0	0	0	0	0	0	0	0

Note. This table shows the number of responses to the colon screening direct mail campaign in calendar year 2022 by age category, gender, the number of completed primary care appointments, the number of completed colon cancer screenings and the number of cancer diagnoses.

Table 40

Colon Screening Direct Mail – FY 2022

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	0	1	0	0	0	1	1	0	0
Bloomington	0	0	0	0	0	0	0	0	0	0
Danville	0	0	1	0	0	0	1	0	0	0
Peoria	0	0	3	0	0	1	2	0	0	0
Rockford	0	0	2	0	0	1	1	0	0	1
Urbana	0	0	0	0	0	0	0	0	0	0
Alton	0	0	2	0	0	0	2	0	1	0
Mendota	0	0	0	0	0	0	0	0	0	0
Ottawa	0	1	1	0	0	2	0	0	0	0
Pontiac	0	0	0	0	0	0	0	0	0	0
Escanaba	0	1	1	0	0	1	1	0	0	0

Note. This table shows the number of responses to the colon screening direct mail campaign in fiscal year 2022 by age category, gender, the number of completed primary care appointments, the number of completed colon cancer screenings and the number of cancer diagnoses.

Table 41

Colon Screening Direct Mail – FY 2023 TD

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	0	1	0	0	0	1	0	1	0
Bloomington	0	0	1	0	0	0	1	0	1	0
Danville	0	0	0	0	0	0	0	0	0	0
Peoria	0	0	1	2	0	1	2	2	1	0
Rockford	0	1	0	0	0	1	0	0	0	1
Urbana	0	0	0	0	0	0	0	0	0	0
Alton	0	0	0	0	0	0	0	0	0	0
Mendota	0	0	0	0	0	0	0	0	0	0
Ottawa	0	0	0	0	0	0	0	0	0	0
Pontiac	0	0	0	0	0	0	0	0	0	0
Escanaba	0	0	0	0	0	0	0	0	0	0

Note. This table shows the number of responses to the colon screening direct mail campaign in fiscal year 2023 to date by age category, gender, the number of completed primary care appointments, the number of completed colon cancer screenings and the number of cancer diagnoses.

Table 42

Lung Screening Direct Mail – FY 2021

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	0	9	6	0	2	13	10	7	0
Bloomington	0	0	13	5	0	9	9	15	3	0
Danville	0	0	23	5	0	9	19	20	8	3
Peoria	1	8	69	14	0	54	38	68	20	7
Rockford	2	0	273	102	0	202	175	29	10	3
Urbana	0	0	5	3	0	2	6	7	0	1
Alton	1	0	44	19	0	35	29	39	30	3
Mendota	0	0	5	0	0	3	2	5	0	0
Ottawa	0	0	30	8	0	20	18	29	7	4
Pontiac	0	0	7	5	0	6	6	9	1	2
Escanaba	0	0	16	6	0	14	8	14	7	2

Note. This table shows the number of responses to the lung screening direct mail campaign in fiscal year 2021 by age category, gender, the number of completed primary care appointments, the number of completed lung cancer screenings and the number of cancer diagnoses.

Table 43

Lung Screening Direct Mail – CY 2022

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	0	12	3	0	2	13	7	7	2
Bloomington	0	0	12	2	0	7	7	9	1	4
Danville	0	0	16	11	0	11	16	17	6	5
Peoria	0	18	80	44	0	71	61	57	62	16
Rockford	0	0	6	1	0	3	4	7	1	1
Urbana	0	0	2	2	0	1	3	4	0	0
Alton	0	0	12	7	0	10	9	10	7	2
Mendota	0	0	75	20	0	30	65	2	1	0
Ottawa	0	0	24	8	0	17	15	21	9	5
Pontiac	0	0	13	0	0	6	7	6	5	2
Escanaba	0	0	10	3	0	5	8	9	1	3

Note. This table shows the number of responses to the lung screening direct mail campaign in calendar year 2022 by age category, gender, the number of completed primary care appointments, the number of completed lung cancer screenings and the number of cancer diagnoses.

Table 44

Lung Screening Direct Mail – FY 2022

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	0	27	8	0	10	25	16	17	3
Bloomington	0	0	30	13	0	23	20	25	12	6
Danville	0	0	52	22	0	29	45	45	21	9
Peoria	0	38	216	82	0	147	189	178	142	28
Rockford	0	0	18	3	0	9	12	19	5	2
Urbana	0	0	8	7	0	6	9	14	1	0
Alton	0	0	34	15	0	13	26	30	17	5
Mendota	0	0	156	39	0	65	130	6	3	0
Ottawa	0	0	58	19	0	39	38	53	20	9
Pontiac	0	0	28	9	0	13	20	19	15	4
Escanaba	0	0	24	15	0	14	25	27	7	5

Note. This table shows the number of responses to the lung screening direct mail campaign in fiscal year 2022 by age category, gender, the number of completed primary care appointments, the number of completed lung cancer screenings and the number of cancer diagnoses.

Table 45

Lung Screening Direct Mail – FY 2023 TD

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	0	31	8	0	8	31	23	11	5
Bloomington	0	0	31	13	0	24	21	18	19	8
Danville	0	0	183	71	0	93	161	157	103	14
Peoria	0	27	199	75	0	124	177	133	160	18
Rockford	0	0	18	6	0	11	13	18	8	2
Urbana	0	0	6	5	0	5	6	10	1	0
Alton	1	1	168	66	0	96	140	141	100	13
Mendota	1	0	155	45	0	76	125	6	5	1
Ottawa	0	0	53	22	0	33	42	34	29	7
Pontiac	0	0	21	10	0	15	17	13	14	5
Escanaba	0	0	16	6	0	14	8	14	7	2

Note. This table shows the number of responses to the lung screening direct mail campaign in fiscal year 2023 to date by age category, gender, the number of completed primary care appointments, the number of completed lung cancer screenings and the number of cancer diagnoses.

Table 46

Breast Screening Email – FY2021

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	5	61	23	0	0	90	88	88	6
Bloomington	0	7	117	28	0	0	152	151	151	5
Danville	0	2	69	21	0	0	92	88	88	4
Peoria	0	19	394	108	0	0	521	520	520	9
Rockford	0	8	136	43	0	0	187	182	182	9
Urbana	0	0	11	3	0	0	14	14	14	1
Alton	0	3	28	5	0	0	36	44	44	4
Mendota	0	0	9	2	0	0	11	11	11	0
Ottawa	0	3	78	16	0	0	97	95	95	3
Pontiac	0	0	38	14	0	0	52	51	51	2
Escanaba	0	1	42	11	0	0	54	54	54	0

Note. This table shows the number of responses to the breast screening email campaign in fiscal year 2021 by age category, gender, the number of completed primary care and mammography appointments, the number of completed mammograms and the number of cancer diagnoses.

Table 47

Breast Screening Email – CY 2022

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	4	35	20	0	0	49	48	48	1
Bloomington	0	4	42	15	0	0	61	60	60	3
Danville	0	0	15	7	0	0	22	21	21	1
Peoria	0	6	127	47	0	0	180	176	176	9
Rockford	0	2	53	14	0	0	69	64	64	6
Urbana	0	0	4	4	0	0	8	8	8	0
Alton	0	0	8	4	0	0	12	11	11	1
Mendota	0	1	2	1	0	0	4	4	4	0
Ottawa	0	0	36	8	0	0	44	44	44	3
Pontiac	0	1	12	4	0	0	17	17	17	0
Escanaba	0	0	14	3	0	0	17	17	17	1

Note. This table shows the number of responses to the breast screening email campaign in calendar year 2022 by age category, gender, the number of completed primary care and mammography appointments, the number of completed mammograms and the number of cancer diagnoses.

Table 48

Breast Screening Email – FY 2022

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	5	72	14	9	9	91	89	89	3
Bloomington	0	6	84	18	0	0	108	105	105	6
Danville	0	0	29	12	0	0	41	39	39	2
Peoria	0	14	247	81	0	0	342	334	334	17
Rockford	0	6	96	29	0	0	131	128	128	7
Urbana	0	0	5	8	0	0	13	13	13	0
Alton	0	0	31	9	0	0	40	36	36	4
Mendota	0	1	6	2	0	0	9	9	9	0
Ottawa	0	0	56	15	0	0	71	71	71	4
Pontiac	0	2	19	7	0	0	28	28	28	1
Escanaba	0	0	34	5	0	0	39	39	39	1

Note. This table shows the number of responses to the breast screening email campaign in fiscal year 2022 by age category, gender, the number of completed primary care and mammography appointments, the number of completed mammograms and the number of cancer diagnoses.

Table 49

Breast Screening Email – FY 2023 TD

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	6	73	22	0	0	101	99	99	5
Bloomington	0	2	85	26	0	0	113	109	109	7
Danville	0	2	45	9	0	0	56	54	54	3
Peoria	0	11	263	84	0	0	358	347	347	30
Rockford	0	7	117	33	0	0	157	154	154	13
Urbana	0	0	7	6	0	0	13	13	13	0
Alton	0	0	23	7	0	0	30	28	28	3
Mendota	0	1	10	2	0	0	13	12	12	2
Ottawa	0	2	57	16	0	0	75	73	73	7
Pontiac	0	1	28	9	0	0	38	28	28	1
Escanaba	0	2	29	8	0	0	39	39	39	0

Note. This table shows the number of responses to the breast screening email campaign in fiscal year 2023 to date by age category, gender, the number of completed primary care and mammography appointments, the number of completed mammograms and the number of cancer diagnoses.

Table 50

Colon Screening Email – FY 2021

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	0	0	2	0	0	2	1	1	0
Bloomington	0	0	5	90	0	43	52	4	1	0
Danville	0	0	2	12	0	3	11	0	1	1
Peoria	0	2	19	81	0	44	58	11	17	7
Rockford	0	0	14	34	0	15	33	6	1	0
Urbana	0	0	2	3	0	4	1	1	1	1
Alton	1	0	4	11	0	9	7	2	5	2
Mendota	0	0	2	4	0	2	4	1	1	1
Ottawa	0	1	11	23	0	13	22	4	5	0
Pontiac	0	0	4	20	0	9	15	0	1	0
Escanaba	1	0	4	8	0	3	10	1	3	1

Note. This table shows the number of responses to the colon screening email campaign in fiscal year 2021 by age category, gender, the number of completed primary care appointments, the number of completed colon cancer screenings and the number of cancer diagnoses.

Table 51

Colon Screening Email – CY 2022

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	0	1	2	0	0	3	2	1	0
Bloomington	0	0	5	47	0	28	24	2	0	0
Danville	0	0	0	0	0	0	0	1	0	0
Peoria	1	0	0	4	0	2	3	1	0	1
Rockford	0	0	0	0	0	0	0	0	0	0
Urbana	0	0	0	0	0	0	0	1	0	0
Alton	0	0	0	0	0	0	0	0	0	0
Mendota	0	0	0	0	0	0	0	0	0	0
Ottawa	0	0	0	1	0	0	1	0	0	0
Pontiac	0	0	3	7	0	5	5	0	1	0
Escanaba	0	0	0	0	0	0	0	1	0	0

Note. This table shows the number of responses to the colon screening email campaign in calendar year 2022 by age category, gender, the number of completed primary care appointments, the number of completed colon cancer screenings and the number of cancer diagnoses.

Table 52

Colon Screening Email – FY 2022

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	0	2	8	0	1	9	5	5	0
Bloomington	0	0	8	104	0	57	65	4	3	1
Danville	0	0	1	0	0	0	1	1	0	0
Peoria	1	1	5	11	0	9	9	7	3	3
Rockford	0	0	4	4	0	2	6	2	2	0
Urbana	0	0	1	1	0	2	0	1	0	0
Alton	0	0	2	1	0	1	2	0	0	2
Mendota	0	0	0	0	0	0	0	0	0	0
Ottawa	0	1	5	3	0	4	5	0	0	0
Pontiac	0	0	5	19	0	14	18	1	2	0
Escanaba	0	0	0	2	0	1	1	1	1	0

Note. This table shows the number of responses to the colon screening email campaign in fiscal year 2022 by age category, gender, the number of completed primary care appointments, the number of completed colon cancer screenings and the number of cancer diagnoses.

Table 53

Colon Screening Email – FY 2023 TD

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	0	1	5	0	2	4	2	4	0
Bloomington	0	0	6	112	1	50	69	3	3	0
Danville	0	0	0	0	0	0	0	0	0	1
Peoria	0	0	0	6	0	0	6	3	0	3
Rockford	1	0	1	0	0	1	1	0	0	1
Urbana	0	0	0	0	0	0	0	0	0	0
Alton	0	0	0	0	0	0	0	0	0	0
Mendota	0	0	0	0	0	0	0	0	0	0
Ottawa	0	0	0	3		1	2	0	1	4
Pontiac	0	0	3	29	0	12	20	2	2	1
Escanaba	0	0	0	0	0	0	0	1	0	0

Note. This table shows the number of responses to the colon screening email campaign in fiscal year 2023 to date by age category, gender, the number of completed primary care appointments, the number of completed colon cancer screenings and the number of cancer diagnoses.

Table 54

Lung Screening Email – FY 2021

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	1	0	15	11	0	4	23	27	10	7
Bloomington	0	0	30	17	0	23	24	35	13	6
Danville	0	0	29	12	0	10	31	45	8	4
Peoria	2	54	300	87	0	186	257	414	118	18
Rockford	1	0	61	17	0	38	41	82	25	10
Urbana	0	0	14	3	0	9	8	12	6	3
Alton	0	0	6	2	0	2	6	5	3	1
Mendota	0	0	11	5	0	7	9	15	2	1
Ottawa	0	0	62	25	0	47	40	86	18	7
Pontiac	0	0	25	4	0	12	17	28	5	0
Escanaba	0	0	20	4	0	8	16	17	6	4

Note. This table shows the number of responses to the lung screening email campaign in fiscal year 2021 by age category, gender, the number of completed primary care appointments, the number of completed lung cancer screenings and the number of cancer diagnoses.

Table 55

Lung Screening Email – CY 2022

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	0	15	5	0	3	17	10	9	3
Bloomington	0	0	12	7	0	9	10	11	3	5
Danville	0	0	16	7	0	7	16	17	3	3
Peoria	0	18	73	39	0	62	68	63	56	14
Rockford	0	0	30	14	0	19	25	25	14	9
Urbana	0	0	3	2	0	1	4	4	0	1
Alton	0	0	12	7	0	8	11	14	4	1
Mendota	0	0	1	2	0	1	2	2	1	0
Ottawa	0	0	22	5	0	12	15	19	6	3
Pontiac	0	0	10	2	0	5	7	8	3	1
Escanaba	0	0	8	1	0	3	6	5	1	3

Note. This table shows the number of responses to the lung screening email campaign in calendar year 2022 by age category, gender, the number of completed primary care appointments, the number of completed lung cancer screenings and the number of cancer diagnoses.

Table 56

Lung Screening Email – FY 2022

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	0	29	12	0	11	31	21	17	5
Bloomington	0	0	30	17	0	23	24	36	13	6
Danville	0	0	45	15	0	18	42	39	17	4
Peoria	0	43	221	92	0	133	223	198	143	27
Rockford	1	0	67	26	0	42	52	56	35	13
Urbana	0	0	8	8	0	5	11	13	2	1
Alton	0	0	29	15	0	19	25	29	14	3
Mendota	0	0	6	2	0	2	6	5	3	0
Ottawa	0	0	54	14	0	29	39	48	17	6
Pontiac	0	0	28	8	0	17	19	23	12	2
Escanaba	0	0	20	11	0	9	22	21	6	4

Note. This table shows the number of responses to the lung screening email campaign in fiscal year 2022 by age category, gender, the number of completed primary care appointments, the number of completed lung cancer screenings and the number of cancer diagnoses.

Table 57

Lung Screening Email – FY 2023 TD

Market	>45	45-54	55-64	65-74	75+	M	F	Comp apt.	Comp screen	Ca DX
Evergreen Park	0	0	27	8	0	7	28	16	14	5
Bloomington	0	0	12	7	0	9	10	11	3	5
Danville	0	0	30	11	0	16	25	14	24	5
Peoria	0	29	215	76	0	114	206	146	164	18
Rockford	0	0	67	26	0	36	57	44	43	12
Urbana	0	0	6	5	0	4	7	10	1	0
Alton	0	0	37	12	0	16	23	18	29	3
Mendota	0	0	6	2	0	1	7	3	4	1
Ottawa	0	0	57	23	0	40	40	39	37	6
Pontiac	0	0	17	9	0	12	14	12	13	1
Escanaba	0	0	10	6	0	4	12	6	7	3

Note. This table shows the number of responses to the lung screening email campaign in fiscal year 2023 to date by age category, gender, the number of completed primary care appointments, the number of completed lung cancer screenings and the number of cancer diagnoses.

Using multiple linear regression, it was possible to predict the value of a dependent variable based on the values of the independent variables. This will help explain the relationship between each individual dependent variable (type of marketing communication, completed primary care appointments, completed cancer screenings and cancer diagnoses received. The equation for multiple linear regression is included below.

Equation 2

Multiple Linear Regression Equation

y- a +bx1 +bx2

Dummy variables were created for type of colon screening, for each market being studied, and for each of the four-time frames being studied (FY 2021, CY 2022, FY 2022, and FY 2023 to date). The dummy variables are shown in Table 58.

Table 58

Dummy Variables for Cancer Screening Type

Variable Creation	
	Label
Cancer_Screening_1	CancerScreening=Colon Screening
Cancer_Screening_2	CancerScreening=Lung Screening
Cancer_Screening_3	CancerScreening=Mammography

Note. This table shows the dummy variables created for cancer screening type in SPSS.

Table 59

Dummy Variables for Markets

Variable Creation	
	Label
Market_1	Market=Alton
Market_2	Market=Bloomington
Market_3	Market=Danville
Market_4	Market=Escanaba
Market_5	Market=Evergreen Park
Market_6	Market=Mendota
Market_7	Market=Ottawa
Market_8	Market=Peoria
Market_9	Market=Pontiac
Market_10	Market=Rockford
Market_11	Market=Urbana

Note. This table shows the dummy variables created for each of the targeted markets in SPSS.

Table 60

Dummy Variables for Time Frame

Variable Creation	
	Label
Time_Frame_1	Time=CY 2022
Time_Frame_2	Time=FY 2021
Time_Frame_3	Time=FY 2022
Time_Frame_4	Time=FY 2023 TD

Note. This table shows the dummy variables created for each of the time frames studied in SPSS.

Research Question 1 Findings

RQ1: Is there a significant difference in response to lung, colon, or breast cancer screening appointments by age, gender or geographic location from consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic?

$H_0$1: There is no significant difference in response to lung, colon, or breast cancer screening appointments by age, gender or geographic location from consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic.

$H_1$1: There is a significant difference in response to lung, colon, or breast cancer screening appointments by age, gender or geographic location from consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic.

Age

The first multiple linear regression analysis is completed primary care and mammography appointments by age during each of the four time frames for those receiving a direct mail piece. The R^2 is 0.771, which means that more than 77% of the predictors can be explained by the dependent variable. At $p<0.001$, the analysis of variance (ANOVA) shows the results to be statistically significant. Within the coefficients table, the Beta identifies which independent variables are contributing to the dependent variable. For example, one can see that by age, the highest contributor to

completed primary care and mammography appointments is ages 65 to 74 ($B = 0.872$), and that at a significance of $p<0.001$, it is statistically significant.

Table 61

Model Summary for Question One – Direct Mail (Age)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.878[a]	.771	.752	14.147

a. Predictors: (Constant), Time=FY 2023 TD, CancerScreening=Mammography, 45-54, 75+, Under 45, Time=CY 2022, CancerScreening=Colon Screening, Time=FY 2021, 55-64, 65-74

b. Dependent Variable: Completed Appointment

Note. This table shows the model summary for question one for age for direct mail in SPSS.

Table 62

ANOVA for Question One – Direct Mail (Age)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	81463.258	10	8146.326	40.705	<.001[b]
	Residual	24216.037	121	200.133		
	Total	105679.295	131			

a. Dependent Variable: Completed Appointment

b. Predictors: (Constant), Time=FY 2023 TD, CancerScreening=Mammography, 45-54, 75+, Under 45, Time=CY 2022, CancerScreening=Colon Screening, Time=FY 2021, 55-64, 65-74

Note. This table shows the ANOVA for question one for age for direct mail in SPSS.

Table 63

Coefficients for Question One – Direct Mail (Age)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	11.761	3.533		3.329	.001	4.766	18.756					
	Under 45	-2.748	1.570	-.080	-1.750	.083	-5.856	.360	.070	-.157	-.076	.914	1.094
	45-54	2.150	.338	.335	6.363	<.001	1.481	2.819	.642	.501	.277	.684	1.461
	55-64	-.212	.102	-.335	-2.087	.039	-.414	-.011	.741	-.186	-.091	.073	13.627
	65-74	1.448	.268	.872	5.409	<.001	.918	1.978	.818	.441	.235	.073	13.711
	75+	-.155	1.944	-.004	-.080	.937	-4.003	3.694	.186	-.007	-.003	.659	1.518
	CancerScreening=Colon Screening	-11.215	3.476	-.187	-3.227	.002	-18.096	-4.335	-.369	-.281	-.140	.565	1.771
	CancerScreening=Mammography	-9.325	3.759	-.155	-2.481	.014	-16.767	-1.883	-.051	-.220	-.108	.483	2.071
	Time=CY 2022	-4.204	3.513	-.064	-1.197	.234	-11.159	2.752	-.160	-.108	-.052	.655	1.526
	Time=FY 2021	-1.329	3.510	-.020	-.379	.706	-8.277	5.620	-.082	-.034	-.016	.656	1.524
	Time=FY 2023 TD	3.175	3.571	.049	.889	.376	-3.895	10.244	.188	.081	.039	.634	1.577

a. Dependent Variable: Completed Appointment

Note. This table shows the coefficients for question one for age for direct mail in SPSS.

Multiple linear regression was then completed by age for primary care and mammography appointments for each of the four time frames for those receiving an email. In the model summary we see that the R^2 is 0.971, which means that more than

97% of the predictors can be explained by the dependent variable. At $p<0.001$, the ANOVA table shows the results are statistically significant. Within the coefficients table, one can see that by age, the highest contributor to completed appointment is ages 55 to 64 ($B = 1.067$), and that at $p<0.001$, it is statistically significant.

Table 64

Model Summary for Question One – Email (Age)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.986[a]	.973	.971	13.320	.973	430.205	10	120	<.001

a. Predictors: (Constant), CancerScreening=3.0, Time=3.0, 65-74, Under 45, 75+, Time=4.0, CancerScreening=2.0, Time=1.0, 45-54, 55-64

b. Dependent Variable: Completed Appointment

Note. This table shows the model summary for question one for age for email in SPSS.

Table 65

ANOVA for Question One – Email (Age)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	763311.143	10	76331.114	430.205	<.001[b]
	Residual	21291.559	120	177.430		
	Total	784602.702	130			

a. Dependent Variable: Completed Appointment

b. Predictors: (Constant), CancerScreening=3.0, Time=3.0, 65-74, Under 45, 75+, Time=4.0, CancerScreening=2.0, Time=1.0, 45-54, 55-64

Note. This table shows the ANOVA for question one for age for email in SPSS.

Table 66

Coefficients for Question One – Email (Age)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	5.222	3.094		1.688	.094					
	Under 45	15.312	4.471	.058	3.425	<.001	.198	.298	.052	.790	1.266
	45-54	-1.159	.296	-.105	-3.910	<.001	.736	-.336	-.059	.313	3.191
	55-64	1.356	.041	1.067	33.062	<.001	.979	.949	.497	.217	4.602
	65-74	-.096	.073	-.030	-1.317	.190	.656	-.119	-.020	.442	2.263
	75+	-.166	1.505	-.002	-.110	.913	.049	-.010	-.002	.964	1.037
	Time=1.0	1.357	3.443	.008	.394	.694	.165	.036	.006	.606	1.650
	Time=3.0	-3.800	3.350	-.021	-1.134	.259	.007	-.103	-.017	.641	1.561
	Time=4.0	-7.009	3.360	-.039	-2.086	.039	-.010	-.187	-.031	.650	1.539
	CancerScreening=2.0	-5.254	3.493	-.032	-1.504	.135	-.360	-.136	-.023	.503	1.987
	CancerScreening=3.0	-14.847	3.016	-.091	-4.923	<.001	-.016	-.410	-.074	.668	1.498

a. Dependent Variable: Completed Appointment

Note. This table shows the coefficients for question one for age for email in SPSS.

Gender

Multiple linear regression was completed by gender for completed primary care and mammography appointments for each of the four time frames for those receiving a direct mail piece. In the model summary, R^2 is 0.942, which means that about 94% of the predictors can be explained by the dependent variable. At less than $p<0.001$, the ANOVA results are statistically significant. Within the coefficients table, females had the highest contribution to completed appointments ($B = 0.933$), and that at $p<0.001$, this is statistically significant.

Table 67

Model Summary for Question One – Direct Mail (Gender)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.971[a]	.942	.940	19.033	.942	340.921	6	125	<.001

a. Predictors: (Constant), Female, Time=3.0, Male, Time=4.0, Time=2.0, Cancer Diagnosis

b. Dependent Variable: Completed Appointment

Note. This table shows the model summary for question one for gender for direct mail in SPSS.

Table 68

ANOVA for Question One – Direct Mail (Gender)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	741029.953	6	123504.992	340.921	<.001[b]
	Residual	45283.524	125	362.268		
	Total	786313.477	131			

a. Dependent Variable: Completed Appointment

b. Predictors: (Constant), Female, Time=3.0, Male, Time=4.0, Time=2.0, Cancer Diagnosis

Note. This table shows the ANOVA for question one for gender for direct mail in SPSS.

Table 69

Coefficients for Question One – Direct Mail (Gender)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	1.036	3.644		.284	.777					
	Time=2.0	-3.412	4.819	-.019	-.708	.480	-.160	-.063	-.015	.630	1.587
	Time=3.0	-6.820	4.729	-.038	-1.442	.152	.010	-.128	-.031	.654	1.528
	Time=4.0	-10.248	4.803	-.057	-2.133	.035	-.017	-.187	-.046	.634	1.576
	Cancer Diagnosis	.416	.585	.027	.711	.478	.732	.063	.015	.330	3.031
	Male	.137	.084	.043	1.631	.105	.360	.144	.035	.651	1.535
	Female	.976	.034	.933	28.497	<.001	.968	.931	.612	.429	2.329

a. Dependent Variable: Completed Appointment

Note. This table shows the coefficients for question one for gender for direct mail in SPSS.

Multiple linear regression was then completed by gender for completed primary care and mammography appointments for each of the four time frames for those receiving an email. In the model summary, R^2 is 0.946, which means that more than 94% of the predictors can be explained by the dependent variable. At $p<0.001$, the ANOVA table shows the results are statistically significant. Within the coefficients table, females had the highest contribution to completed appointments ($B = 0.930$), and that at $p<0.001$, this is also statistically significant.

Table 70

Model Summary for Question One – Email (Gender)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.973[a]	.946	.943	18.485	.946	311.025	7	124	<.001

a. Predictors: (Constant), Female, Time=3.0, CancerScreening=3.0, Time=4.0, Male, Time=2.0, CancerScreening=2.0

b. Dependent Variable: Completed Appointment

Note. This table shows the model summary for question one for gender for email in SPSS.

Table 71

ANOVA for Question One – Email (Gender)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	743942.615	7	106277.516	311.025	<.001[b]
	Residual	42370.863	124	341.701		
	Total	786313.477	131			

a. Dependent Variable: Completed Appointment

b. Predictors: (Constant), Female, Time=3.0, CancerScreening=3.0, Time=4.0, Male, Time=2.0, CancerScreening=2.0

Note. This table shows the ANOVA for question one for gender for email in SPSS.

Table 72

Coefficients for Question One – Email (Gender)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	5.626	4.739		1.187	.237					
	Time=2.0	-3.891	4.661	-.022	-.835	.405	-.160	-.075	-.017	.636	1.573
	Time=3.0	-6.741	4.564	-.038	-1.477	.142	.010	-.131	-.031	.663	1.509
	Time=4.0	-9.871	4.570	-.055	-2.160	.033	-.017	-.190	-.045	.661	1.513
	CancerScreening=2.0	-10.489	4.597	-.064	-2.282	.024	-.363	-.201	-.048	.551	1.814
	CancerScreening=3.0	.588	4.832	.004	.122	.903	-.013	.011	.003	.499	2.004
	Male	.165	.082	.052	2.020	.046	.360	.178	.042	.644	1.554
	Female	.972	.028	.930	35.237	<.001	.968	.954	.735	.624	1.601

a. Dependent Variable: Completed Appointment

Note. This table shows the coefficients for question one for gender for email in SPSS.

Geography

Multiple linear regression was completed by geography for completed primary care and mammography appointments for each of the four time frames for those receiving a direct mail piece. In the model summary, R^2 is 0.482, which means that about 48% of the predictors can be explained by the dependent variable. At $p<0.001$, the ANOVA table shows the results are statistically significant. Within the coefficients table, Peoria (suburban market) had the highest contribution to completed appointments (B = 631), and that at $p<0.001$, the result is statistically significant.

Table 73

Model Summary for Question One – Direct Mail (Geography)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.694[a]	.482	.420	58.989	.482	7.784	14	117	<.001

a. Predictors: (Constant), Market=Urbana, Cancer Screening, Time=4.0, Market=Rockford, Market=Pontiac, Market=Ottawa, Market=Mendota, Market=Evergreen Park, Time=3.0, Market=Escanaba, Market=Danville, Market=Bloomington, Time=2.0, Market=Peoria

b. Dependent Variable: Completed Appointment

Note. This table shows the model summary for question one for geography for direct mail in SPSS.

Table 74

ANOVA for Question One – Direct Mail (Geography)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	379187.292	14	27084.807	7.784	<.001[b]
	Residual	407126.186	117	3479.711		
	Total	786313.477	131			

a. Dependent Variable: Completed Appointment

b. Predictors: (Constant), Market=Urbana, Cancer Screening, Time=4.0, Market=Rockford, Market=Pontiac, Market=Ottawa, Market=Mendota, Market=Evergreen Park, Time=3.0, Market=Escanaba, Market=Danville, Market=Bloomington, Time=2.0, Market=Peoria

Note. This table shows the ANOVA for question one for geography for direct mail in SPSS.

Table 75

Coefficients for Question One – Direct Mail (Geography)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	80.205	22.961		3.493	<.001					
	Time=2.0	-43.606	14.522	-.245	-3.003	.003	-.160	-.267	-.200	.667	1.500
	Time=3.0	-21.000	14.522	-.118	-1.446	.151	.010	-.133	-.096	.667	1.500
	Time=4.0	-24.515	14.522	-.138	-1.688	.094	-.017	-.154	-.112	.667	1.500
	Cancer Screening	-21.170	6.288	-.224	-3.367	.001	-.224	-.297	-.224	1.000	1.000
	Market=Bloomington	28.667	24.082	.107	1.190	.236	.012	.109	.079	.550	1.818
	Market=Danville	11.000	24.082	.041	.457	.649	-.060	.042	.030	.550	1.818
	Market=Escanaba	1.250	24.082	.005	.052	.959	-.100	.005	.003	.550	1.818
	Market=Evergreen Park	18.417	24.082	.069	.765	.446	-.030	.071	.051	.550	1.818
	Market=Mendota	-10.417	24.082	-.039	-.433	.666	-.148	-.040	-.029	.550	1.818
	Market=Ottawa	24.333	24.082	.091	1.010	.314	-.005	.093	.067	.550	1.818
	Market=Peoria	169.417	24.082	.631	7.035	<.001	.589	.545	.468	.550	1.818
	Market=Pontiac	.917	24.082	.003	.038	.970	-.101	.004	.003	.550	1.818
	Market=Rockford	46.333	24.082	.173	1.924	.057	.085	.175	.128	.550	1.818
	Market=Urbana	-8.083	24.082	-.030	-.336	.738	-.138	-.031	-.022	.550	1.818

a. Dependent Variable: Completed Appointment

Note. This table shows the coefficients for question one for geography for direct mail in SPSS.

Multiple linear regression was completed by geography for completed primary care and mammography appointments for each of the four time frames for those receiving an email. In the model summary, R^2 is 0.420, which means that 42% of the predictors can be explained by the dependent variable. At $p<0.001$, the ANOVA table shows the results are statistically significant. Within the coefficients table, Peoria (suburban market) had the highest contribution to completed appointments ($B = 0.631$). At $p<0.001$, the result is statistically significant.

Table 76

Model Summary for Question One – Email (Geography)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.694[a]	.482	.420	58.989	.482	7.784	14	117	<.001

a. Predictors: (Constant), Market=Urbana, Cancer Screening, Time=4.0, Market=Rockford, Market=Pontiac, Market=Ottawa, Market=Mendota, Market=Evergreen Park, Time=3.0, Market=Escanaba, Market=Danville, Market=Bloomington, Time=2.0, Market=Peoria

b. Dependent Variable: Completed Appointment

Note. This table shows the model summary for question one for geography for email in SPSS.

Table 77

ANOVA for Question One – Email (Geography)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	379187.292	14	27084.807	7.784	<.001[b]
	Residual	407126.186	117	3479.711		
	Total	786313.477	131			

a. Dependent Variable: Completed Appointment

b. Predictors: (Constant), Market=Urbana, Cancer Screening, Time=4.0, Market=Rockford, Market=Pontiac, Market=Ottawa, Market=Mendota, Market=Evergreen Park, Time=3.0, Market=Escanaba, Market=Danville, Market=Bloomington, Time=2.0, Market=Peoria

Note. This table shows the ANOVA for question one for geography for email in SPSS.

Table 78

Coefficients for Question One – Email (Geography)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	80.205	22.961		3.493	<.001					
	Time=2.0	-43.606	14.522	-.245	-3.003	.003	-.160	-.267	-.200	.667	1.500
	Time=3.0	-21.000	14.522	-.118	-1.446	.151	.010	-.133	-.096	.667	1.500
	Time=4.0	-24.515	14.522	-.138	-1.688	.094	-.017	-.154	-.112	.667	1.500
	Cancer Screening	-21.170	6.288	-.224	-3.367	.001	-.224	-.297	-.224	1.000	1.000
	Market=Bloomington	28.667	24.082	.107	1.190	.236	.012	.109	.079	.550	1.818
	Market=Danville	11.000	24.082	.041	.457	.649	-.060	.042	.030	.550	1.818
	Market=Escanaba	1.250	24.082	.005	.052	.959	-.100	.005	.003	.550	1.818
	Market=Evergreen Park	18.417	24.082	.069	.765	.446	-.030	.071	.051	.550	1.818
	Market=Mendota	-10.417	24.082	-.039	-.433	.666	-.148	-.040	-.029	.550	1.818
	Market=Ottawa	24.333	24.082	.091	1.010	.314	-.005	.093	.067	.550	1.818
	Market=Peoria	169.417	24.082	.631	7.035	<.001	.589	.545	.468	.550	1.818
	Market=Pontiac	.917	24.082	.003	.038	.970	-.101	.004	.003	.550	1.818
	Market=Rockford	46.333	24.082	.173	1.924	.057	.085	.175	.128	.550	1.818
	Market=Urbana	-8.083	24.082	-.030	-.336	.738	-.138	-.031	-.022	.550	1.818

a. Dependent Variable: Completed Appointment

Note. This table shows the coefficients for question one for geography for email in SPSS.

Research Question 2 Findings

RQ2: What is the association between targeted direct mail versus email marketing campaigns promoting colon, lung, and breast cancer screenings after the COVID-19 pandemic and conversions to patient appointments?

$H_0$2: There is no association between targeted direct mail versus targeted email marketing campaigns promoting colon, lung, and breast cancer screenings after the COVID-19 pandemic and conversions to patient appointments.

$H_1$2: There is an association between targeted direct mail versus targeted email marketing campaigns promoting colon, lung, and breast cancer screenings after the COVID-19 pandemic and conversions to patient appointments.

Age

Multiple linear regression was completed by age for completed breast, colon, and lung screenings during each of the four time frames for those receiving a direct mail piece. The R^2 is 0.833, which means that more than 83% of the predictors can be explained by the dependent variable. At $p<0.001$, the ANOVA results are statistically significant. Within the coefficients table, the Beta identifies which independent variables are contributing to the dependent variable. Age, the highest contributor to completed cancer screenings, is ages 65 to 74 ($B = 0.985$), and at $p<0.001$, it is statistically significant.

Table 79

Model Summary for Question Two – Direct Mail

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.913[a]	.833	.819	10.208

a. Predictors: (Constant), Time=FY 2023 TD, CancerScreening=Mammography, 45-54, 75+, Under 45, Time=CY 2022, CancerScreening=Colon Screening, Time=FY 2021, 55-64, 65-74

b. Dependent Variable: Completed Screening

Note This table shows the model summary for question two for age for direct mail in SPSS.

Table 80

ANOVA for Question Two – Direct Mail

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	62961.533	10	6296.153	60.426	<.001[b]
	Residual	12607.649	121	104.195		
	Total	75569.182	131			

a. Dependent Variable: Completed Screening

b. Predictors: (Constant), Time=FY 2023 TD, CancerScreening=Mammography, 45-54, 75+, Under 45, Time=CY 2022, CancerScreening=Colon Screening, Time=FY 2021, 55-64, 65-74

Note. This table shows the ANOVA for question two for age for direct mail in SPSS.

Table 81

Coefficients for Question Two – Direct Mail

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	2.515	2.549		.986	.326	-2.532	7.562					
	Under 45	-3.409	1.133	-.117	-3.010	.003	-5.652	-1.167	.054	-.264	-.112	.914	1.094
	45-54	2.540	.244	.468	10.418	<.001	2.057	3.022	.718	.688	.387	.684	1.461
	55-64	-.266	.073	-.497	-3.629	<.001	-.412	-.121	.685	-.313	-.135	.073	13.627
	65-74	1.384	.193	.985	7.165	<.001	1.001	1.766	.804	.546	.266	.073	13.711
	75+	.163	1.403	.005	.116	.908	-2.614	2.940	.233	.011	.004	.659	1.518
	CancerScreening=Colon Screening	-3.542	2.508	-.070	-1.412	.160	-8.507	1.423	-.328	-.127	-.052	.565	1.771
	CancerScreening=Mammography	-.799	2.712	-.016	-.295	.769	-6.169	4.570	.048	-.027	-.011	.483	2.071
	Time=CY 2022	-1.298	2.535	-.023	-.512	.610	-6.317	3.720	-.138	-.047	-.019	.655	1.526
	Time=FY 2021	-.737	2.533	-.013	-.291	.772	-5.750	4.277	-.120	-.026	-.011	.656	1.524
	Time=FY 2023 TD	5.937	2.577	.107	2.304	.023	.836	11.038	.231	.205	.086	.634	1.577

a. Dependent Variable: Completed Screening

Note. This table shows the coefficients for question two for age for direct mail in SPSS.

Multiple linear regression was also completed by age for completed cancer screenings for each of the four time frames for those receiving an email. In the model summary, R^2 is 0.965, which means that more than 96% of the predictors can be explained by the dependent variable. At $p<0.001$, the ANOVA results are statistically

significant. Within the coefficients table, we can see that by age, the highest contributor to completed cancer screenings is ages 55 to 64 ($B = 1.297$), and that at $p<0.001$, it is statistically significant.

Table 82

Model Summary for Question Two – Email

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.983[a]	.967	.965	13.314	.967	354.417	10	120	<.001

a. Predictors: (Constant), CancerScreening=3.0, Time=3.0, 65-74, Under 45, 75+, Time=4.0, CancerScreening=2.0, Time=1.0, 45-54, 55-64

b. Dependent Variable: Completed Screening

Note. This table shows the model summary for question two for age for email in SPSS.

Table 83

ANOVA for Question Two – Email

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	628239.635	10	62823.964	354.417	<.001[b]
	Residual	21271.205	120	177.260		
	Total	649510.840	130			

a. Dependent Variable: Completed Screening

b. Predictors: (Constant), CancerScreening=3.0, Time=3.0, 65-74, Under 45, 75+, Time=4.0, CancerScreening=2.0, Time=1.0, 45-54, 55-64

Note. This table shows the ANOVA for question two for age for email in SPSS.

Table 84

Coefficients for Question Two – Email

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	7.664	3.092		2.479	.015					
	Under 45	-19.676	4.469	-.082	-4.403	<.001	-.013	-.373	-.073	.790	1.266
	45-54	-3.807	.296	-.379	-12.850	<.001	.559	-.761	-.212	.313	3.191
	55-64	1.454	.041	1.257	35.458	<.001	.923	.955	.586	.217	4.602
	65-74	-.044	.073	-.015	-.603	.548	.618	-.055	-.010	.442	2.263
	75+	.225	1.504	.003	.150	.881	.062	.014	.002	.964	1.037
	Time=1.0	-5.695	3.442	-.035	-1.655	.101	.097	-.149	-.027	.606	1.650
	Time=3.0	-5.901	3.348	-.036	-1.763	.081	.006	-.159	-.029	.641	1.561
	Time=4.0	-3.960	3.358	-.024	-1.179	.241	.045	-.107	-.019	.650	1.539
	CancerScreening=2.0	-2.950	3.492	-.020	-.845	.400	-.335	-.077	-.014	.503	1.987
	CancerScreening=3.0	-26.550	3.014	-.178	-8.808	<.001	-.142	-.627	-.146	.668	1.498

a. Dependent Variable: Completed Screening

Note. This table shows the coefficients for question two for age for email in SPSS.

Gender

Multiple linear regression was completed by gender for completed cancer screenings for each of the four time frames for those receiving a direct mail piece. In the model summary, R^2 is 0.999, which means that nearly 100% of the predictors can be explained by the dependent variable. At $p<0.001$, the ANOVA results are statistically significant. Within the coefficients table, females had the highest contribution to completed cancer screenings ($B = 1.008$), and at $p<0.001$, the result is statistically significant.

Table 85

Model Summary for Question Two – Direct Mail (Gender)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.995[a]	.989	.989	7.542	.989	1885.906	6	125	<.001

a. Predictors: (Constant), Female, Time=3.0, Male, Time=4.0, Time=2.0, Cancer Diagnosis

b. Dependent Variable: Completed Screening

Note. This table shows the model summary for question two for gender for direct mail in SPSS.

Table 86

ANOVA for Question Two – Direct Mail (Gender)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	643562.176	6	107260.363	1885.906	<.001[b]
	Residual	7109.339	125	56.875		
	Total	650671.515	131			

a. Dependent Variable: Completed Screening

b. Predictors: (Constant), Female, Time=3.0, Male, Time=4.0, Time=2.0, Cancer Diagnosis

Note. This table shows the ANOVA for question two for gender for direct mail in SPSS.

Table 87

Coefficients for Question Two – Direct Mail (Gender)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-3.874	1.444		-2.683	.008					
	Time=2.0	2.514	1.909	.016	1.317	.190	-.145	.117	.012	.630	1.587
	Time=3.0	.840	1.874	.005	.448	.655	.008	.040	.004	.654	1.528
	Time=4.0	2.278	1.903	.014	1.197	.234	.038	.106	.011	.634	1.576
	Cancer Diagnosis	.821	.232	.058	3.542	<.001	.666	.302	.033	.330	3.031
	Male	-.672	.033	-.235	-20.280	<.001	.119	-.876	-.190	.651	1.535
	Female	.959	.014	1.008	70.655	<.001	.973	.988	.661	.429	2.329

a. Dependent Variable: Completed Screening

Note. This table shows the coefficients for question two for gender for direct mail in SPSS.

Multiple linear regression was completed by gender for completed cancer screenings for each of the four time frames for those receiving an email. In the model summary, R^2 is 0.988, which means that more than 98% of the predictors can be explained by the dependent variable. At $p<0.001$, the ANOVA results are statistically significant. Within the coefficients table, females had the highest contribution to completed cancer screenings ($B = 1.037$), and at $p<0.001$, the result is statistically significant.

Table 88

Model Summary for Question Two – Email (Gender)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.994[a]	.989	.988	7.673	.989	1560.937	7	124	<.001

a. Predictors: (Constant), Female, Time=3.0, CancerScreening=3.0, Time=4.0, Male, Time=2.0, CancerScreening=2.0

b. Dependent Variable: Completed Screening

Note. This table shows the model summary for question two for gender for email in SPSS.

Table 89

ANOVA for Question Two – Email (Gender)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	643370.232	7	91910.033	1560.937	<.001[b]
	Residual	7301.284	124	58.881		
	Total	650671.515	131			

a. Dependent Variable: Completed Screening

b. Predictors: (Constant), Female, Time=3.0, CancerScreening=3.0, Time=4.0, Male, Time=2.0, CancerScreening=2.0

Note. This table shows the ANOVA for question two for gender for email in SPSS.

Table 90

Coefficients for Question Two – Email (Gender)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-2.568	1.967		-1.306	.194					
	Time=2.0	2.929	1.935	.018	1.514	.133	-.145	.135	.014	.636	1.573
	Time=3.0	1.494	1.895	.009	.789	.432	.008	.071	.008	.663	1.509
	Time=4.0	3.509	1.897	.022	1.850	.067	.038	.164	.018	.661	1.513
	CancerScreening=2.0	-3.704	1.908	-.025	-1.941	.055	-.337	-.172	-.018	.551	1.814
	CancerScreening=3.0	1.130	2.006	.008	.563	.574	-.139	.051	.005	.499	2.004
	Male	-.621	.034	-.217	-18.284	<.001	.119	-.854	-.174	.644	1.554
	Female	.987	.011	1.037	86.182	<.001	.973	.992	.820	.624	1.601

a. Dependent Variable: Completed Screening

Note. This table shows the coefficients for question two for gender for email in SPSS.

Geography

Multiple linear regression was completed by geography for completed cancer screenings each of the four time frames for those receiving a direct mail piece. In the model summary, R^2 is 0.431, which means that about 43% of the predictors can be explained by the dependent variable. At $p<0.001$, the ANOVA results are statistically significant. Within the coefficients table, Peoria (suburban market) had the highest contribution to completed cancer screenings ($B = 581$), and at $p<0.001$, this is statistically significant.

Table 91

Model Summary for Question Two – Direct Mail (Geography)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics			
					R Square Change	F Change	df1	df2	Sig. F Change
1	.701[a]	.492	.431	53.170	.492	8.083	14	117	<.001

a. Predictors: (Constant), Market=Urbana, Cancer Screening, Time=4.0, Market=Rockford, Market=Pontiac, Market=Ottawa, Market=Mendota, Market=Evergreen Park, Time=3.0, Market=Escanaba, Market=Danville, Market=Bloomington, Time=2.0, Market=Peoria

b. Dependent Variable: Completed Screening

Note. This table shows the model summary for question two for geography for direct mail in SPSS.

Table 92

ANOVA for Question Two – Direct Mail (Geography)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	319905.602	14	22850.400	8.083	<.001[b]
	Residual	330765.913	117	2827.059		
	Total	650671.515	131			

a. Dependent Variable: Completed Screening

b. Predictors: (Constant), Market=Urbana, Cancer Screening, Time=4.0, Market=Rockford, Market=Pontiac, Market=Ottawa, Market=Mendota, Market=Evergreen Park, Time=3.0, Market=Escanaba, Market=Danville, Market=Bloomington, Time=2.0, Market=Peoria

Note. This table shows the ANOVA for question two for geography for direct mail in SPSS.

Table 93

Coefficients for Question Two – Direct Mail (Geography)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	87.477	20.696		4.227	<.001					
	Time=2.0	-29.606	13.090	-.183	-2.262	.026	-.145	-.205	-.149	.667	1.500
	Time=3.0	-11.000	13.090	-.068	-.840	.402	.008	-.077	-.055	.667	1.500
	Time=4.0	-7.394	13.090	-.046	-.565	.573	.038	-.052	-.037	.667	1.500
	Cancer Screening	-30.489	5.668	-.355	-5.379	<.001	-.355	-.445	-.355	1.000	1.000
	Market=Bloomington	24.167	21.707	.099	1.113	.268	.017	.102	.073	.550	1.818
	Market=Danville	6.750	21.707	.028	.311	.756	-.062	.029	.020	.550	1.818
	Market=Escanaba	-.083	21.707	.000	-.004	.997	-.092	.000	.000	.550	1.818
	Market=Evergreen Park	17.583	21.707	.072	.810	.420	-.013	.075	.053	.550	1.818
	Market=Mendota	-10.583	21.707	-.043	-.488	.627	-.140	-.045	-.032	.550	1.818
	Market=Ottawa	16.083	21.707	.066	.741	.460	-.020	.068	.049	.550	1.818
	Market=Peoria	142.000	21.707	.581	6.542	<.001	.548	.518	.431	.550	1.818
	Market=Pontiac	-.917	21.707	-.004	-.042	.966	-.096	-.004	-.003	.550	1.818
	Market=Rockford	39.500	21.707	.162	1.820	.071	.086	.166	.120	.550	1.818
	Market=Urbana	-9.667	21.707	-.040	-.445	.657	-.136	-.041	-.029	.550	1.818

a. Dependent Variable: Completed Screening

Note. This table shows the coefficients for question two for geography for direct mail in SPSS.

Multiple linear regression was also completed by geography for completed cancer screenings for each of the four time frames for those receiving an email. In the model summary, R^2 is 0.421, which means that 42% of the predictors can be explained by the dependent variable. At $p<0.001$, the ANOVA results are statistically significant. Within the coefficients table, Peoria (suburban market) had the highest contribution to completed cancer screenings ($B = 0.581$), and at $p<0.001$, this is statistically significant.

Table 94

Model Summary for Question Two – Email (Geography)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.701[a]	.492	.431	53.170	.492	8.083	14	117	<.001

a. Predictors: (Constant), Market=Urbana, Cancer Screening, Time=4.0, Market=Rockford, Market=Pontiac, Market=Ottawa, Market=Mendota, Market=Evergreen Park, Time=3.0, Market=Escanaba, Market=Danville, Market=Bloomington, Time=2.0, Market=Peoria

b. Dependent Variable: Completed Screening

Note. This table shows the model summary for question two for geography for email in SPSS.

Table 95

ANOVA for Question Two – Email (Geography)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	319905.602	14	22850.400	8.083	<.001[b]
	Residual	330765.913	117	2827.059		
	Total	650671.515	131			

a. Dependent Variable: Completed Screening

b. Predictors: (Constant), Market=Urbana, Cancer Screening, Time=4.0, Market=Rockford, Market=Pontiac, Market=Ottawa, Market=Mendota, Market=Evergreen Park, Time=3.0, Market=Escanaba, Market=Danville, Market=Bloomington, Time=2.0, Market=Peoria

Note. This table shows the ANOVA for question two for geography for email in SPSS.

Table 96

Coefficients for Question Two – Email (Geography)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	87.477	20.696		4.227	<.001					
	Time=2.0	-29.606	13.090	-.183	-2.262	.026	-.145	-.205	-.149	.667	1.500
	Time=3.0	-11.000	13.090	-.068	-.840	.402	.008	-.077	-.055	.667	1.500
	Time=4.0	-7.394	13.090	-.046	-.565	.573	.038	-.052	-.037	.667	1.500
	Cancer Screening	-30.489	5.668	-.355	-5.379	<.001	-.355	-.445	-.355	1.000	1.000
	Market=Bloomington	24.167	21.707	.099	1.113	.268	.017	.102	.073	.550	1.818
	Market=Danville	6.750	21.707	.028	.311	.756	-.062	.029	.020	.550	1.818
	Market=Escanaba	-.083	21.707	.000	-.004	.997	-.092	.000	.000	.550	1.818
	Market=Evergreen Park	17.583	21.707	.072	.810	.420	-.013	.075	.053	.550	1.818
	Market=Mendota	-10.583	21.707	-.043	-.488	.627	-.140	-.045	-.032	.550	1.818
	Market=Ottawa	16.083	21.707	.066	.741	.460	-.020	.068	.049	.550	1.818
	Market=Peoria	142.000	21.707	.581	6.542	<.001	.548	.518	.431	.550	1.818
	Market=Pontiac	-.917	21.707	-.004	-.042	.966	-.096	-.004	-.003	.550	1.818
	Market=Rockford	39.500	21.707	.162	1.820	.071	.086	.166	.120	.550	1.818
	Market=Urbana	-9.667	21.707	-.040	-.445	.657	-.136	-.041	-.029	.550	1.818

a. Dependent Variable: Completed Screening

Note. This table shows the coefficients for question two for geography for email in SPSS.

Research Question 3 Findings

RQ3: Is there a significant difference in new diagnoses for lung, colon, or breast cancer by age, gender or geographic location in consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic?

$H_0$3: There is no significant difference in new diagnoses for lung, colon, or breast cancer in consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic.

$H_1$3: There is a significant difference in new diagnoses for lung, colon, or breast cancer in consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic.

Age

Finally, multiple linear regression was completed by age for cancer diagnoses during each of the four time frames for those receiving a direct mail piece. In the model summary, R^2 is 0.835, which means that more than 83% of the predictors can be explained by the dependent variable. At $p<0.001$, the ANOVA results are statistically significant. Within the coefficients table, age, the highest contributor to cancer diagnoses, is 65 to 74 ($B = 0.782$), and at $p<0.001$, the result is statistically significant.

Table 97

Model Summary for Question Three – Direct Mail

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.914[a]	.835	.822	1.650

a. Predictors: (Constant), Time=FY 2023 TD, CancerScreening=Mammography, 45-54, 75+, Under 45, Time=CY 2022, CancerScreening=Colon Screening, Time=FY 2021, 55-64, 65-74

b. Dependent Variable: Cancer Diagnosis

Note. This table shows the model summary for question three for age for direct mail in SPSS.

Table 98

ANOVA for Question Three – Direct Mail

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1671.463	10	167.146	61.386	<.001[b]
	Residual	329.469	121	2.723		
	Total	2000.932	131			

a. Dependent Variable: Cancer Diagnosis

b. Predictors: (Constant), Time=FY 2023 TD, CancerScreening=Mammography, 45-54, 75+, Under 45, Time=CY 2022, CancerScreening=Colon Screening, Time=FY 2021, 55-64, 65-74

Note. This table shows the ANOVA for question three for age for direct mail in SPSS.

Table 99

Coefficients for Question Three – Direct Mail

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			95.0% Confidence Interval for B		Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Lower Bound	Upper Bound	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	2.950	.412		7.157	<.001	2.134	3.766					
	Under 45	-.541	.183	-.114	-2.957	.004	-.904	-.179	.025	-.260	-.109	.914	1.094
	45-54	.472	.039	.534	11.978	<.001	.394	.550	.751	.737	.442	.684	1.461
	55-64	-.041	.012	-.473	-3.476	<.001	-.065	-.018	.695	-.301	-.128	.073	13.627
	65-74	.179	.031	.782	5.726	<.001	.117	.241	.746	.462	.211	.073	13.711
	75+	-.204	.227	-.041	-.899	.370	-.653	.245	.112	-.081	-.033	.659	1.518
	CancerScreening=Colon Screening	-2.633	.405	-.319	-6.496	<.001	-3.436	-1.831	-.359	-.508	-.240	.565	1.771
	CancerScreening=Mammography	-2.655	.438	-.321	-6.054	<.001	-3.523	-1.787	-.144	-.482	-.223	.483	2.071
	Time=CY 2022	-.523	.410	-.058	-1.277	.204	-1.335	.288	-.089	-.115	-.047	.655	1.526
	Time=FY 2021	-.926	.409	-.103	-2.261	.026	-1.736	-.115	-.161	-.201	-.083	.656	1.524
	Time=FY 2023 TD	.220	.417	.024	.528	.599	-.605	1.044	.154	.048	.019	.634	1.577

a. Dependent Variable: Cancer Diagnosis

Note. This table shows the coefficients for question three for age for direct mail in SPSS.

Multiple linear regression was also completed by age for cancer diagnoses for each of the four time frames for those receiving an email. In the model summary, R^2 is 0.727, which means that nearly 73% of the predictors can be explained by the dependent variable. At $p<0.001$, the ANOVA results are statistically significant. Within the

coefficients table, age, the highest contributor to cancer diagnoses, is 55 to 64 (B = 0.571), and at $p<0.001$, the result is statistically significant.

Table 100

Model Summary for Question Three – Email

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.853[a]	.727	.704	2.701	.727	31.946	10	120	<.001

a. Predictors: (Constant), CancerScreening=3.0, Time=3.0, 65-74, Under 45, 75+, Time=4.0, CancerScreening=2.0, Time=1.0, 45-54, 55-64

b. Dependent Variable: Cancer Diagnosis

Note. This table shows the model summary for question three for age for email

Table 101

ANOVA for Question Three – Email

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2329.939	10	232.994	31.946	<.001[b]
	Residual	875.206	120	7.293		
	Total	3205.145	130			

a. Dependent Variable: Cancer Diagnosis

b. Predictors: (Constant), CancerScreening=3.0, Time=3.0, 65-74, Under 45, 75+, Time=4.0, CancerScreening=2.0, Time=1.0, 45-54, 55-64

Note. This table shows the model summary for question three for age for email

Table 102

Coefficients for Question Three – Email

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	.461	.627		.734	.464					
	Under 45	1.150	.906	.068	1.269	.207	.211	.115	.061	.790	1.266
	45-54	.084	.060	.120	1.405	.163	.705	.127	.067	.313	3.191
	55-64	.046	.008	.571	5.577	<.001	.802	.454	.266	.217	4.602
	65-74	.030	.015	.143	1.993	.048	.605	.179	.095	.442	2.263
	75+	-.264	.305	-.042	-.865	.389	-.014	-.079	-.041	.964	1.037
	Time=1.0	-.813	.698	-.071	-1.164	.247	.018	-.106	-.056	.606	1.650
	Time=3.0	.300	.679	.026	.442	.659	.036	.040	.021	.641	1.561
	Time=4.0	.792	.681	.069	1.162	.248	.099	.105	.055	.650	1.539
	CancerScreening=2.0	-.625	.708	-.059	-.883	.379	-.394	-.080	-.042	.503	1.987
	CancerScreening=3.0	2.029	.611	.194	3.318	.001	.277	.290	.158	.668	1.498

a. Dependent Variable: Cancer Diagnosis

Note. This table shows the coefficients for question three for age for email.

Gender

Multiple linear regression was completed by gender for cancer diagnoses for each of the four time frames for those receiving a direct mail piece. In the model summary, R^2 is 0.657, which means that more than 65% of the predictors can be explained by the dependent variable. At $p<0.001$, the ANOVA results are statistically significant. Within the coefficients table, females had the highest contribution to cancer diagnoses ($B = 625$), followed by male at $B = .347$, and that at $p<0.001$, both of these are statistically significant.

Table 103

Model Summary for Question Three – Direct Mail (Gender)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.819[a]	.670	.657	2.897	.670	51.193	5	126	<.001

a. Predictors: (Constant), Female, Time=3.0, Male, Time=4.0, Time=2.0

b. Dependent Variable: Cancer Diagnosis

Note. This table shows the model summary for question three for gender for direct mail.

Table 104

ANOVA for Question Three – Direct Mail (Gender)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2148.105	5	429.621	51.193	<.001[b]
	Residual	1057.410	126	8.392		
	Total	3205.515	131			

a. Dependent Variable: Cancer Diagnosis

b. Predictors: (Constant), Female, Time=3.0, Male, Time=4.0, Time=2.0

Note. This table shows the ANOVA for question three for gender for direct mail.

Table 105

Coefficients for Question Three – Direct Mail (Gender)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-.075	.555		-.135	.893					
	Time=2.0	.911	.729	.080	1.250	.214	-.153	.111	.064	.638	1.567
	Time=3.0	.932	.715	.082	1.303	.195	.036	.115	.067	.663	1.508
	Time=4.0	1.662	.716	.146	2.321	.022	.099	.202	.119	.661	1.512
	Male	.074	.011	.367	6.769	<.001	.559	.516	.346	.888	1.126
	Female	.042	.004	.625	11.436	<.001	.734	.714	.585	.875	1.143

a. Dependent Variable: Cancer Diagnosis

Note. This table shows the coefficients for question three for gender for direct mail.

Multiple linear regression was also completed by gender for cancer diagnoses for each of the four time frames for those receiving an email. In the model summary, R^2 is 0.698, which means that more than 98% of the predictors can be explained by the dependent variable. At $p<0.001$, the ANOVA results are statistically significant. Within the coefficients table, females had the highest contribution to cancer diagnoses (B = 0.637), followed by male at B = 0.290. At a significance of $p<0.001$, both were statistically significant.

Table 106

Model Summary for Question Three – Email (Gender)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.845[a]	.714	.698	2.717	.714	44.325	7	124	<.001

a. Predictors: (Constant), Female, Time=3.0, CancerScreening=3.0, Time=4.0, Male, Time=2.0, CancerScreening=2.0

b. Dependent Variable: Cancer Diagnosis

Note. This table shows the model summary for question three for gender for email.

Table 107

ANOVA for Question Three – Email (Gender)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2290.238	7	327.177	44.325	<.001[b]
	Residual	915.278	124	7.381		
	Total	3205.515	131			

a. Dependent Variable: Cancer Diagnosis

b. Predictors: (Constant), Female, Time=3.0, CancerScreening=3.0, Time=4.0, Male, Time=2.0, CancerScreening=2.0

Note. This table shows the ANOVA for question three for gender for email.

Table 108

Coefficients for Question Three – Email (Gender)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	-.222	.696		-.318	.751					
	Time=2.0	.787	.685	.069	1.149	.253	-.153	.103	.055	.636	1.573
	Time=3.0	.904	.671	.079	1.347	.180	.036	.120	.065	.663	1.509
	Time=4.0	1.594	.672	.140	2.374	.019	.099	.208	.114	.661	1.513
	CancerScreening=2.0	-.817	.676	-.078	-1.209	.229	-.389	-.108	-.058	.551	1.814
	CancerScreening=3.0	1.815	.710	.174	2.555	.012	.276	.224	.123	.499	2.004
	Male	.058	.012	.290	4.849	<.001	.559	.399	.233	.644	1.554
	Female	.043	.004	.637	10.487	<.001	.734	.686	.503	.624	1.601

a. Dependent Variable: Cancer Diagnosis

Note. This table shows the coefficients for question three for gender for email.

Geography

Multiple linear regression was completed by geography for cancer diagnoses for each of the four time frames for those receiving a direct mail piece. In the model summary, R^2 is 0.481, which means that about 48% of the predictors can be explained by the dependent variable. At $p<0.001$, the ANOVA results are statistically significant.

Within the coefficients table, Peoria (suburban market) had the highest contribution to cancer diagnoses ($B = 642$), and at $p<0.001$, this is statistically significant.

Table 109

Model Summary for Question Three – Direct Mail (Geography)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.733[a]	.537	.481	3.562	.537	9.684	14	117	<.001

a. Predictors: (Constant), Market=Urbana, Cancer Screening, Time=4.0, Market=Rockford, Market=Pontiac, Market=Ottawa, Market=Mendota, Market=Evergreen Park, Time=3.0, Market=Escanaba, Market=Danville, Market=Bloomington, Time=2.0, Market=Peoria

b. Dependent Variable: Cancer Diagnosis

Note. This table shows the model summary for question three for geography for direct mail.

Table 110

ANOVA for Question Three – Direct Mail (Geography)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1720.667	14	122.905	9.684	<.001[b]
	Residual	1484.848	117	12.691		
	Total	3205.515	131			

a. Dependent Variable: Cancer Diagnosis

b. Predictors: (Constant), Market=Urbana, Cancer Screening, Time=4.0, Market=Rockford, Market=Pontiac, Market=Ottawa, Market=Mendota, Market=Evergreen Park, Time=3.0, Market=Escanaba, Market=Danville, Market=Bloomington, Time=2.0, Market=Peoria

Note. This table shows the ANOVA for question three for geography for direct mail.

Table 111

Coefficients for Question Three – Direct Mail (Geography)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	1.015	1.387		.732	.466					
	Time=2.0	-1.455	.877	-.128	-1.659	.100	-.153	-.152	-.104	.667	1.500
	Time=3.0	.152	.877	.013	.173	.863	.036	.016	.011	.667	1.500
	Time=4.0	.697	.877	.061	.795	.428	.099	.073	.050	.667	1.500
	Cancer Screening	.568	.380	.094	1.496	.137	.094	.137	.094	1.000	1.000
	Market=Bloomington	1.667	1.454	.097	1.146	.254	.018	.105	.072	.550	1.818
	Market=Danville	.333	1.454	.019	.229	.819	-.068	.021	.014	.550	1.818
	Market=Escanaba	-.583	1.454	-.034	-.401	.689	-.127	-.037	-.025	.550	1.818
	Market=Evergreen Park	.917	1.454	.053	.630	.530	-.031	.058	.040	.550	1.818
	Market=Mendota	-1.583	1.454	-.092	-1.089	.279	-.191	-.100	-.069	.550	1.818
	Market=Ottawa	1.583	1.454	.092	1.089	.279	.012	.100	.069	.550	1.818
	Market=Peoria	11.000	1.454	.642	7.563	<.001	.616	.573	.476	.550	1.818
	Market=Pontiac	-1.250	1.454	-.073	-.859	.392	-.170	-.079	-.054	.550	1.818
	Market=Rockford	4.667	1.454	.272	3.209	.002	.210	.284	.202	.550	1.818
	Market=Urbana	-1.417	1.454	-.083	-.974	.332	-.180	-.090	-.061	.550	1.818

a. Dependent Variable: Cancer Diagnosis

Note. This table shows the coefficient for question three for geography for direct mail.

Multiple linear regression was then completed by geography for cancer diagnoses for each of the four time frames for those receiving an email. In the model summary, R^2 is 0.481, which means that about 48% of the predictors can be explained by the dependent variable. At $p<0.001$, the ANOVA results are statistically significant. Within the coefficients table, Peoria (suburban market) had the highest contribution to cancer diagnoses ($B = 0.642$), and at $p<0.001$, this is statistically significant. Rockford (also a suburban market) had the second highest contribution to cancer diagnoses at $B = 0.272$. At a significance of $p<0.002$, this is statistically significant.

Table 112

Model Summary for Question Three – Email (Geography)

Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.733[a]	.537	.481	3.562	.537	9.684	14	117	<.001

a. Predictors: (Constant), Market=Urbana, Cancer Screening, Time=4.0, Market=Rockford, Market=Pontiac, Market=Ottawa, Market=Mendota, Market=Evergreen Park, Time=3.0, Market=Escanaba, Market=Danville, Market=Bloomington, Time=2.0, Market=Peoria

b. Dependent Variable: Cancer Diagnosis

Note. This table shows the model summary for question three for geography for email.

Table 113

ANOVA for Question Three – Email (Geography)

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1720.667	14	122.905	9.684	<.001[b]
	Residual	1484.848	117	12.691		
	Total	3205.515	131			

a. Dependent Variable: Cancer Diagnosis

b. Predictors: (Constant), Market=Urbana, Cancer Screening, Time=4.0, Market=Rockford, Market=Pontiac, Market=Ottawa, Market=Mendota, Market=Evergreen Park, Time=3.0, Market=Escanaba, Market=Danville, Market=Bloomington, Time=2.0, Market=Peoria

Note. This table shows the ANOVA for question three for geography for email.

Table 114

Coefficients for Question Three – Email (Geography)

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients			Correlations			Collinearity Statistics	
		B	Std. Error	Beta	t	Sig.	Zero-order	Partial	Part	Tolerance	VIF
1	(Constant)	1.015	1.387		.732	.466					
	Time=2.0	-1.455	.877	-.128	-1.659	.100	-.153	-.152	-.104	.667	1.500
	Time=3.0	.152	.877	.013	.173	.863	.036	.016	.011	.667	1.500
	Time=4.0	.697	.877	.061	.795	.428	.099	.073	.050	.667	1.500
	Cancer Screening	.568	.380	.094	1.496	.137	.094	.137	.094	1.000	1.000
	Market=Bloomington	1.667	1.454	.097	1.146	.254	.018	.105	.072	.550	1.818
	Market=Danville	.333	1.454	.019	.229	.819	-.068	.021	.014	.550	1.818
	Market=Escanaba	-.583	1.454	-.034	-.401	.689	-.127	-.037	-.025	.550	1.818
	Market=Evergreen Park	.917	1.454	.053	.630	.530	-.031	.058	.040	.550	1.818
	Market=Mendota	-1.583	1.454	-.092	-1.089	.279	-.191	-.100	-.069	.550	1.818
	Market=Ottawa	1.583	1.454	.092	1.089	.279	.012	.100	.069	.550	1.818
	Market=Peoria	11.000	1.454	.642	7.563	<.001	.616	.573	.476	.550	1.818
	Market=Pontiac	-1.250	1.454	-.073	-.859	.392	-.170	-.079	-.054	.550	1.818
	Market=Rockford	4.667	1.454	.272	3.209	.002	.210	.284	.202	.550	1.818
	Market=Urbana	-1.417	1.454	-.083	-.974	.332	-.180	-.090	-.061	.550	1.818

a. Dependent Variable: Cancer Diagnosis

Note. This table shows the coefficients for question three for geography for email.

Summary

For RQ1, the null hypothesis is rejected as there is a significant difference in response to appointments for breast, colon, and lung cancer screening appointments by age, gender, or geography from consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic. Women and those living in Peoria (a suburban market) were found to be more likely to complete a breast, colon, or lung cancer screening, both for those who received direct mail and for those who received email, and the ages of those receiving cancer diagnoses did vary by the medium received. For direct mail, the respondent age group most closely aligned with receiving a cancer diagnosis was 65 to 74. For email, the age group was 55 to 64.

For RQ2, the null hypothesis is rejected as there is a significant difference in response to appointments for primary care and mammography patient appointments by age, gender, or geography from consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic. Women and those living in Peoria (a suburban market) were found to be more likely to complete a primary care or mammography appointment, both for those who received direct mail and for those who received email, and the ages of those receiving cancer diagnoses did vary by the medium received. For direct mail, the respondent age group most closely aligned with receiving a cancer diagnosis was 65 to 74. For email, the age group was 55 to 64.

For RQ3, the null hypothesis was rejected as there is a significant difference in cancer diagnoses by age, gender, or geography from consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic. The diagnosis codes used for breast cancer are included in Appendix P; for colon cancer, Appendix Q; and for lung cancer Appendix R. Women and those living in Peoria (a suburban market) were found to be more likely to receive a cancer diagnosis, both for those who received direct mail and for those who received email, the ages of those receiving cancer diagnoses did vary by the medium received. For direct mail, the respondent age group most closely aligned with receiving a cancer diagnosis was 65 to 74. For email, the age group was 55 to 64.

In summary, for all three RQs, the null hypothesis is rejected as there is a significant difference ($p<0.001$) in response to primary care and completed screening appointments, as well as cancer diagnoses for breast, colon, and lung cancer screening

appointments by age, gender, or geography from consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic. For health care marketing professionals, this could mean that targeting women with cancer screening messages may provide better results for a campaign's outcomes. Or health care marketing professionals. While ideally, all consumers should be encouraged, regardless of gender, to complete their recommended cancer screenings, women were found to be more likely to complete a primary care appointment as well as more likely to complete a breast, colon, or lung screening after receiving email and direct mail marketing messages. Efforts to help motivate consumers to come in for a cancer screening may be best deployed through direct mail for consumers aged 65 to 74 and through email for consumers aged 55 to 64. Additional research to determine what mediums might be the most effective at targeting men and younger consumers would be important for future marketing efforts. In Section 4, I will further discuss the interpretation of findings, as well as limitations of the study and recommendations for future research. In addition, discussions related to the implications of this study for marketing and communications professionals, as well as for positive social change will be presented.

Section 4: Application to Professional Practice and Implications for Social Change

Introduction

The purpose of this quantitative study was to investigate whether there is a significant difference in scheduled breast, colon, and lung cancer screenings in consumers receiving targeted direct mail and email marketing communications following the COVID-19 pandemic, based on age, gender, and geographic location. I analyzed secondary data from a health system headquartered in Peoria, Illinois, including CRM data and strategic marketing campaign creative and results from 2021. A correlational study design was used to assess the impact of variables in each population. The independent variables of this study included the type of marketing communication deployed and well as the recipient's age, gender, and geographic location. The dependent variables were breast, colon, and lung cancer screening appointment volumes as well as cancer diagnoses that resulted from the screenings.

The results of this study demonstrate that there was a significant difference in response to appointments for breast, colon, and lung cancer screening appointments by age, gender, or geography from consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic. Women and those living in Peoria (a suburban market) were found to be more likely to complete a breast, colon, or lung cancer screening, both those who received direct mail and those who received email. The ages of those receiving cancer diagnoses varied by the medium received. For direct mail, the respondent age group most closely aligned with receiving a cancer diagnosis was 65 to 74. For email, the age group was 55 to 64.

There was a significant difference in response to appointments for primary care and mammography patient appointments by age, gender, or geography from consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic. Women and those living in Peoria (a suburban market) were found to be more likely to complete a primary care or mammography appointment, both for those who received direct mail and for those who received email, and the ages of those receiving cancer diagnoses did vary by the medium received. For direct mail, the respondent age group most closely aligned with receiving a cancer diagnosis was 65 to 74. For email, the age group was 55 to 64.

There was a significant difference in cancer diagnoses by age, gender, or geography from consumers receiving targeted direct mail messages versus targeted email messages after the COVID-19 pandemic. Women and those living in Peoria (a suburban market) were found to be more likely to receive a cancer diagnosis, both for those who received direct mail and for those who received email, and the ages of those receiving cancer diagnoses did vary by the medium received. For direct mail, the respondent age group most closely aligned with receiving a cancer diagnosis was 65 to 74. For email, the age group was 55 to 64.

Interpretation of the Findings

Routine breast, colon, and lung cancer screenings enable physicians to diagnose and treat cancer in its earliest stages (Petty, 2009). Despite provider efforts to encourage screenings for those at risk for these cancers, many patients have historically delayed or avoided recommended screenings out of fear of receiving a cancer diagnosis; fear of

physical discomfort from the screening itself; and perceived disruptions in their day by traveling to an appointment, parking, and navigating a large hospital campus (Petty, 2009). Regular marketing communications that are impactful and targeted to the receiving consumer and that address some of these fears are critical to contributing to population health improvements. This study helps confirm these findings by demonstrating the impact marketing communications had in 2021 in getting consumers to return to cancer screenings during the COVID-19 pandemic.

The Health Information National Trends Survey highlights the importance of improving health literacy and health outcomes. It does so by not only encouraging patients to engage in managing their health, including cancer screenings, but also by suggesting that health care providers make it as convenient as possible to schedule an appointment (Hesse, 2017). This study helps affirm these best practices by demonstrating the impact of marketing communications on health literacy and eventual movement to action to schedule a cancer screening.

Impacts of Breast Cancer Screenings on Population Health

Smith (2019) found that screening mammography is associated with earlier detection of malignancies and therefore reduced mortality from breast cancer. The reductions vary across the many study designs but range from 15% to 54% fewer breast cancer deaths associated with screening mammography. Duffy (2020) validated that the number of deaths from breast cancer and the number of advanced stage breast cancers were reduced in women who participated in regular screening mammography as opposed to those who did not have a screening mammogram. Women who participated in

screening mammography had a 41% reduction in their risk of dying of breast cancer within 10 years (relative risk, 0.59; 95% confidence interval, 0.51-0.68 [$p < .001$]) and a 25% reduction in the rate of advanced breast cancers (relative risk, 0.75; 95% confidence interval, 0.66-0.84 [$p < .001$]). In my study, it was possible to see the impact marketing communications had on encouraging women to return to the medical center for their screening mammogram. As a result of these patients being motivated to come in for their screening mammogram, 238 breast cancers were able to be diagnosed. Had these women not returned for their screening mammogram, their cancer may not have been found until it was in a more advanced stage, where the physical, emotional, and financial impacts of their cancer may have been more severe.

Impacts of Colon Cancer Screenings on Population Health

Colorectal cancer diagnoses and deaths have declined over the past 2 decades among adults aged 50 years and older, which is largely attributable to increased screening and prevention and early detection efforts (Smith, 2019). Levin (2018) reported that higher rates of colorectal cancer screening were associated with a 25.5% reduction in colorectal cancer diagnoses between 2000 and 2015, from 95.8 cases/100,000 to 71.4 cases/100,000 ($p < .01$), and a 52.4% reduction in cancer mortality, from 30.9 deaths/100,000 to 14.7 deaths/100,000 ($p < .01$). Advanced-stage colorectal cancer incidence rates decreased 36.2% from 45.9 cases/100,000 to 29.3 cases/100,000 ($p < .01$) and early-stage colorectal cancer incidence rates decreased 14.5% from 48.2 cases/100,000 to 41.2 cases/100,000 ($p < .04$) (Levin, 2018).

By encouraging consumers to engage in routine colorectal cancer screenings, it is possible to demonstrate the impact on population health through my study. Thirty-two new colorectal cancers were diagnosed because of the marketing campaign's efforts to encourage colorectal cancer screenings. Like the 238 breast cancers that were diagnosed because of this campaign, the 32 individuals who received colorectal cancer diagnoses likely did so at a stage earlier than what the cancer would have been detected in had they not responded to the campaign.

Impacts of Lung Cancer Screenings on Population Health

Smith (2019) found a statistically significant reduction in lung cancer deaths in high-risk, current, and former smokers who received lung cancer screenings compared with a similar group that did not. These results add to other evidence demonstrating the value of lung cancer screening in detecting lung cancer in earlier stages and in reducing lung cancer deaths (Smith, 2019). The efficacy of lung cancer screening in high-risk current and former smokers makes identifying and marketing to adults who meet screening criteria a population health priority. A massive 445 new cancers were diagnosed in patients who came to the health system because of the marketing campaign for a lung cancer screening. Again, had these patients not been motivated by the marketing communications they received, their cancers may have been diagnosed at a much later stage, causing additional (and unnecessary) physical, emotional, and financial strain.

Limitations of the Study

There are several limitations of the study. The first limitation of the study is that the collection of data reflects only a single point in time rather than serving as an ongoing reflection of marketing's impact on consumer behavior. Therefore, it cannot be assumed that if replicated, the marketing campaign's performance would be the same. It may be more successful, with an increased number of responses. It may not.

The impact of other media impressions is another limitation. Impressions represent the number of times an advertisement is served to its intended audience (Lovett, 2019). While the paid advertisements (cable, broadcast and connected TV, radio, etc.) within the campaign complement the direct mail and email marketing messages, it is difficult to determine how they impacted a consumer's choice to respond to a direct mail or email. For example, one consumer may have simply received a direct mail piece and decided to make a cancer screening appointment from it alone. Another may have driven past a billboard, heard a radio spot or watched a TV ad from the campaign prior to receiving an email. These exposures may have created their desire for a cancer screening before the email was ever received.

A third limitation of the study is the limited ability to demonstrate whether someone who responded to the colon and lung screening campaigns and scheduled an appointment eventually followed through and had a screening. While the call-to-action for the mammography marketing campaign allowed the respondent to directly schedule their mammogram appointment, the colon and lung screening campaigns created a bit of detour, as respondents had to first be seen by a primary care provider to determine their

eligibility for a colon or lung screening. This additional step creates some reporting challenges as we follow respondents through their journey in our CRM database.

CRM reporting issues were another limitation. The CRM database used for these marketing campaigns are somewhat limited in our ability to follow individual respondent's journeys. It was possible to see how many of a particular segment of responders acted (i.e., "Twenty-seven women ages 51-52 living in rural communities made mammography appointments."). However, it was not possible to attribute those actions to 27 individual patient records and follow their individual journeys. Rather, with market-level, aggregated totals, these are grouped together, and generalizations must be made about the group as a whole.

Recommendations

Further research on marketing communications' impact on consumer engagement in cancer screenings should be conducted outside of the pandemic's influence. The marketing creative that was included in this study was impacted by the enormity of COVID-19. Understanding how best to motivate consumers to action in a time not impacted by the virus could help understand how to best target consumers during times of less emotion and stress.

The type of marketing creative used to target consumers is another potential area of continued study. The marketing creative used in this study relied on humor to break through the clutter and grab attention. Researching humor versus a more serious tone, for example, could help marketing communications professionals determine the best creative approach to the messaging.

Finally, studying the impact of other marketing mediums on the outcomes of the campaign could be interesting. In the health system's Northern region, which includes Rockford, Mendota, and Ottawa, Illinois, the 2021 cancer screening marketing campaign included 6.8 million additional paid media impressions, including a Green Bay Packers at Chicago Bears game on January 3, 2021, as well as a mix of radio, billboards, &and print ads. In the Eastern region, which includes Urbana, Danville, Pontiac and Bloomington, Illinois, there were an additional 14.5 million paid media impressions, including an ad in local broadcast TV during the 2021 Super Bowl. In the Alton, Illinois market, there were an additional 1.6 million paid media impressions during the marketing campaign. The Central region, which includes the community of Peoria, Illinois, had an additional 8.2 million media impressions during the campaign, including a local broadcast TV spot during the 2021 Super Bowl. The Metro region, which includes the community of Evergreen Park, Illinois, saw an additional 13.6 million paid media impressions during the marketing campaign. Complementing these paid media impressions, the overall marketing campaign was also supported by organic social media posts and blogs featuring patient testimonials about the importance of cancer screenings. Further research to understand how each medium impacted the success of the campaign could help marketing communications professionals better target their audiences in the future.

Implications for Professional Practice and Social Change

The marketing communications function within every health system plays a critical role in enhancing health literacy within the communities they serve, and in encouraging consumers to engage in routine cancer screenings. Understanding which

audiences are critical to engage and what mediums best drive action, as well as developing creative messages that break through the clutter are important considerations for health care administrators and marketing communications professionals.

Routine breast, colon, and lung cancer screenings enable physicians to diagnose and treat cancer in its earliest stages (Petty, 2009). Despite provider efforts to encourage screenings for those at risk for these cancers, many patients have historically delayed or avoided recommended screenings out of fear of receiving a cancer diagnosis, fear of physical discomfort from the screening itself and perceived disruptions in their day by traveling to an appointment, parking, navigating a large hospital campus, and so forth. (Petty, 2009). Regular marketing communications that are impactful, targeted to the right receiving consumer and that address some of these fears are critical to contributing to population health improvements. This study helps confirm these findings by demonstrating the impact marketing communications have had over the last 2 years in getting consumers to return to cancer screenings during the COVID-19 pandemic.

The Health Information National Trends Survey reports on the importance improving health literacy and health outcomes by not only encouraging patients to engage in managing their health, including cancer screenings, but also by ensuring health care providers make it as convenient as possible to schedule an appointment. (Hesse, 2017). This study helps affirm this by demonstrating the impact of marketing communications on health literacy and eventual movement to action to schedule a cancer screening. Continued work to encourage cancer screenings is critical to the role of health system marketing and communications teams.

Through positive social change, it is possible to improve human and social conditions, including health (Walden University, 2023). People with inadequate health education have been found to have higher mortality rates (Woolf, 2007). In fact, a 2007 study found that the social change impact of better health education could save more lives than other medical advances such as new procedures, technologies or drug therapies (Woolf, 2007).

The findings of my study could be significant in that it has demonstrated the importance of marketing communications in motivating health literacy for patients regarding re-engagement in breast, colon, and lung cancer screenings, ultimately helping to promote social change through earlier cancer diagnoses at earlier stages to improve patient outcomes. This is helpful in supporting the need for marketing communications that are strategically planned, targeted, and appropriately funded to ensure change in consumer attitudes and behaviors towards managing their health and ultimately, improvements in population health in the communities served by health systems.

Other potential positive social change implications from this study include a long-term, increased awareness of the importance of cancer screenings in adults, as well as the ability of a consumer to articulate what screenings he/she should get and when, and how to schedule them. Further, positive social change implications include life-long compliance with recommended cancer screenings, and even advocating cancer screenings with family and friends. Ultimately, this impacts earlier detection of cancers, reduced cost of care, and long-term survival rates.

Conclusion

In 2021, the marketing communications team at one Midwestern health system motivated 7,404 individuals to make an appointment to learn more about their need for a cancer screening for breast, colon, and/or lung cancer against all odds during a massive, worldwide pandemic. They helped convince 6,094 to complete a screening and 715 people to obtain the diagnosis and treatment for cancer they needed and deserved. Their efforts are emblematic of the marketing and communications teams throughout the United States that work each day to find gaps in health literacy that they can best address through strategic and thoughtful marketing messages. This study may help others to understand the impact that health care marketing professionals have on their communities. Improve health care marketing may contribute to earlier detection of cancers, reduced cost of care, and long-term cancer survival rates.

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Appendix A: Breast International Classification of Diseases, Ninth Revision Procedure Codes

The following International Classification of Diseases, Ninth Revision procedure codes were used for the breast cancer screening marketing campaign: 0H0T07Z , 0H0T37Z, 0H0TX7Z, 0H0TXJZ, 0H0TXKZ, 0H0U07Z, 0H0U37Z, 0H0UX7Z, 0H0UXJZ, 0H0UXKZ, 0H0VX7Z, 0H0VXJZ, 0H0VXKZ, 0HTT0ZZ, 0HTU0ZZ, 0HTV0ZZ, 0HDT0ZZ, 0HDU0ZZ, 0HDV0ZZ and 0HDY0ZZ), ICD10 DX codes (0H5T0ZZ, 0H5T3ZZ, 0H5T7ZZ, 0H5T8ZZ, 0H5TXZZ, 0H5U0ZZ, 0H5U3ZZ, 0H5U7ZZ, 0H5U8ZZ, 0H5UXZZ, 0H5V0ZZ, 0H5V3ZZ, 0H5V7ZZ, 0H5V8ZZ, 0H5VXZZ, 0H5W0ZZ, 0H5W3ZZ, 0H5W7ZZ, 0H5W8ZZ, 0H5WXZZ, 0H5X0ZZ, 0H5X3ZZ, 0H5X7ZZ, 0H5X8ZZ, 0H5XXZZ, 0H9T00Z, 0H9T0ZX, 0H9T0ZZ, 0H9T3ZX, 0H9T7ZX, 0H9T8ZX, 0H9TX0Z, 0H9TXZX, 0H9TXZZ, 0H9U00Z, 0H9U0ZX, 0H9U0ZZ, 0H9U3ZX, 0H9U7ZX, 0H9U8ZX, 0H9UX0Z, 0H9UXZX, 0H9UXZZ, 0H9V00Z, 0H9V0ZX, 0H9V0ZZ, 0H9V3ZX, 0H9V7ZX, 0H9V8ZX, 0H9VX0Z, 0H9VXZX, 0H9VXZZ, 0H9W00Z, 0H9W0ZX, 0H9W0ZZ, 0H9W3ZX, 0H9W7ZX, 0H9W8ZX, 0H9WX0Z, 0H9WXZX, 0H9WXZZ, 0H9X00Z, 0H9X0ZX, 0H9X0ZZ, 0H9X3ZX, 0H9X7ZX, 0H9X8ZX, 0H9XX0Z, 0H9XXZX, 0H9XXZZ, 0HBT0ZX, 0HBT0ZZ, 0HBT3ZX, 0HBT3ZZ, 0HBT7ZX, 0HBT7ZZ, 0HBT8ZX, 0HBT8ZZ, 0HBTXZX, 0HBTXZZ, 0HBU0ZX, 0HBU0ZZ, 0HBU3ZX, 0HBU3ZZ, 0HBU7ZX, 0HBU7ZZ, 0HBU8ZX, 0HBU8ZZ, 0HBUXZX, 0HBUXZZ, 0HBV0ZX, 0HBV0ZZ, 0HBV3ZX, 0HBV3ZZ, 0HBV7ZX, 0HBV7ZZ, 0HBV8ZX, 0HBV8ZZ, 0HBVXZX, 0HBVXZZ, 0HBW0ZX, 0HBW0ZZ, 0HBW3ZX, 0HBW3ZZ, 0HBW7ZX, 0HBW7ZZ,

0HBW8ZX, 0HBW8ZZ, 0HBWXZX, 0HBWXZZ, 0HBX0ZX, 0HBX0ZZ, 0HBX3ZX, 0HBX3ZZ, 0HBX7ZX, 0HBX7ZZ, 0HBX8ZX, 0HBX8ZZ, 0HBXXZX, 0HBXXZZ, 0HBY0ZX, 0HBY0ZZ, 0HBY3ZX, 0HBY3ZZ, 0HBY7ZX, 0HBY7ZZ, 0HBY8ZX, 0HBY8ZZ, 0HBYXZX, 0HBYXZZ, 0HCT0ZZ, 0HCT3ZZ, 0HCT7ZZ, 0HCT8ZZ, 0HCTXZZ, 0HCU0ZZ, 0HCU3ZZ, 0HCU7ZZ, 0HCU8ZZ, 0HCUXZZ, 0HCV0ZZ, 0HCV3ZZ, 0HCV7ZZ, 0HCV8ZZ, 0HCVXZZ, 0HCW0ZZ, 0HCW3ZZ, 0HCW7ZZ, 0HCW8ZZ, 0HCWXZZ, 0HCX0ZZ, 0HCX3ZZ, 0HCX7ZZ, 0HCX8ZZ, 0HCXXZZ, 0HJT0ZZ, 0HJT3ZZ, 0HJT7ZZ, 0HJT8ZZ, 0HJU0ZZ, 0HJU3ZZ, 0HJU7ZZ, 0HJU8Z , 0HPT00Z, 0HPT01Z, 0HPT07Z, 0HPT0KZ, 0HPT30Z, 0HPT31Z, 0HPT37Z, 0HPT3KZ, 0HPT70Z, 0HPT71Z, 0HPT77Z, 0HPT7JZ, 0HPT7KZ, 0HPT7NZ, 0HPT80Z, 0HPT81Z, 0HPT87Z, 0HPT8JZ, 0HPT8KZ, 0HPT8NZ, 0HPU00Z, 0HPU01Z, 0HPU07Z, 0HPU0KZ, 0HPU30Z, 0HPU31Z, 0HPU37Z, 0HPU3KZ, 0HPU70Z, 0HPU71Z, 0HPU77Z, 0HPU7JZ, 0HPU7KZ, 0HPU7NZ, 0HPU80Z, 0HPU81Z, 0HPU87Z, 0HPU8JZ, 0HPU8KZ, 0HPU8NZ, 0HRT3JZ, 0HRU3JZ, 0HRV0JZ, 0HRV3JZ, 0HTWXZZ, 0HTXXZZ, 0HTY0ZZ, 0HWT00Z, 0HWT07Z, 0HWT0KZ, 0HWT0NZ, 0HWT30Z, 0HWT37Z, 0HWT3KZ, 0HWT3NZ, 0HWT70Z, 0HWT77Z, 0HWT7JZ, 0HWT7KZ, 0HWT7NZ, 0HWT80Z, 0HWT87Z, 0HWT8JZ, 0HWT8KZ, 0HWT8NZ, 0HWU00Z, 0HWU07Z, 0HWU0KZ, 0HWU0NZ, 0HWU30Z, 0HWU37Z, 0HWU3KZ, 0HWU3NZ, 0HWU70Z, 0HWU77Z, 0HWU7JZ, 0HWU7KZ, 0HWU7NZ, 0HWU80Z, 0HWU87Z, 0HWU8JZ, 0HWU8KZ, 0HWU8NZ, BH00ZZZ, BH01ZZZ, BH02ZZZ, BH030ZZ, BH031ZZ, BH03YZZ, BH03ZZZ, BH040ZZ,

BH041ZZ, BH04YZZ, BH04ZZZ, BH050ZZ, BH051ZZ, BH05YZZ, BH05ZZZ, BH060ZZ, BH061ZZ, BH06YZZ and BH06ZZZ.

Appendix B: Breast International Classification of Diseases Diagnosis Codes

The following International Classification of Diseases, Ninth Revision diagnosis codes were used for the breast cancer screening marketing campaign: 174.0 -174.6, 174.8, 174.9, 175.0, 175.9, 233.0, V10.3 and V45.71.

Appendix C: Breast Current Procedural Terminology Codes

The following Current Procedural Terminology codes were used for the breast cancer screening marketing campaign: 19303, 19304, 19305, 19306, 19307, 19301 and 19302.

Appendix D: Colon Diagnosis-Related Group Codes

The following Diagnosis-Related Group codes were used for the colon cancer screening marketing campaign: 329-334, 344-349.

Appendix E: Colon International Classification of Diseases, Ninth Revision Codes

The following International Classification of Diseases, Ninth Revision codes were used for the colon cancer screening marketing campaign: 153.0-153.9, 159.0, 209.10-209.16, 230.3 and V10.05.

Appendix F: Colon International Classification of Diseases, 10th Revision Diagnosis Codes

The following International Classification of Diseases, 10th Revision diagnosis codes were used for the colon cancer screening marketing campaign: C18.0-C18.9, C26.0, C7A.020-C7A.025, C7A.029, D01.0, and Z85.038.

Appendix G: Colon International Classification of Diseases, 10th Revision Diagnosis Codes

The following ICD10 PX codes were used for the colon cancer screening marketing campaign: 0D5E4ZZ , 0D5E8ZZ, 0D5F4ZZ, 0D5F8ZZ, 0D5G4ZZ, 0D5G8ZZ, 0D5H4ZZ, 0D5H8ZZ, 0D5K4ZZ, 0D5K8ZZ, 0D5L4ZZ, 0D5L8ZZ, 0D5M4ZZ, 0D5M8ZZ, 0D5N4ZZ, 0D5N8ZZ, 0D780DZ, 0D783DZ, 0D784DZ, 0D787DZ, 0D788DZ, 0D790DZ, 0D793DZ, 0D794DZ, 0D797DZ, 0D798DZ, 0D7A0DZ, 0D7A3DZ, 0D7A4DZ, 0D7A7DZ, 0D7A8DZ, 0D7B0DZ, 0D7B3DZ, 0D7B4DZ, 0D7B7DZ, 0D7B8DZ, 0D7C0DZ, 0D7C3DZ, 0D7C4DZ, 0D7C7DZ, 0D7C8DZ, 0D7E0DZ, 0D7E3DZ, 0D7E4DZ, 0D7E7DZ, 0D7E8DZ, 0D7F0DZ, 0D7F3DZ, 0D7F4DZ, 0D7F7DZ, 0D7F8DZ, 0D7G0DZ, 0D7G3DZ, 0D7G4DZ, 0D7G7DZ, 0D7G8DZ, 0D7H0DZ, 0D7H3DZ, 0D7H4DZ, 0D7H7DZ, 0D7H8DZ, 0D7K0DZ, 0D7K3DZ, 0D7K4DZ, 0D7K7DZ, 0D7K8DZ, 0D7L0DZ, 0D7L3DZ, 0D7L4DZ, 0D7L7DZ, 0D7L8DZ, 0D7M0DZ, 0D7M3DZ, 0D7M4DZ, 0D7M7DZ, 0D7M8DZ, 0D7N0DZ, 0D7N3DZ, 0D7N4DZ, 0D7N7DZ, 0D7N8DZ, 0D9E3ZX, 0D9E4ZX, 0D9E7ZX, 0D9E8ZX, 0D9F3ZX, 0D9F4ZX, 0D9F7ZX, 0D9F8ZX, 0D9G3ZX, 0D9G4ZX, 0D9G7ZX, 0D9G8ZX, 0D9H3ZX, 0D9H4ZX, 0D9H7ZX, 0D9H8ZX, 0D9K3ZX, 0D9K4ZX, 0D9K7ZX, 0D9K8ZX, 0D9L3ZX, 0D9L4ZX, 0D9L7ZX, 0D9L8ZX, 0D9M3ZX, 0D9M4ZX, 0D9M7ZX, 0D9M8ZX, 0D9N3ZX, 0D9N4ZX, 0D9N7ZX, 0D9N8ZX, 0DBE3ZX, 0DBE4ZX, 0DBE7ZX, 0DBE8ZX, 0DBE8ZZ, 0DBF3ZX, 0DBF4ZX, 0DBF7ZX, 0DBF8ZX, 0DBF8ZZ, 0DBG3ZX, 0DBG4ZX, 0DBG7ZX, 0DBG8ZX, 0DBG8ZZ, 0DBH3ZX, 0DBH4ZX, 0DBH7ZX, 0DBH8ZX,

0DBH8ZZ, 0DBK3ZX, 0DBK4ZX, 0DBK7ZX, 0DBK8ZX, 0DBK8ZZ, 0DBL3ZX, 0DBL4ZX, 0DBL7ZX, 0DBL8ZX, 0DBL8ZZ, 0DBM3ZX, 0DBM4ZX, 0DBM7ZX, 0DBM8ZX, 0DBM8ZZ, 0DBN3ZX, 0DBN4ZX, 0DBN7ZX, 0DBN8ZX, 0DBN8ZZ, 0DH80DZ, 0DH83DZ, 0DH84DZ, 0DH87DZ, 0DH88DZ, 0DH90DZ, 0DH93DZ, 0DH94DZ, 0DH97DZ, 0DH98DZ, 0DHA0DZ, 0DHA3DZ, 0DHA4DZ, 0DHA7DZ, 0DHA8DZ, 0DHB0DZ, 0DHB3DZ, 0DHB4DZ, 0DHB7DZ, 0DHB8DZ, 0DHE0DZ, 0DHE3DZ, 0DHE4DZ, 0DHE7DZ, 0DHE8DZ, 0DHP0DZ, 0DHP3DZ, 0DHP4DZ, 0DHP7DZ and 0DHP8DZ.

Appendix H: Colon Current Procedural Terminology Codes

The following Current Procedural Terminology codes were used for the colon cancer screening marketing campaign: 44388, 44389, 44391, 44392, 44393, 44394, 44395, 44396 and 44397.

Appendix I: Lung International Classification of Diseases Procedure Code

The following International Classification of Diseases, Ninth Revision procedure code was used for the lung cancer screening marketing campaign: 87.41.

Appendix J: Lung International Classification of Diseases, 10th Revision Diagnosis Codes

The following International Classification of Diseases, 10th Revision diagnosis codes were used for the lung cancer screening marketing campaign: F17.200, Z87.891, Z72.0 and Z71.6.

Appendix K: Lung International Classification of Diseases, 10th Revision Diagnosis Codes

The following International Classification of Diseases, 10th Revision diagnosis codes were used for the lung screening marketing campaign: R91.8, R91.1, BB2400Z, BB240ZZ, BB2410Z, BB241ZZ, BB24Y0, BB24YZZ, BB24ZZZ, BP2W0ZZ, BP2W1ZZ and BP2WYZZ.

Appendix L: Lung International Classification of Diseases, 10th Revision Procedure Codes

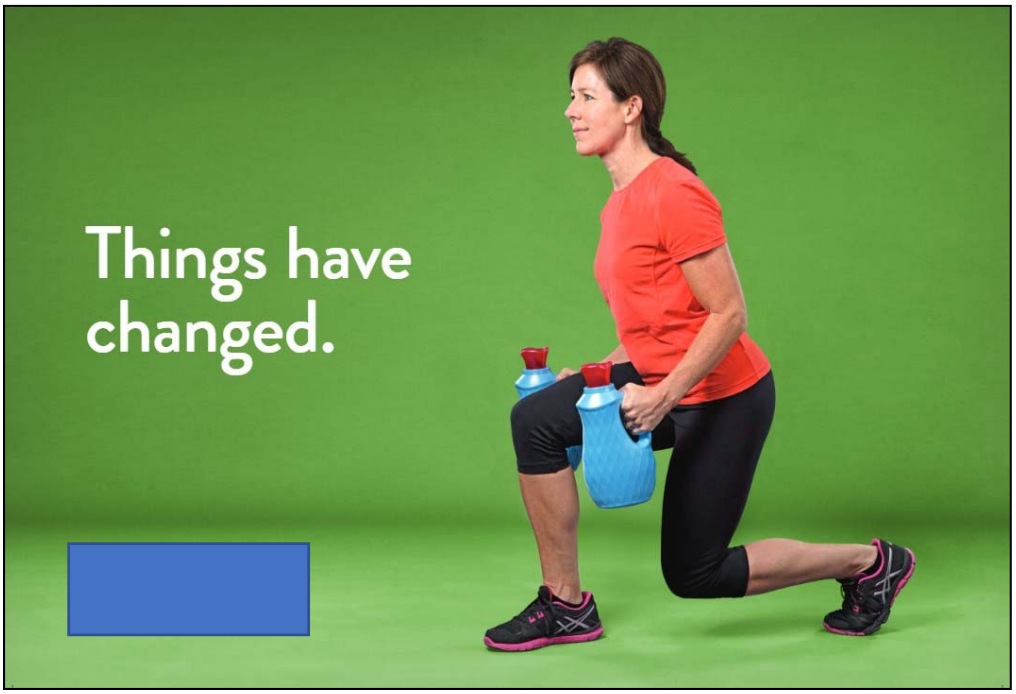
The following International Classification of Diseases, 10th Revision procedure codes were used for the lung screening marketing campaign: C34.90 and Z12.2.

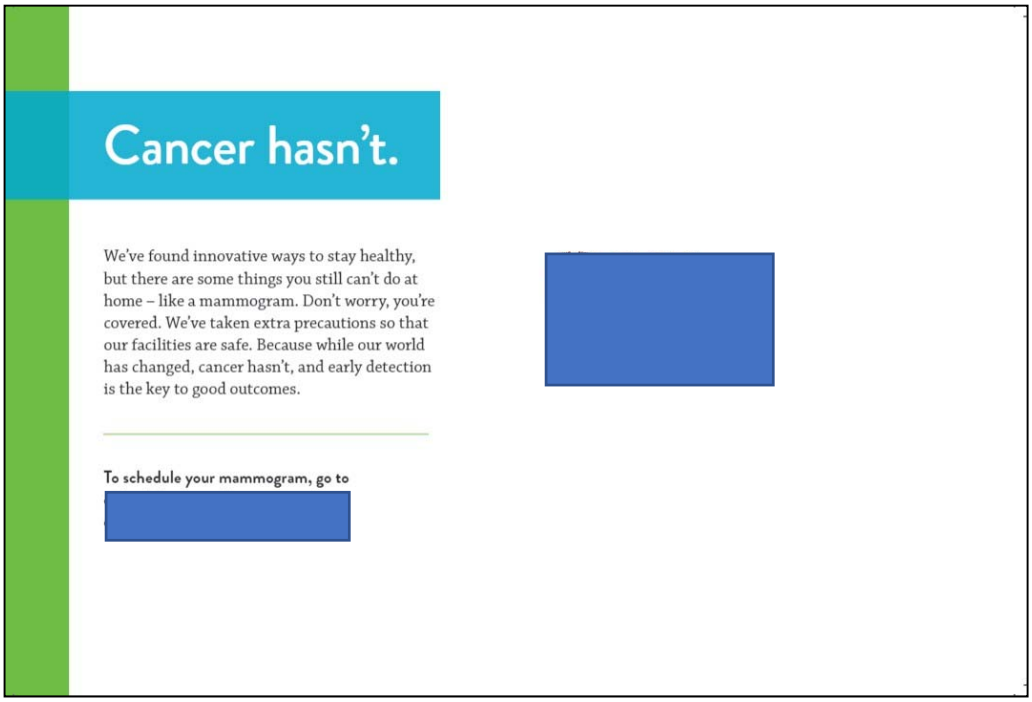
Appendix M: Lung Current Procedural Terminology Codes

The following Current Procedural Terminology codes were used for the lung screening marketing campaign: 71250, S8032, G0296 and G0297.

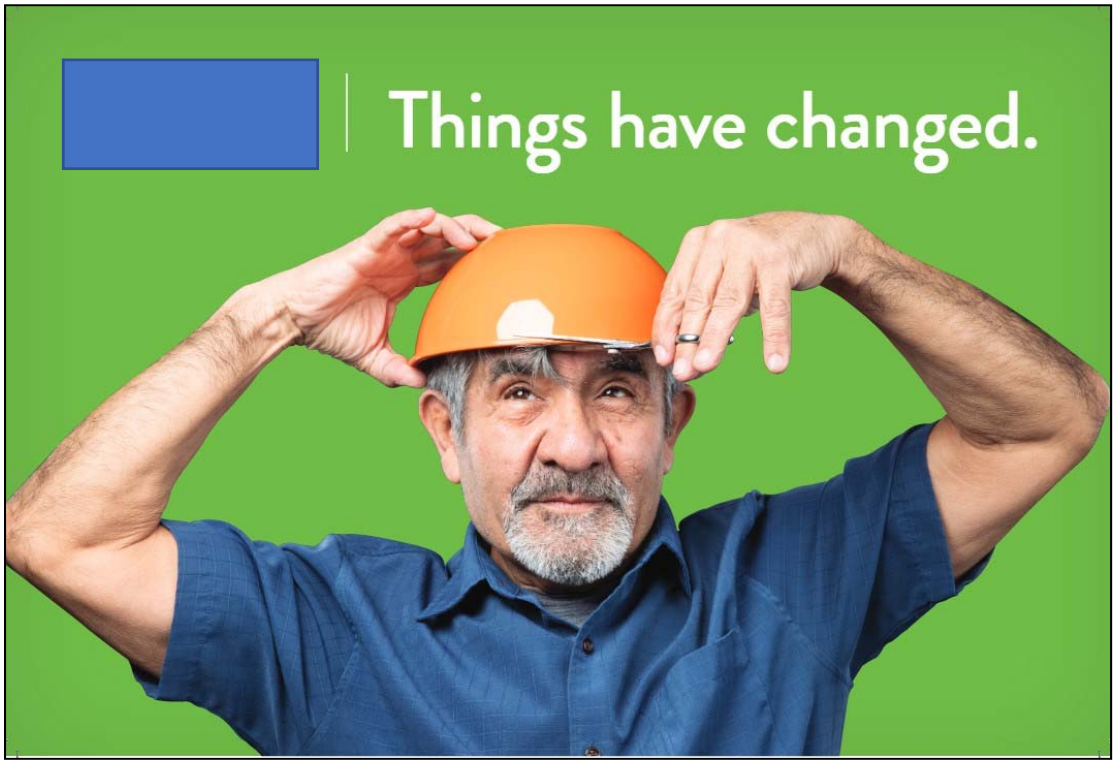
Appendix N: Creative Examples

Mammography Direct Mail (front and back)

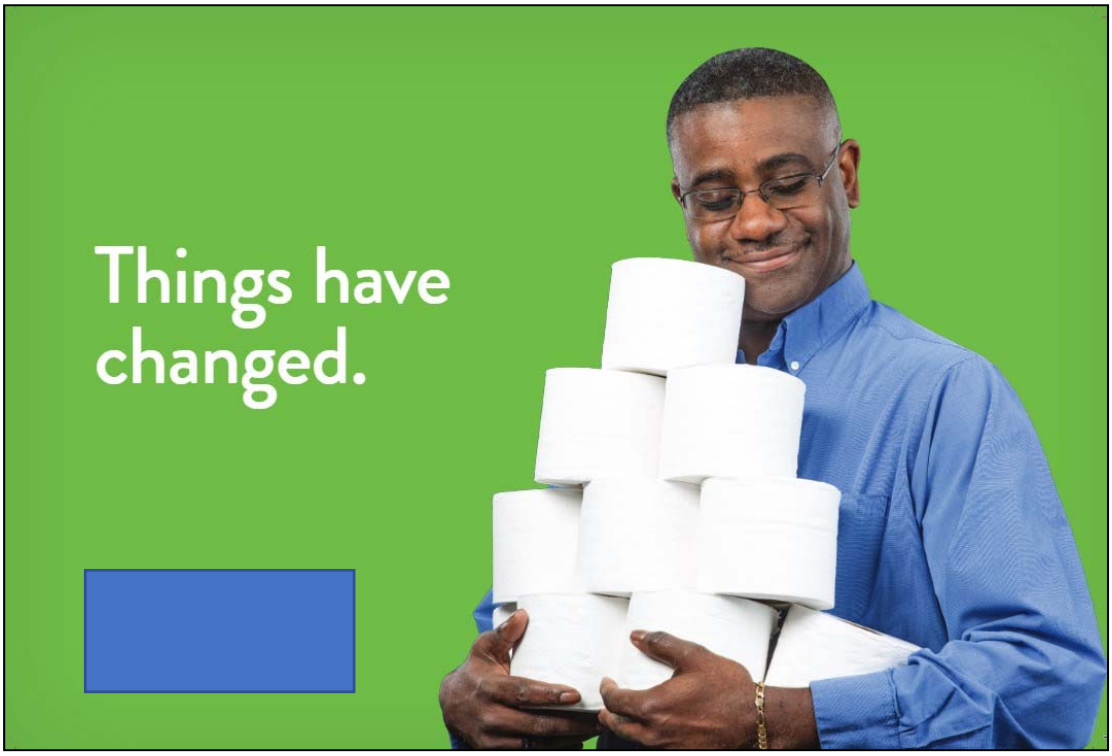




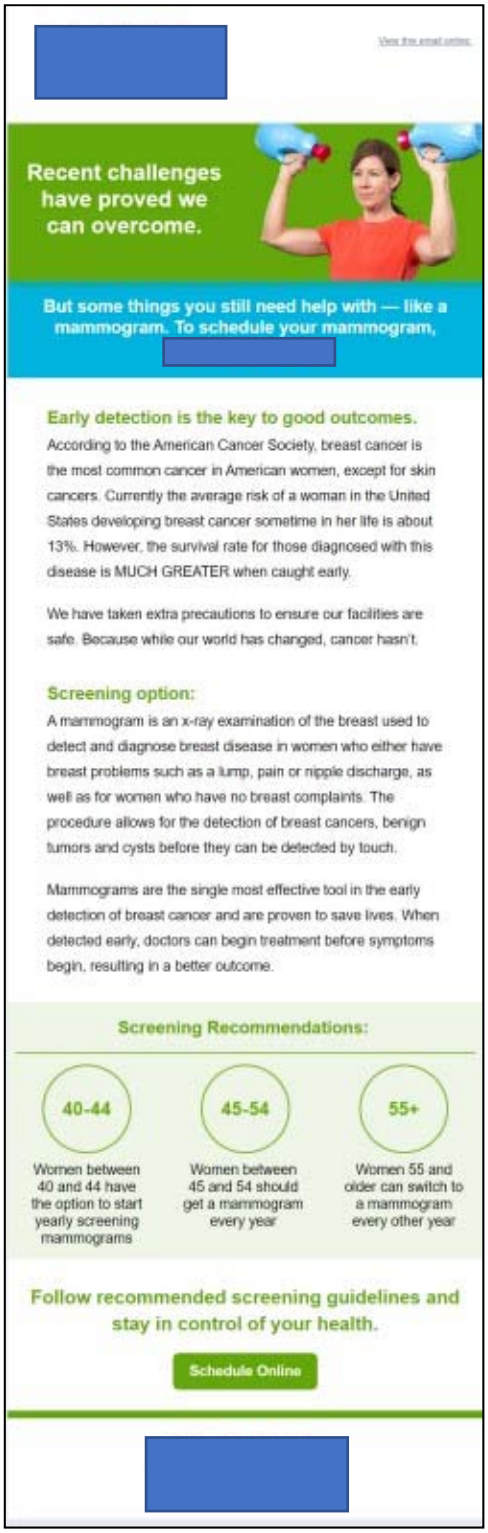
Colon Screening Direct Mail (front and back)



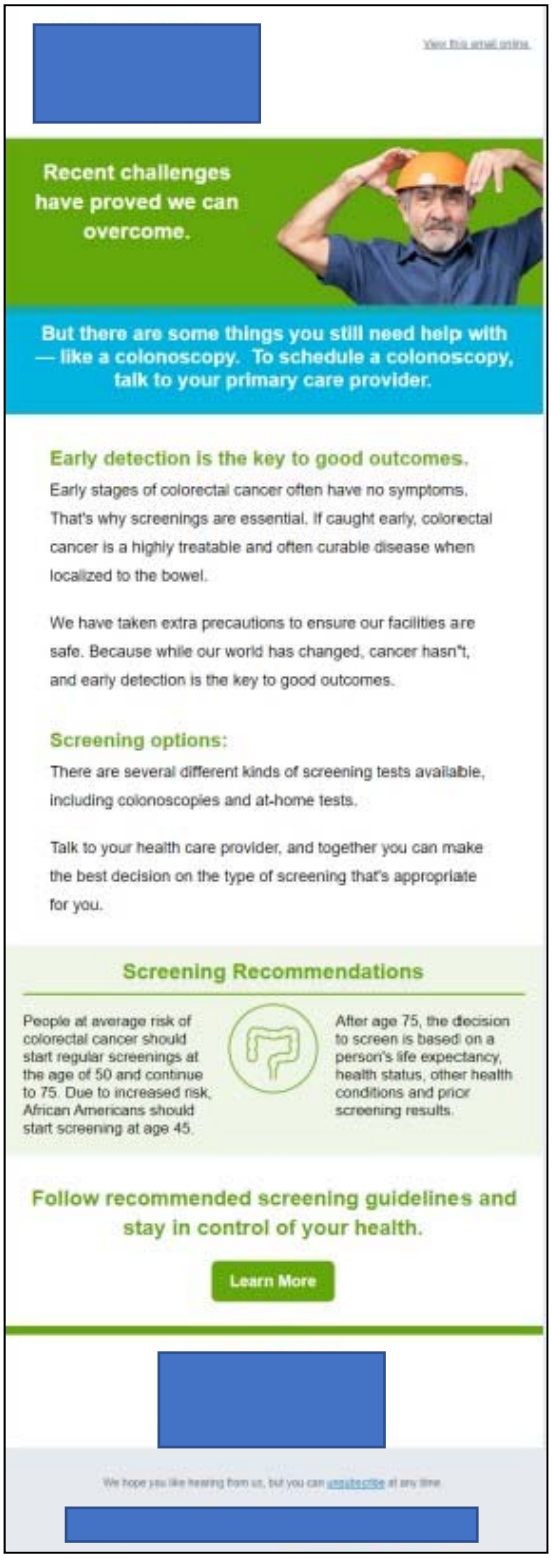
Lung Cancer Screening Direct Mail (front and back)



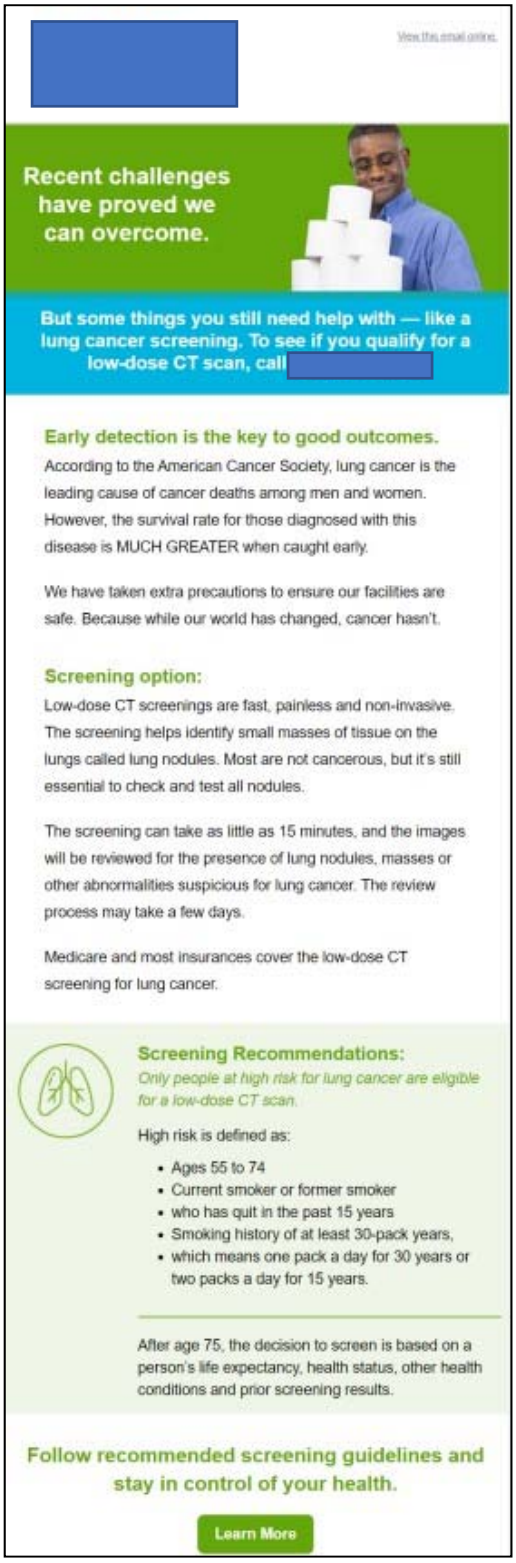
Breast Cancer Screening Email



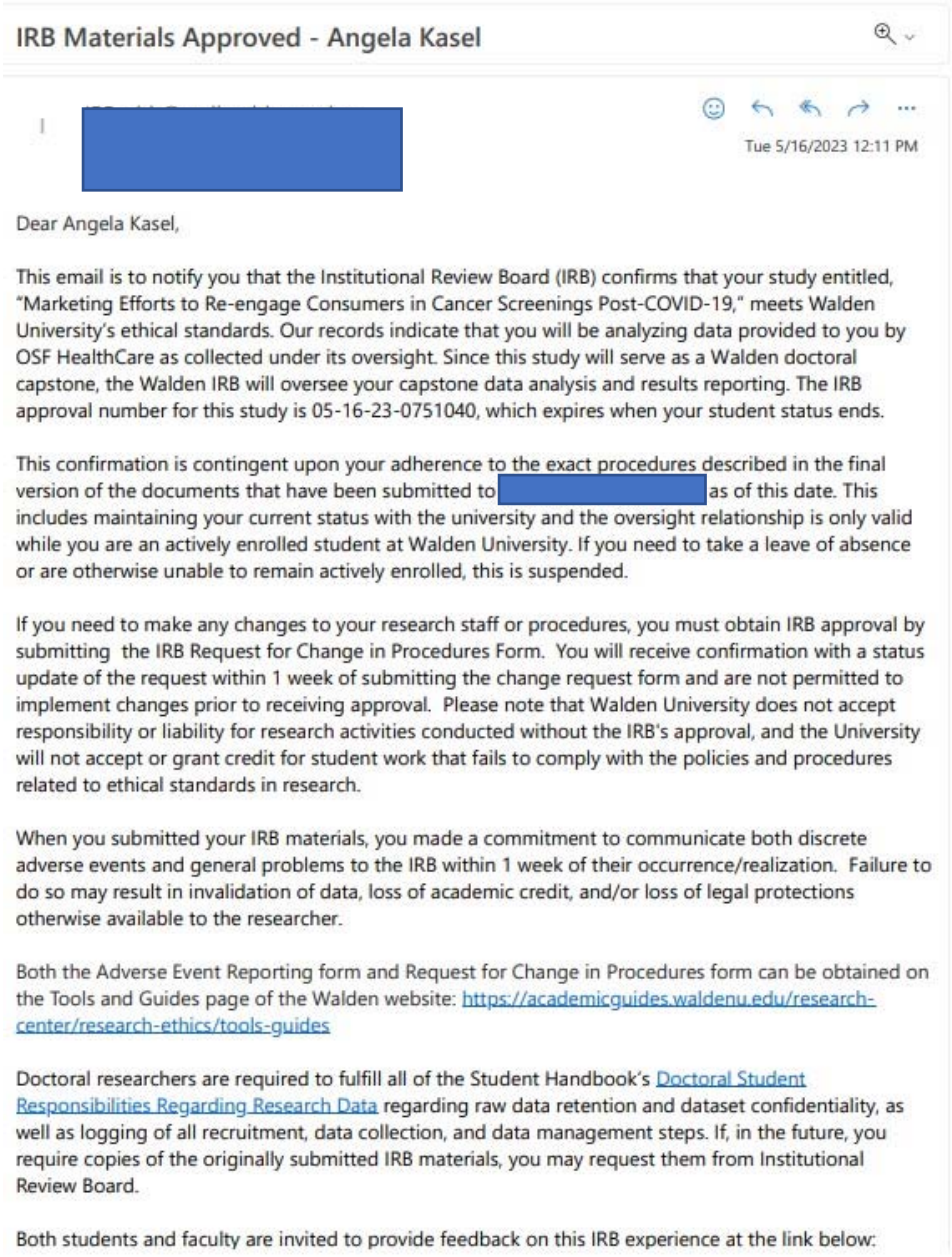
Colon Cancer Screening Email



Lung Cancer Screening Email



Appendix O: Institutional Review Board Approvals



IRB Materials Approved - Angela Kasel

[redacted]

Tue 5/16/2023 12:11 PM

Dear Angela Kasel,

This email is to notify you that the Institutional Review Board (IRB) confirms that your study entitled, "Marketing Efforts to Re-engage Consumers in Cancer Screenings Post-COVID-19," meets Walden University's ethical standards. Our records indicate that you will be analyzing data provided to you by OSF HealthCare as collected under its oversight. Since this study will serve as a Walden doctoral capstone, the Walden IRB will oversee your capstone data analysis and results reporting. The IRB approval number for this study is 05-16-23-0751040, which expires when your student status ends.

This confirmation is contingent upon your adherence to the exact procedures described in the final version of the documents that have been submitted to [redacted] as of this date. This includes maintaining your current status with the university and the oversight relationship is only valid while you are an actively enrolled student at Walden University. If you need to take a leave of absence or are otherwise unable to remain actively enrolled, this is suspended.

If you need to make any changes to your research staff or procedures, you must obtain IRB approval by submitting the IRB Request for Change in Procedures Form. You will receive confirmation with a status update of the request within 1 week of submitting the change request form and are not permitted to implement changes prior to receiving approval. Please note that Walden University does not accept responsibility or liability for research activities conducted without the IRB's approval, and the University will not accept or grant credit for student work that fails to comply with the policies and procedures related to ethical standards in research.

When you submitted your IRB materials, you made a commitment to communicate both discrete adverse events and general problems to the IRB within 1 week of their occurrence/realization. Failure to do so may result in invalidation of data, loss of academic credit, and/or loss of legal protections otherwise available to the researcher.

Both the Adverse Event Reporting form and Request for Change in Procedures form can be obtained on the Tools and Guides page of the Walden website: https://academicguides.waldenu.edu/research-center/research-ethics/tools-guides

Doctoral researchers are required to fulfill all of the Student Handbook's Doctoral Student Responsibilities Regarding Research Data regarding raw data retention and dataset confidentiality, as well as logging of all recruitment, data collection, and data management steps. If, in the future, you require copies of the originally submitted IRB materials, you may request them from Institutional Review Board.

Both students and faculty are invited to provide feedback on this IRB experience at the link below:

FWA 00005172

IRB #00000688
IRB #00000689

DATE:	March 15, 2023
TO:	Angela Kasel , Doctorate of Healthcare Administration
FROM:	University of Illinois College of Medicine at Peoria IRB 1
STUDY TITLE:	[2018370-1] Marketing Efforts to Re-engage Consumers in Cancer Screenings Post-COVID-19
IRB REFERENCE #:	
SUBMISSION TYPE:	New Project - OSF Ministry
ACTION:	DETERMINATION OF NOT HUMAN SUBJECTS RESEARCH
DECISION DATE:	March 15, 2023

Thank you for your submission of New Project materials for this research study. University of Illinois College of Medicine at Peoria IRB 1 has determined this project does not meet the definition of human subjects research under the purview of the IRB according to federal regulations.

We will put a copy of this correspondence on file in our office.

Appendix P: Breast International Classification of Diseases, Ninth and 10th Revisions Diagnosis Codes

The following diagnosis codes were used in analysis of the breast cancer screening marketing campaign:

C4A.59 Merkel cell carcinoma of skin of breast

C50.011 Malignant neoplasm: Nipple and areola, female, right breast

C50.012 Malignant neoplasm: Nipple and areola, female, left breast

C50.019 Malignant neoplasm: Nipple and areola, female, unspecified breast

C50.021 Malignant neoplasm: Nipple and areola, male, right breast

C50.022 Malignant neoplasm: Nipple and areola, male, left breast

C50.029 Malignant neoplasm: Nipple and areola, male, unspecified breast

C50.111 Malignant neoplasm: Central portion of breast, female, right breast

C50.112 Malignant neoplasm: Central portion of breast, female, left breast

C50.119 Malignant neoplasm: Central portion of breast, female, unspecified breast

C50.121 Malignant neoplasm: Central portion of breast, male, right breast

C50.122 Malignant neoplasm: Central portion of breast, male, left breast

C50.129 Malignant neoplasm: Central portion of breast, male, unspecified breast

C50.211 Malignant neoplasm: Upper-inner quadrant of breast, female, right breast

C50.212 Malignant neoplasm: Upper-inner quadrant of breast, female, left breast

C50.219 Malignant neoplasm: Upper-inner quadrant of breast, female, unspecified breast

C50.221 Malignant neoplasm: Upper-inner quadrant of breast, male, right breast

C50.222 Malignant neoplasm: Upper-inner quadrant of breast, male, left breast

C50.229 Malignant neoplasm: Upper-inner quadrant of breast, male, unspecified breast

C50.311 Malignant neoplasm: Lower-inner quadrant of breast, female, right breast

C50.312 Malignant neoplasm: Lower-inner quadrant of breast, female, left breast

C50.319 Malignant neoplasm: Lower-inner quadrant of breast, female, unspecified breast

C50.321 Malignant neoplasm: Lower-inner quadrant of breast, male, right breast

C50.322 Malignant neoplasm: Lower-inner quadrant of breast, male, left breast

C50.329 Malignant neoplasm: Lower-inner quadrant of breast, male, unspecified breast

C50.411 Malignant neoplasm: Upper-outer quadrant of breast, female, right breast

C50.412 Malignant neoplasm: Upper-outer quadrant of breast, female, left breast

C50.419 Malignant neoplasm: Upper-outer quadrant of breast, female, unspecified breast

C50.421 Malignant neoplasm: Upper-outer quadrant of breast, male, right breast

C50.422 Malignant neoplasm: Upper-outer quadrant of breast, male, left breast

C50.429 Malignant neoplasm: Upper-outer quadrant of breast, male, unspecified breast

C50.511 Malignant neoplasm: Lower-outer quadrant of breast, female, right breast

C50.512 Malignant neoplasm: Lower-outer quadrant of breast, female, left breast

C50.519 Malignant neoplasm: Lower-outer quadrant of breast, female, unspecified breast

C50.521 Malignant neoplasm: Lower-outer quadrant of breast, male, right breast

C50.522 Malignant neoplasm: Lower-outer quadrant of breast, male, left breast

C50.529 Malignant neoplasm: Lower-outer quadrant of breast, male, unspecified breast

C50.611 Malignant neoplasm: Axillary tail of breast, female, right breast

C50.612 Malignant neoplasm: Axillary tail of breast, female, left breast

C50.619 Malignant neoplasm: Axillary tail of breast, female, unspecified breast

C50.621 Malignant neoplasm: Axillary tail of breast, female, right breast

C50.622 Malignant neoplasm: Axillary tail of breast, female, left breast

C50.629 Malignant neoplasm: Axillary tail of breast, female, unspecified breast

C50.811 Malignant neoplasm: Overlapping lesion of breast, female, right breast

C50.812 Malignant neoplasm: Overlapping lesion of breast, female, left breast

C50.819 Malignant neoplasm: Overlapping lesion of breast, female, unspecified breast

C50.821 Malignant neoplasm: Overlapping lesion of breast, male, right breast

C50.822 Malignant neoplasm: Overlapping lesion of breast, male, left breast

C50.829 Malignant neoplasm: Overlapping lesion of breast, male, unspecified breast

C50.911 Malignant neoplasm: Breast, unspecified, female, right breast

C50.912 Malignant neoplasm: Breast, unspecified, female, left breast

C50.919 Malignant neoplasm: Breast, unspecified, female, unspecified breast

C50.911 Malignant neoplasm: Breast, unspecified, male, right breast

C50.912 Malignant neoplasm: Breast, unspecified, male, left breast

C50.919 Malignant neoplasm: Breast, unspecified, male, unspecified breast

C79.81 Secondary malignant neoplasm of breast

D04.5 Carcinoma in situ of skin of trunk (breast)

D03.52 Melanoma in situ of breast (skin) (soft tissue)

D05.00 Lobular carcinoma in situ of unspecified breast

D05.01 Lobular carcinoma in situ of right breast

D05.02 Lobular carcinoma in situ of left breast

D05.10 Intraductal carcinoma in situ of unspecified breast

D05.11 Intraductal carcinoma in situ of right breast

D05.12 Intraductal carcinoma in situ of left breast

D05.80 Other specified type of carcinoma in situ of unspecified breast

D05.81 Other specified type of carcinoma in situ of right breast

D05.82 Other specified type of carcinoma in situ of left breast

D09.90 Unspecified type of carcinoma in situ of unspecified breast

D09.91 Unspecified type of carcinoma in situ of right breast

D09.92 Unspecified type of carcinoma in situ of left breast

Z80.3 Family history of malignant neoplasm of breast

Z85.3 Personal history of malignant neoplasm of breast

Z86.000 Personal history of in-situ neoplasm of breast

Appendix Q: Colon International Classification of Diseases, Ninth and 10th Revisions Diagnosis Codes

The following diagnosis codes were used in analysis of the colon cancer screening marketing campaign: C18.0, C18.2, C18.3, C18.4, C18.5, C18.6, C18.7, C18.8, C18.9, C19, C20, C21.8, C78.5, C78.6, D01, D01.0, D01.1, D01.3, D01.40, D01.49, D37.4, D37.5, K63.5.

Appendix R: Lung International Classification of Diseases, Ninth and 10th Revisions Diagnosis Codes

The following diagnosis codes were used in analysis of the colon cancer screening marketing campaign:

C33 Malignant neoplasm of trachea

C34.00 Malignant neoplasm of unspecified main bronchus

C34.01 Malignant neoplasm of right main bronchus

C34.02 Malignant neoplasm of left main bronchus

C34.10 Malignant neoplasm of upper lobe, unspecified bronchus or lung

C34.11 Malignant neoplasm of upper lobe, right bronchus or lung

C34.12 Malignant neoplasm of upper lobe, left bronchus or lung

C34.2 Malignant neoplasm of middle lobe, bronchus or lung

C34.30 Malignant neoplasm of lower lobe, unspecified bronchus or lung

C34.31 Malignant neoplasm of lower lobe, right bronchus or lung

C34.32 Malignant neoplasm of lower lobe, left bronchus or lung

C34.80 Malignant neoplasm of overlapping sites of unspecified bronchus and lung

C34.81 Malignant neoplasm of overlapping sites of right bronchus and lung

C34.82 Malignant neoplasm of overlapping sites of left bronchus and lung

C34.90 Malignant neoplasm of unspecified part of unspecified bronchus or lung

C34.91 Malignant neoplasm of unspecified part of right bronchus or lung

C34.92 Malignant neoplasm of unspecified part of left bronchus or lung

C78.00 Secondary malignant neoplasm of unspecified lung

C78.01 Secondary malignant neoplasm of right lung

C78.02 Secondary malignant neoplasm of left lung

C78.1 Secondary malignant neoplasm of mediastinum

C78.2 Secondary malignant neoplasm of pleura

C78.30 Secondary malignant neoplasm of unspecified respiratory organ

C78.39 Secondary malignant neoplasm of other respiratory organs

C77.1 Intrathoracic lymph nodes

D02.20 Carcinoma in situ of unspecified bronchus and lung

D02.21 Carcinoma in situ of right bronchus and lung

D02.22 Carcinoma in situ of left bronchus and lung

D02.3 Carcinoma in situ of other parts of respiratory system

D02.4 Carcinoma in situ of respiratory system, unspecified

C46.50 Kaposi's sarcoma of unspecified lung

C46.51 Kaposi's sarcoma of right lung

C46.52 Kaposi's sarcoma of left lung

C46.9 Kaposi's sarcoma, unspecified

Z80.1 Family history of malignant neoplasm of trachea, bronchus and lung

Z80.2 Family history of malignant neoplasm of other respiratory and intrathoracic organs

Z85.110 Personal history of malignant neoplasm of trachea, bronchus and lung

Z85.118 Personal history of other malignant neoplasm of bronchus and lung

Z85.12 Personal history of malignant neoplasm of trachea

Z85.2 Personal history of malignant neoplasm of other respiratory and intrathoracic organs

Z85.20 Personal history of malignant neoplasm of unspecified respiratory organ

Z85.29 Personal history of malignant neoplasm of other respiratory and intrathoracic organs

Appendix S: Urban Market Zip Codes

City	State	Zip
Oak Lawn	IL	60453
Hometown	IL	60456
Bedford Park	IL	60459
Burbank	IL	60459
Chicago	IL	60619
Chicago	IL	60620
Chicago	IL	60628
Chicago	IL	60629
Chicago	IL	60636
Chicago	IL	60643
Chicago	IL	60652
Chicago	IL	60655
Merrionette Park	IL	60803
Alsip	IL	60803
Evergreen Park	IL	60805

Note. This table shows the zip codes for the Evergreen Park, Illinois market.

Appendix T: Suburban Market Zip Codes

Table T1

Bloomington Zip Codes

City	State	Zip
Dana	IL	61321
Rutland	IL	61358
Bloomington	IL	61701
Bloomington	IL	61704
Bloomington	IL	61705
Anchor	IL	61720
Arrowsmith	IL	61722
Carlock	IL	61725
Chenoa	IL	61726
Clinton	IL	61727
Colfax	IL	61728
Cooksville	IL	61730
Cropsey	IL	61731
Danvers	IL	61732
Dewitt	IL	61735
Holder	IL	61736
Downs	IL	61736
Ellsworth	IL	61737
Panola	IL	61738
El Paso	IL	61738
Kappa	IL	61738
Gridley	IL	61744
Heyworth	IL	61745
Hudson	IL	61748
Kenney	IL	61749
Lane	IL	61750
Le Roy	IL	61752
Lexington	IL	61753
Mc Lean	IL	61754
Minonk	IL	61760
Normal	IL	61761

Saybrook	IL	61770
Shirley	IL	61772
Stanford	IL	61774
Towanda	IL	61776
Wapella	IL	61777
Waynesville	IL	61778
Farmer City	IL	61842
Weldon	IL	61882

Note. This table shows the zip codes for the Bloomington, Illinois market.

Table T2

Danville Zip Codes

City	**State**	**Zip**
Cayuga	IN	47928
Covington	IN	47932
Kingman	IN	47952
Mellott	IN	47958
Perrysville	IN	47974
State Line	IN	47982
Veedersburg	IN	47987
West Lebanon	IN	47991
Williamsport	IN	47993
Hoopeston	IL	60942
Clarence	IL	60960
Rankin	IL	60960
Rossville	IL	60963
Allerton	IL	61810
Alvin	IL	61811
Armstrong	IL	61812
Bismarck	IL	61814
Catlin	IL	61817
Collison	IL	61831
Danville	IL	61832
Tilton	IL	61833
Danville	IL	61834

Fairmount	IL	61841
Fithian	IL	61844
Georgetown	IL	61846
Henning	IL	61848
Indianola	IL	61850
Indianola	IL	61850
Muncie	IL	61857
Oakwood	IL	61858
Potomac	IL	61865
Ridge Farm	IL	61870
Sidell	IL	61876
Westville	IL	61883

Note. This table shows the zip codes for the Danville, Illinois market.

Table T3

Peoria Zip Codes

City	**State**	**Zip**
Toluca	IL	61369
Varna	IL	61375
Bradford	IL	61421
Castleton	IL	61426
Cuba	IL	61427
Ellisville	IL	61431
Fairview	IL	61432
Fiatt	IL	61433
La Fayette	IL	61449
Laura	IL	61451
Marietta	IL	61459
Smithfield	IL	61477
Speer	IL	61479
Toulon	IL	61483
Wyoming	IL	61491
Benson	IL	61516
Brimfield	IL	61517
Bryant	IL	61519

Canton	IL	61520
Chillicothe	IL	61523
Dunfermline	IL	61524
Dunlap	IL	61525
Edelstein	IL	61526
Edwards	IL	61528
Elmwood	IL	61529
Eureka	IL	61530
Farmington	IL	61531
Glasford	IL	61533
Green Valley	IL	61534
Groveland	IL	61535
Hanna City	IL	61536
Henry	IL	61537
Kingston Mines	IL	61539
Lacon	IL	61540
La Rose	IL	61541
London Mills	IL	61544
Cazenovia	IL	61545
Lowpoint	IL	61545
Manito	IL	61546
Mapleton	IL	61547
Metamora	IL	61548
Germantown Hills	IL	61548
Morton	IL	61550
Mossville	IL	61552
North Pekin	IL	61554
Marquette Heights	IL	61554
Pekin	IL	61554
Pekin	IL	61555
Princeville	IL	61559
Roanoke	IL	61561
Rome	IL	61562
Saint David	IL	61563
South Pekin	IL	61564
Sparland	IL	61565
Hopewell	IL	61565

Sparland	IL	61565
Tremont	IL	61568
Trivoli	IL	61569
Washburn	IL	61570
Washington	IL	61571
Peoria	IL	61601
Peoria	IL	61602
Peoria	IL	61603
Peoria	IL	61604
Bellevue	IL	61604
Peoria	IL	61605
Peoria	IL	61606
Bartonville	IL	61607
Creve Coeur	IL	61610
East Peoria	IL	61611
Spring Bay	IL	61611
Peoria	IL	61612
Peoria	IL	61614
Peoria	IL	61615
Peoria Heights	IL	61616
Peoria	IL	61650
Armington	IL	61721
Congerville	IL	61729
Deer Creek	IL	61733
Delavan	IL	61734
Goodfield	IL	61742
Hopedale	IL	61747
Mackinaw	IL	61755
Minier	IL	61759
Secor	IL	61771

Note. This table shows the zip codes for the Peoria, Illinois market.

Table T4

Rockford Zip Codes

City	State	Zip
Beloit	WI	53511
Clinton	WI	53525
Creston	IL	60113
Esmond	IL	60129
Kirkland	IL	60146
Belvidere	IL	61008
Caledonia	IL	61011
Cherry Valley	IL	61016
Davis Junction	IL	61020
Garden Prairie	IL	61038
Lindenwood	IL	61049
Monroe Center	IL	61052
Poplar Grove	IL	61065
Kings	IL	61068
Rochelle	IL	61068
Rockton	IL	61072
Roscoe	IL	61073
South Beloit	IL	61080
Rockford	IL	61101
Rockford	IL	61102
Machesney Park	IL	61103
Rockford	IL	61103
Rockford	IL	61104
Rockford	IL	61105
Rockford	IL	61106
Rockford	IL	61107
Rockford	IL	61108
Rockford	IL	61109
Machesney Park	IL	61111
Loves Park	IL	61111
Rockford	IL	61114
Machesney Park	IL	61115
Rockford	IL	61125

Rockford	IL	61126
Loves Park	IL	61130
Loves Park	IL	61132

Note. This table shows the zip codes for the Rockford, Illinois market.

Table T5

Urbana Zip Codes

City	**State**	**Zip**
Gibson City	IL	60936
Loda	IL	60948
Ludlow	IL	60949
Melvin	IL	60952
Paxton	IL	60957
Roberts	IL	60962
Sibley	IL	61773
Urbana	IL	61801
Urbana	IL	61802
Urbana	IL	61803
Bondville	IL	61815
Broadlands	IL	61816
Champaign	IL	61820
Champaign	IL	61821
Champaign	IL	61822
Dewey	IL	61840
Fisher	IL	61843
Foosland	IL	61845
Gifford	IL	61847
Homer	IL	61849
Ivesdale	IL	61851
Longview	IL	61852
Mahomet	IL	61853
Ogden	IL	61859
Penfield	IL	61862
Pesotum	IL	61863
Philo	IL	61864

Rantoul	IL	61866
Royal	IL	61871
Sadorus	IL	61872
Saint Joseph	IL	61873
Savoy	IL	61874
Seymour	IL	61875
Sidney	IL	61877
Thomasboro	IL	61878
Tolono	IL	61880

Note. This table shows the zip codes for the Urbana, Illinois market.

Appendix U: Rural Market Zip Codes

Table U1

Alton, Illinois Zip Codes

City	State	Zip
Alton	IL	62002
Bethalto	IL	62010
Brighton	IL	62012
Cottage Hills	IL	62018
Dow	IL	62022
East Alton	IL	62024
Elsah	IL	62028
Godfrey	IL	62035
Grafton	IL	62037
Hartford	IL	62048
Jerseyville	IL	62052
Otterville	IL	62037
Piasa	IL	62079
Roxana	IL	62084
South Roxana	IL	62087
Wood River	IL	62095

Note. This table shows the zip codes for the Alton, Illinois market.

Table U2

Mendota Zip Codes

City	State	Zip
Compton	IL	61318
Mendota	IL	61342
Paw	IL	61353
Sublette	IL	61367
Triumph	IL	61371
West Brooklyn	IL	61378

Note. This table shows the zip codes for the Mendota, Illinois market.

Table U3

Ottawa Zip Codes

City	State	Zip
Ransom	IL	60470
Earlville	IL	60518
Serena	IL	60549
Wedron	IL	60557
La Salle	IL	61301
Grand Ridge	IL	61325
Lostant	IL	61334
Marseilles	IL	61341
Oglesby	IL	61348
Ottawa	IL	61350
Peru	IL	61354
Streator	IL	61364
Tonica	IL	61370
Troy Grove	IL	61372
Utica	IL	61373
Wenona	IL	61377

Note. This table shows the zip codes for the Ottawa, Illinois market.

Table U4

Pontiac Zip Codes

City	State	Zip
Dwight	IL	60420
Odell	IL	60460
Cabery	IL	60919
Campus	IL	60920
Chatsworth	IL	60921
Cullom	IL	60929
Emington	IL	60934
Kempton	IL	60946
Piper City	IL	60959
Ancona	IL	61311

Blackstone	IL	61313
Manville	IL	61319
Cornell	IL	61319
Long Point	IL	61333
Fairbury	IL	61739
Flanagan	IL	61740
Forrest	IL	61741
Graymont	IL	61743
Pontiac	IL	61764
Saunemin	IL	61769
Strawn	IL	61775

Note. This table shows the zip codes for the Pontiac, Illinois market.

Table U5

Escanaba Zip Codes

City	**State**	**Zip**
Bark River	MI	49807
Cornell	MI	49818
Escanaba	MI	49829
Gladstone	MI	49837
Perronville	MI	49873
Powers	MI	49874
Rapid River	MI	49878
Rock	MI	49880
Spalding	MI	49886
Wells	MI	49894
Wilson	MI	49896

Note. This table shows the zip codes for the Escanaba, Michigan market.