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Increasing Colorectal Cancer (CRC) Screening in Hispanic Adults Using an Evidence-Based Social Determinants of Health-Oriented Guide for Patient Navigation

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Abstract

Colorectal cancer (CRC) is the second leading cause of cancer-related deaths in the United States. It affects over 140,000 individuals and results in over 50,000 deaths per year. It is estimated that increasing screening to 80% could potentially prevent approximately 300,000 new cases and over 200,000 deaths by 2030. Screening disparity among the Hispanic population is influenced by socio-economic and socio-cultural factors. The aim of this project was to develop a balanced scorecard (BSC), using publicly available data and research files from three databases (Behavioral Risk Factor Surveillance System [BRFSS], Texas Health Care Information Collection [THCIC], and Healthy North Texas [HNT]) to highlight the trends of social determinants of health (SDOH) that impact CRC screening, and to inform providers' decision-making in improving CRC screening rates in Hispanic adults in their efforts to contribute to achieving the Center for Disease control and Prevention (CDC)'s national goal of reducing CRC burden.

Key Findings: Approximately 85% of the Dallas County population had worse CRC screening rates than North Texas population, and the BSC highlights significant SDOH characteristics that may be contributing to this outcome.

Ethics Statement: This database project was conducted with the approval of the Graduate Nursing Review Committee (GNRC) as required by the University of Texas, Arlington. The project did not require approval from the university's internal review board; however, human subject training was completed. There are no conflicts of interest to declare in this project.

Keywords: Colorectal cancer, Colorectal cancer screening, Colorectal cancer screening in Hispanics, Colorectal cancer screening barriers, Colorectal cancer education

Increasing Colorectal Cancer (CRC) Screening in Hispanic Adults Using an Evidence-Based Social Determinants of Health-Oriented Guide for Patient Navigation

CRC is the second leading cause of cancer-related deaths in the United States (Hannon et al., 2019). It affects over 140,000 individuals and results in over 50,000 deaths per year (CDC, 2021). Approximately 94% of new cases of CRC are reported among adults 45 years and older (United States Preventive Services Task Force [USPSTF], 2021). CRC can be treated and prevented if precancerous lesions or polyps are detected early through screening (CDC, 2021). The CDC initiated the CRC control program (CRCCP) between 2009 and 2015 to promote CRC screening and increase the screening rate to at least 80% in communities across the United States (CDC, 2021; Hannon et al., 2019). During this program, free screening was offered to communities at outpatient facilities while implementing evidence-based interventions (EBIs) such as verbal education, patient reminders, provider reminders, and the limitation of structural barriers to enhance screening (Hannon et al., 2019). The focus was on increasing screening because screening is the best strategy to control the burden of CRC (CDC, 2021; USPSTF, 2021). It is estimated that increasing screening to 80% could potentially prevent approximately 300,000 new cases and over 200,000 deaths by 2030 (Hannon et al., 2019). Therefore, the USPSTF recommends routine CRC screening for adults over 45 years to control morbidity and mortality due to CRC through stool-based tests and colon visualization procedures (USPSTF, 2021).

National Healthcare Gap

Colorectal cancer screening rates are lower in Hispanics compared to non-Hispanic whites, and the death rate has decreased by 3% per year in non-Hispanic whites but only 1.5% per year in Hispanics between 2009 and 2019 (United States Cancer Statistics [USCS], 2022),

indicating a disparity. The 2020 BRFSS showed that approximately 58% of Hispanics and 70% of non-Hispanic whites are screened in the United States annually (CDC, 2021). Nationally, 58% to 67% of adults are screened by colonoscopy (CDC, 2021). Viramontes et al. (2020) found that the screening rates for Hispanics in the United States were 53.4 % (n = 12,395) and 70.4% (n = 186,331) for non-Hispanic whites ($p < 0.001$).

State Healthcare Gap

Texas is one of the states in the United States with the highest ethnic screening disparities (Viramontes et al., 2020), and Hispanics represent over 40% of its population (United States Census Bureau [USCB], 2023). Approximately 70% of eligible adults in Texas fully met USPSTF CRC recommendations in 2020: N = 2764 (CDC, 2021). The average percentage of adults in Texas screened by colonoscopy in 2020 is 50% (CDC, 2021). Approximately 60% of non-Hispanic whites and 38% of Hispanics in Texas were screened by colonoscopy in 2020 (CDC, 2021). For trends in actual CRC screening services at the state level, administrative claims data from Texas Health and Human Services (2022) were used. In analysis of Texas patient encounters in outpatient setting, it was noted that the average percentage of Hispanics screened for CRC between 2021 and 2022 in Texas was less than 20% (see Figure 1).

Local Healthcare Gap

In review of CRC screening at the local level, about 68% of the total population in Dallas fully met screening recommendations in 2020 (CDC, 2021). Non-English speakers represent approximately 43% of the entire Dallas population including approximately 35% Spanish speakers (USCB, 2023). Once again, for trends in actual CRC screening services at the local level, administrative claims data from Texas Health and Human Services (2022) were used. In analysis of Dallas County patient encounters in outpatient settings, it was noted that an average

of less than 16% of Hispanics were screened for CRC in Dallas County, indicating a screening gap (see Figure 2).

Significance of the Gap

Healthcare knowledge deficits resulting from language barriers are partly responsible for the screening disparity shown in Figures 1 and 2 (Mojica et al., 2018; Viramontes et al., 2020). Hispanics are a fast-growing population in the United States, and language barriers represent a significant social determinant of health, affecting healthcare access, socioeconomic factors, and sociocultural factors, and contributing significantly to the CRC screening disparity documented in this population (Mojica et al., 2018; Viramontes et al., 2020). Researchers recommend culturally tailored patient navigation, including language-appropriate education, to improve and close the screening gap in this population (Mojica et al., 2018; Viramontes et al., 2020).

Literature Review

Colorectal Cancer (CRC)

CRC involves abnormal cell growth in the colon or rectum that can turn into cancer over time (CDC, 2023). Screening tests are available for detecting abnormal cell growths (polyps) to allow for early removal before they progress into cancer (CDC, 2023). Risk factors are mostly modifiable, including obesity, inactivity, low-fiber and high-fat diets, alcohol use, and tobacco use (CDC, 2023; Gonzales et al., 2012).

Over the years, CRC has placed significant health and financial burdens on various communities worldwide, with one in three individuals developing precancerous lesions in their lifetime (Hamdan et al., 2021). In the United States, CRC is ranked as the second leading cause of cancer-related deaths, affecting over 140,000 persons per year, resulting in over 50,000 deaths per year (CDC, 2021). According to the National Center for Chronic Disease Prevention and

Health Promotion (NCCDPHP, 2022), the cost of colorectal cancer care is ranked the second highest of any cancer and accounts for 12.6% of all cancer care costs; it also accounts for $24.3 billion of total annual medical costs in 2020. Colorectal cancer is prevalent among adults over 50 years of age, with increasing age contributing to increased incidence and mortality rates among this age group (CDC, 2022). Although CRC results in high mortality, it can be treated and prevented if precancerous lesions or polyps are detected early through screening (CDC, 2021).

Screening Disparities

The USPSTF recommends routine evidence-based screening for adults aged > 45 years, with stool-based tests (e.g. fecal immunochemical test [FIT] and fecal occult blood test [FOBT]) or colon visualization tests (e.g. colonoscopy and sigmoidoscopy) (USPSTF, 2021). Even though CRC screening recommendations are in place and offered to targeted populations, Spanish-speaking Hispanics have lower screening rates than non-Hispanic whites, resulting in a screening disparity (DeGroff et al., 2018; Mojica et al., 2018; Viramontes et al., 2020). Less than 20% of Hispanics in Texas and less than 16% in Dallas County were screened for CRC between 2021 and 2022 (Figures 1 and 2).

Evidence-Based Screening

The CDC initiated a colorectal cancer control program (CRCCP) between 2009 and 2015 to increase screening rates to at least 80% among eligible adults in communities across the United States (CDC, 2021; Hannon et al., 2019). In this program, five evidence-based interventions (EBIs) have been adopted and used along with CRC screening (CDC, 2021; Hannon et al., 2019). The five EBIs were categorized as client-oriented or provider-oriented interventions (Hannon et al., 2019; Maxwell et al., 2022; Sharma et al., 2021). Client-oriented interventions involve not only small media education using videos, printed materials, posters,

and brochures but also patient navigation which involves support to eliminate screening barriers using verbal one-on-one patient education and reminders through phone calls and text messages (Hannon et al., 2019; Maxwell et al., 2022; Sharma et al., 2021). Removal of structural barriers to screening was categorized under client-oriented intervention as less invasive tests such as FIT and FOBT were offered to patients rather than colonoscopy or other colon visualization tests (Maxwell et al., 2022; Sharma et al., 2021). This intervention influenced screening, as patients found it to be less invasive and preferred stool-based tests for colonoscopy (Mojica et al., 2018). Provider-oriented interventions, which were found to be more complex and less utilized, involved electronic (via patient charts in electronic medical records or e-mails) reminders for providers to recommend screening and assessment and screening feedback for providers who recommend screening (Hannon et al., 2019; Maxwell et al., 2022; Sharma et al., 2021). Generally, client-oriented interventions were found to be more accessible and utilized than provider-oriented interventions; small media education and reminders were easy and the most consistently used interventions that influenced increased screening rates (Hannon et al., 2019; Maxwell et al., 2022; Sharma et al., 2021). Following the evaluation of the effectiveness of EBIs, researchers have found that increasing screening prevalence to 80% in eligible adults can reduce the number of new CRC cases by 22% and the number of CRC-related deaths by 33% by 2030 (NCCDPHP, 2022). Increased CRC screening could also reduce healthcare costs by $ 14 billion by 2050 (NCCDPHP, 2022).

Barriers to Screening

There is not one effective intervention to improve screening; however, since the CDC's CRCCP initiation, many researchers have used similar EBIs, particularly education and screening in different studies to increase screening rates in non-English speaking populations

(Mojica et al., 2018; Viramontes et al., 2020). Evidence-based interventions are associated with increased CRC screening; however, there is insufficient evidence to substantiate the effectiveness of each EBI because they are usually used together or simultaneously with other EBIs to potentiate increased screening rates (Maxwell et al., 2022). It is also unclear whether the implementation of existing, modified, or enhanced EBIs, and new EBIs account for changes in screening rates and the extent to which CRC outcomes are impacted (Hannon et al., 2013; Sharma et al., 2021). Following a patient chart review and self-report surveys to obtain the screening completion status of patients who were offered CRC screening tests, Mojica et al. (2018) and Viramontes et al. (2020) attributed screening disparity among Hispanics to limited healthcare access due to low health literacy and a lack of knowledge about CRC, mostly due to language barriers that represent a component of the SDOH for this population. In studies involving interviews and phone surveys to assess and understand CRC screening barriers, researchers found that the cost of screening, fear of diagnosis, and other SDOH related to socioeconomic and sociocultural factors contributed to screening disparities among Hispanics (Byrd et al., 2019; Wang et al., 2013).

Social Determinants of Health

The SDOH of people represents all environmental factors that influence their health and quality of life (Healthy People 2030). These factors are categorized into five main domains: 1. Economic stability 2. Educational access and quality 3. Healthcare access and quality 4. Neighborhoods and built environment 5. Social and community context (see Figure 3). Mitigating screening disparities involves addressing SDOH by implementing evidence-based patient-tailored navigation to improve screening rates (Mojica et al., 2018; Sanchez et al., 2013). In some studies, researchers used interviews and self-report surveys to determine that education

is a significant screening-facilitating factor, as it increases awareness of CRC and screening benefits, allays screening fears, and influences willingness to screen (Byrd et al., 2019; Tong et al., 2017; Wang et al., 2013). The elimination of structural barriers to screening by offering or recommending less invasive tests, such as stool-based tests instead of colon visualization options has been found to complement education and other EBIs in improving screening access and screening rates (Hannon et al., 2019; Maxwell et al., 2022; Mojica et al., 2018). Developing an SDOH-based balanced scorecard that reflects health equity indices and key variables across the five domains of the SDOH framework can positively impact screening rates in the Hispanic population (Terhaar, 2021).

Expected Benefits of a SDOH-Based Balanced Scorecard

The Hispanic population will benefit from increased screening rates and associated decreased morbidity and mortality rates, as well as reduced healthcare spending if at least 80% of eligible adults are screened (Hannon et al., 2019; NCCDPHP, 2022). Approximately 88% of adults diagnosed with early-stage CRC live five years or more, compared to 16% of adults diagnosed with late-stage CRC (NCCDPHP, 2022). Hence, this population could also benefit from a better quality of life if CRC is diagnosed early. This can be achieved if healthcare providers utilize the developed BSC to inform their decisions to recommend and offer CRC screening to patients (Terhaar, 2021). This will facilitate the continued use of patient-tailored navigation and contribute to the national CRC prevention goal (CDC, 2022).

Review of Literature (ROL) Summary

Increasing CRC screening rates is the key to reducing CRC-related morbidity and mortality (CDC, 2022; Hannon et al., 2019). Strategic interventions at the national, state, and local levels can potentially address screening barriers and risk factors, particularly in vulnerable

populations (Goding et al., 2019). Continually practicing culturally tailored patient navigation based on SDOH is key to achieving and maintaining increased screening rates and CRC outcomes (Gonzalez et al., 2012; Tong et al., 2017; Winkle et al., 2022). More studies are needed to further understand the changes in CRC screening and outcomes in relation to SDOH and the relative effectiveness of EBIs (Sharma et al., 2021). Appendix A shows the details of all ROL sources in an evidence table.

Project Question

Can SDOH characteristics found in publicly available databases reveal trends and patterns that can be used to create *SDOH-focused interventions* for care management with a BSC for Hispanic adults aged 45 years and older?

Objective

The objective of this project was to develop a balanced scorecard that can facilitate and inform providers' decision-making in improving CRC screening rates in Hispanic adults and to contribute to achieving the CDC's national goal of reducing CRC burden (CDC, 2022; Hannon et al., 2019).

Social Determinants of Health Framework

Social determinants of health (SDOH) are the "conditions in the environments where people are born, live, learn, work, play, worship, and age that affect a wide range of health, functioning, and quality-of-life outcomes and risks" (Healthy People 2030, 2020, para 1). SDOH can be grouped into five domains (Figure 3).

1. Economic stability
2. Education access and quality
3. Healthcare access and quality

4. Neighborhood and built environment
5. Social and community context

SDOH as a Framework for Increasing CRC Screening in Hispanic Adults

SDOH and the Hispanic Adults Eligible for Preventive CRC Screening

This project focuses on health equity indices categorized under the economic, educational, and healthcare access domains of the SDOH framework (Birkhead et al., 2022). The economic health equity indices examined in this project included the employment status and income level of Hispanic adults in the selected zip codes; the educational index included the level of education of this population; and the healthcare access indices included health insurance coverage, language barriers, and structural barriers to CRC screening.

1. Economic stability: Hispanics are a rapidly growing population in the United States with poor socio-economic status (Viramontes et al., 2020). Cost of care (screening) has been identified as one of the barriers to screening among Hispanics (Byrd et al., 2019; Wang et al., 2013).
2. Healthcare access and quality: Hispanics have socio-cultural barriers to healthcare access (Byrd et al., 2019; Wang et al., 2013; Viramontes et al., 2020). The elimination of structural barriers to screening using patient-tailored navigation and offering less invasive tests, such as stool-based tests instead of colon visualization options has been found to increase screening access and screening rates (Hannon et al., 2019; Maxwell et al., 2022; Mojica et al., 2018).
3. Education access and quality: There is limited healthcare access due to low health literacy and a lack of knowledge about CRC, mostly resulting from language barriers among Hispanics (Mojica et al., 2018; Viramontes et al., 2020). Education is a significant

screening-facilitating factor, as it increases awareness of CRC and screening benefits and influences willingness to screen (Byrd et al., 2019; Tong et al., 2017; Wang et al., 2013).

SDOH and the Data Application to Hispanic Adults Eligible for Preventive CRC Screening

Evidence-based data supports the fact that increased screening can prevent new cases and deaths related to CRC (CDC, 2022). Patient-tailored navigation using the SDOH framework can increase screening and contribute to achieving national goals (CDC, 2022). There are evidence-based recommendations for continued patient-tailored navigation to achieve and maintain this goal (Gonzalez et al., 2012; Tong et al., 2017; Winkle et al., 2022).

Methods

This was an evidence-based development of SDOH-focused interventions, guided by a BSC. This database project aimed to develop a tool to assist providers in offering patient-tailored care to increase CRC screening rates in Hispanic adults aged > 45 years. Another aim of this project was to contribute to the CDC's national goal of increasing CRC screening rates to 80% in populations across the United States to prevent almost 300,000 new cases and over 200,000 deaths by 2030 (Hannon et al., 2019). This project was implemented by developing a balanced scorecard to highlight screening outcomes based on multiple health equity indices using the Healthy People SDOH framework for health outcomes. The Healthy People framework for health outcomes focuses on improving the health and well-being of people in the United States (Birkhead et al., 2022). Inclusion criteria were Hispanic adults aged 45 years and older in Dallas County with no known CRC diagnosis or history. The exclusion criteria included all adults aged 45 years and older with CRC or a history of CRC. This project reviewed and analyzed the trends and patterns of CRC screening in Hispanic adults in Dallas County, and data reflective of outliers, errors, and blanks were excluded from the analysis (Tableau, 2022).

Population

The USPSTF recommends routine CRC screening of adults aged > 45 years (USPSTF, 2021). This project focused on Hispanic adults aged 45 years and older in Dallas County.

Setting

This project involved the use of data sets obtained from the BRFSS, HNT, and THCIC databases. It focuses on data sets obtained from outpatient facilities throughout Dallas County.

Measurement and Analysis

In this project, an SDOH-based variable dashboard was created to guide data collection from three databases, THCIC, BRFSS, and HNT (see Appendix B). Databases were the primary tools for data collection in this project which facilitated the development of the BSC. The BSC developed in this project could be a tool for improving CRC screening if utilized by healthcare providers (Terhaar, 2021). The CDC's BRFSS is a reliable source of evidence-based data used by the CDC to lead research and science to protect the health of the population in the United States (CDC, 2022). The HNT database, like the BRFSS, is another reliable source of community health data files, open to the public for research to improve healthcare practice; therefore, no permission to access the database is required (Conduent Healthy Communities Institute, 2023). Dr. Mari Tietze, a member of this project team, received internal funding from the University of Texas at Arlington, College of Nursing which facilitated access to the THCIC database for data collection for this project.

Procedure (Intervention)

This database project focuses on health equity indices categorized under the economic, educational, and healthcare access domains of the SDOH framework (Birkhead et al., 2022). The economic health equity indices examined in this project included the employment status and

income level of Hispanic adults in Dallas County, which consisted of the level of education of this population. The healthcare access indices included health insurance coverage, language barriers, and structural barriers to CRC screening.

The project's initial steps involved identifying data sources, including existing data and reports from public and health departments, after an assessment of strengths, weaknesses, opportunities, threats [SWOT] (see Appendix C), and a risk management plan was developed (see Appendix D). The data were examined after quality was determined in terms of validity. The next steps involved collaboration and engagement of the project team, which consisted of two faculty advisors and a Doctor of Nursing Practice (DNP) student, through virtual encounters in the data collection process. The data collection process allowed the examination of existing data to determine the CRC screening rates in Dallas County. Screening rates were examined based on the economic, educational, and healthcare access status of this population, and focused on the diagnosis code Z 12.11: Encounter for screening for malignant neoplasms of the colon. Appendix E shows the other CRC-related ICD codes used. The numerator and denominator data related to variables, such as CRC screening rates, were associated with outcome indicators of SDOH characteristics in the Hispanic population across the Dallas County zip codes (Birkhead et al., 2022). The developed *SDOH-focused interventions* guided by a BSC are intended for use in the care of Hispanic adults to increase CRC screening. Appendix F presents the timeline for each project step.

The development of SDOH-focused interventions guided by a BSC involved the use of big data in an Excel file format to identify the impact of SDOH in Hispanic adults on CRC screening. The project team used de-identified and aggregated data from three databases: THCIC, BFRSS, and HNT. The team undertook data cleaning measures, such as the

standardization of variables and the removal of outliers and incorrect, incomplete, and duplicate data to ensure the accuracy and quality of the data collected. The team used aggregated data to study the trends and patterns of CRC screening in Hispanic adults aged 45 years and older in Dallas County based on their SDOH, behavioral risk factors, health care information, and cost of care. This database project was approved by the GNRC as required by the University of Texas at Arlington.

Statistical Analysis

Descriptive statistical analysis using Microsoft Excel and SPSS version 28 was used to identify trends in CRC screening based on the SDOH of the population, using aggregated numerator and denominator data. Microsoft Excel and SPSS were used to conduct a descriptive analysis to identify relationships among the identified key variables. Following data collection and analysis, the team, including a statistician, developed a BSC, highlighting the trends and patterns of similar cohorts of patients in Dallas County (see Appendix G). The BSC is accompanied by a demographic spreadsheet, an educational guide, and a case study-based exercise on how to use the tool (see Appendix H&I). The BSC was used to follow the trends identified in populations with CRC-related diagnosis codes (see Appendix E).

Ethical Considerations

This database project was conducted with the approval of the GNRC as required by the University of Texas, Arlington. The project did not require approval from the university's internal review board; however, human subject training was completed (see Appendix J). There are no conflicts of interest to declare in this project.

Results

Project Outcomes

There were 82 Dallas County zip codes which were captured on the BSC. The data for each zip code were benchmarked against data from North Texas. Each zip code had a corresponding health equity index (HEI). According to the Conduent Healthy Communities Institute, (2023), HEIs are socioeconomic needs associated with poor health outcomes. All zip codes were assigned an index value from zero (low need) to 100 (high need) in locations ranked from 1(low need) to 5 (high need).

Using the HEI ranking by the Conduent Healthy Communities Institute, (2023), 30 zip codes were ranked 1, 11 in rank 2, 9 in rank 3, 18 in rank 4, and 14 in rank 5, as shown in Table 1. Approximately 39% (32) of the 82 zip codes fell in the high-need rank (4 and 5), 50% (41) fell in the low-need rank (1 and 2), and approximately 11% (9) fell in the average rank (3).

CRC Screening

Approximately 85% (70) of the zip codes performed worse than the benchmark, North Texas, in terms of CRC screening. Of the 50% (41) of the low-need zip codes, only 29% (12) had better screening rates than North Texas, the remaining 71% (29) had worse screening rates than North Texas. All the average and high-need zip codes (50%; 41) had worse screening rates than the benchmark.

SDOH

***Health Access*:** Health access was defined as the cost of services for each episode of care, percentage of the population with at least one primary care provider, and percentage of the population who underwent routine check-ups (see Appendix B). Approximately 41.5% of the population had a better cost of care; 58.5% had a worse cost of care than the benchmark. BRFSS data on the percentage of the population with a PCP and those who underwent routine check-ups were not available for North Texas; hence, state (Texas) data were used as a benchmark for

health access instead of North Texas. All zip codes (100%; 82) performed better than the benchmark in terms of yearly check-ups; however, 100% (82) of the zip codes performed worse than the benchmark in terms of having at least one doctor or primary care provider.

***Transportation cost*:** Transportation cost is defined as the cost of private and public transportation per household (see Appendix B). The average travel time to work within Dallas County was 27.6 minutes and approximately 98% (80) of the zip codes had relatively worse household transportation costs than the benchmark.

***Poverty level*:** Poverty level was defined as the percentage of adults living below the federal poverty level (see Appendix B). Approximately 34% (28 zip codes) of the population live below the poverty level in Dallas County as compared to the benchmark.

***Education*:** Educational level was defined as the percentage of adults with a high school diploma or higher (see Appendix B). Only 40% (33) of the zip codes had high school education or higher; approximately 60% (49) had no high school education or higher.

Discussion

Compared to the benchmark, the CRC screening rates were significantly worse across Dallas County, even among populations with a low health equity index. Less than 15% of the population in Dallas County had better screening rates than the benchmark. CRC screening was worse regardless of the HEI of the population, which aligns with the findings of Byrd et al. (2019) and Wang et al. (2013), who suggested that fear of diagnosis and cultural attitude towards CRC screening may be contributing factors to the screening disparities in the Hispanic population. Further studies investigating these factors may provide useful evidence to mitigate their effects. However, screening was worst in the zip codes with high HEI, which showed corresponding significant demographic characteristics (SDOH) that have an impact on CRC

screening as compared to North Texas. In terms of health access, having at least one doctor or primary care provider was an issue for most of the population; however, they managed to have a yearly check-up, even though they were constrained by the cost of care and transportation. These costs are relatively high for most populations. As noted, the demographic characteristics of the population reflect significant poverty, low literacy, and language barriers, which may be potential barriers impacting the population's ability to navigate the social and healthcare systems to mitigate the challenges associated with their SDOH. SDOH-focused interventions guided by a BSC have the potential to affect outcomes through customized interventions.

Recommendations

Those of Hispanic origin have socio-economic and socio-cultural barriers to healthcare access (Byrd et al., 2019; Wang et al., 2013; Viramontes et al., 2020). The elimination of structural barriers to screening, using patient-tailored navigation and offering less invasive and expensive tests, such as stool-based tests instead of colon visualization options as suggested by Hannon et al. (2019), Maxwell et al. (2022), and Mojica et al. (2018), can increase screening access and screening rates. There is limited healthcare access due to low health literacy and lack of knowledge about CRC, mostly due to language barriers among Hispanics (Mojica et al., 2018; Viramontes et al., 2020). Education is a significant screening-facilitating factor (Byrd et al., 2019; Tong et al., 2017; Wang et al., 2013); conducting a language-appropriate education using the Agency for Healthcare Research and Quality (AHRQ)'s health literacy universal precautions (AHRQ, 2020), can effectively increase awareness of CRC and screening benefits and influence the willingness to screen. Further studies are necessary to investigate the impact of fear and cultural attitudes on CRC screening.

Implications

Continual screening for SDOH can help identify barriers to CRC screening (Gonzalez et al., 2012; Tong et al., 2017; Winkle et al., 2022). A thorough assessment using BSC can benefit providers and patients in achieving and maintaining disease prevention and better health outcomes. Studies have shown that using culturally tailored patient navigation yields better CRC screening outcomes among adults of Hispanic origin (Mojica et al., 2018; Viramontes et al., 2020), using a BSC that highlights diversity and SDOH may lead to similar positive outcomes.

Summary

Key Findings: Approximately 85% of the Dallas County population had worse CRC screening rates than North Texas, and the BSC highlights significant SDOH characteristics that may be contributing to this outcome.

Other Issues Identified: This project highlights the impact of SDOH on CRC screening and needs to be continued to identify trends in screening over time. In addition to the SDOH, the cultural attitude of the population towards CRC screening may have contributed to lower screening rates across Dallas County, as shown in studies by Byrd et al. (2019) and Wang et al. (2013). Using the BSC developed in this project to continually screen for SDOH has the potential to yield better patient experiences and outcomes through planning and implementation of patient-tailored care.

Limitations

Lack of data: Some data to substantiate the relative impacts of health access on the individual zip codes of Dallas County were unavailable. Some variables were modified to allow the use of metropolitan area and state data, which may not reflect the true picture of each zip code.

Generalizability: The BSC developed in this project involved data only for Dallas County and was compared mostly to North Texas; hence, it may not be generalized to populations with different zip code demographics.

Time constraints: This project was limited to Dallas County. There was an opportunity to broaden data collection to include multiple counties in Texas; however, this was not possible owing to time constraints.

Cost-constraint: Cost, in terms of data, data storage, and working hours to maintain the BSC, must be considered in the cost-benefit analysis to enhance a continuous evaluation of the value of the tool and the outcomes of its use in patient care (Joel, 2018). However, the cost of care and factors such as missed CRC diagnosis and repeated admissions may offset the cost of maintaining the BSC.

Conclusion

Increasing CRC screening rates is key to reducing CRC-related morbidity and mortality (CDC, 2021; Hannon et al., 2019). Strategic interventions at the national, state, and local levels can potentially address screening barriers and risk factors, particularly in vulnerable populations (Goding et al., 2019). Continually practicing culturally tailored patient navigation based on SDOH is key to achieving and maintaining increased screening rates and CRC outcomes (Gonzalez et al., 2012; Tong et al., 2017; Winkle et al., 2022). This effort can be applied in an increasingly targeted approach using SDOH-focused interventions guided by a BSC as depicted in this study. More studies are needed to further understand the changes in CRC screening and outcomes in relation to SDOH and the relative effectiveness of EBIs (Sharma et al., 2021). Locally, providers can use the BSC developed in this project to improve screening rates and

contribute to the national goal of achieving 80% screening rates across communities in the United States.

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Table 1

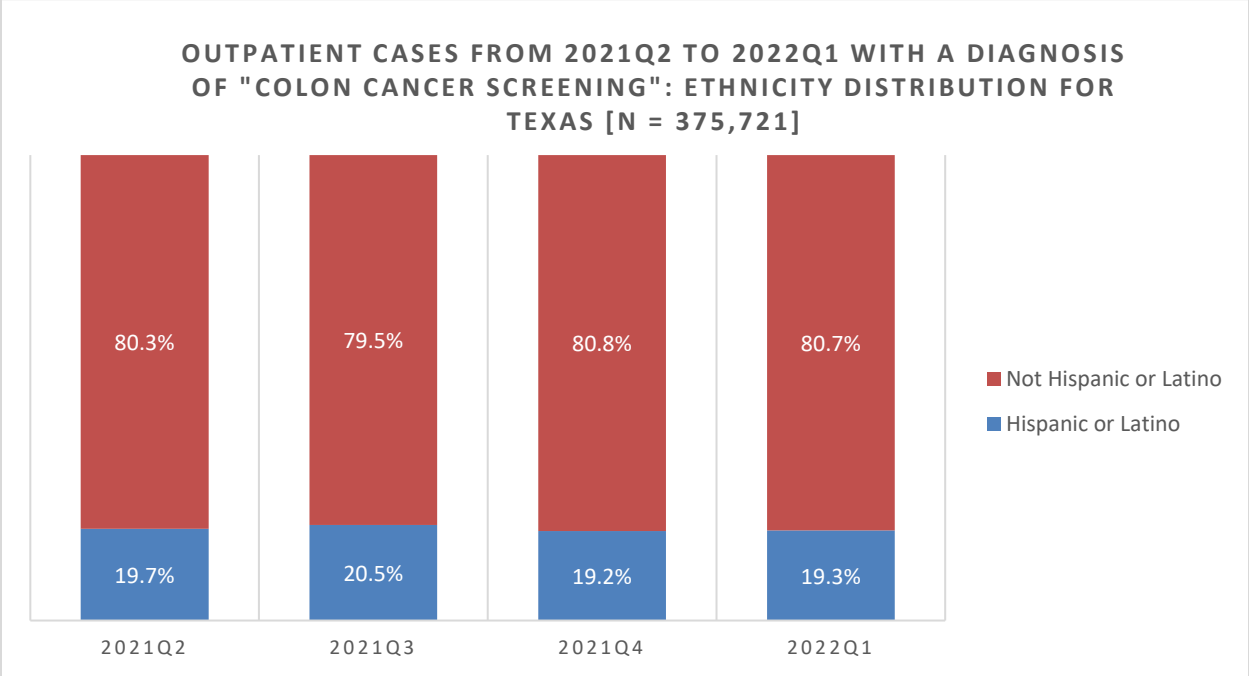
Health Equity Index Ranks

Rank (HEI)	Number of Zip Codes
1	30
2	11
3	9
4	18
5	14

Note. Approximately 39% (32) of the 82 zip codes fell in the high-need rank (4 and 5); 50% (41) fell in the low-need rank (1 and 2); approximately 11% (9) fell in the average rank (3).

Figure 1

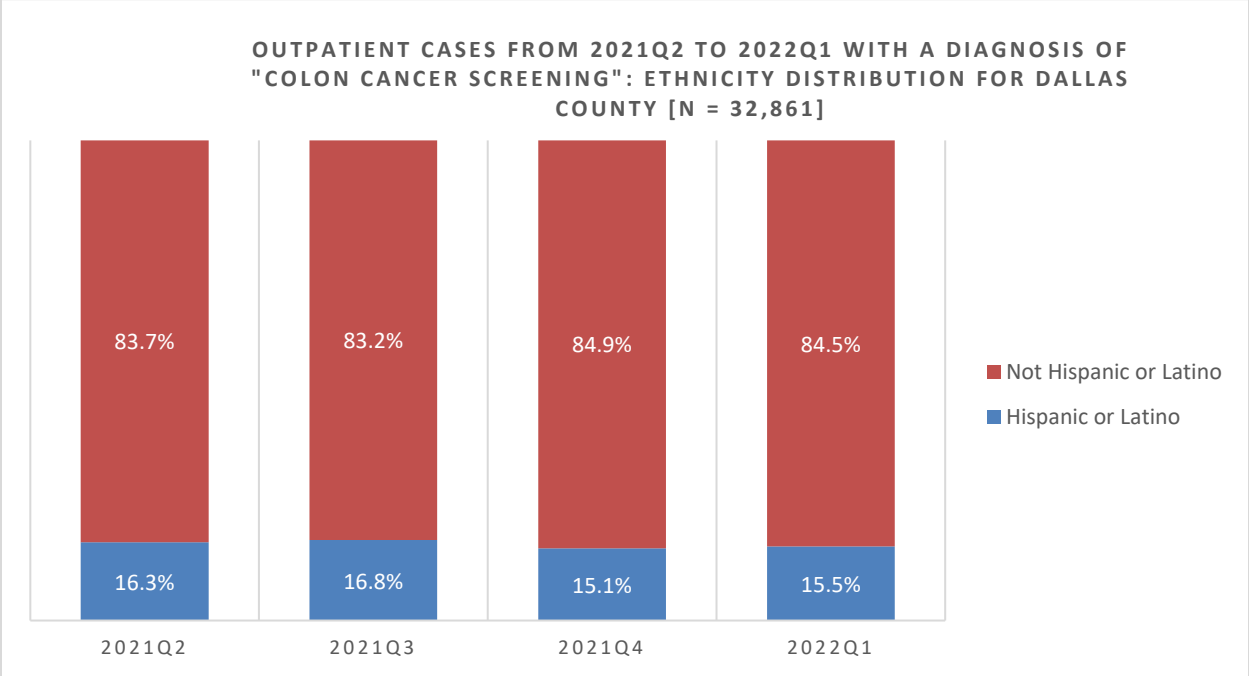
Colon Cancer Screening in Texas: Ethnicity Distribution



Note. This figure shows the percentage of Hispanics and non-Hispanics in Texas screened for CRC from 2021 to 2022 from the https://www.dshs.texas.gov/texas-health-care-information-collection.

Figure 2

Colon Cancer Screening in Dallas County: Ethnicity Distribution



Note. This figure shows the percentage of Hispanics and non-Hispanics in Dallas County screened for CRC from 2021 to 2022 (https://www.dshs.texas.gov/texas-health-care-information-collection).

Figure 3

Healthy People 2030: Social Determinants of Health (SDOH)

Note. The figure was retrieved from healthy people in 2030. Social determinants of health. https://health.gov/healthypeople/priority-areas/social-determinants-health. SDOH are environmental factors that affect individuals' health and quality of life (Healthy People 2030). The figure shows the five domains of SDOH: economic stability, education access and quality, healthcare access and quality, neighborhood and built environment, and social and community contexts (Healthy People 2030).

Appendix A: Evidence Table

First Author Last Name/ Location	Publication Year	Title	Participant Characteristics	Sample Size	Study Type	Evidence-Based Pyramid Level 1 - 8	Results	Conclusion
Gonzalez / United States	2012	Interventions promoting colorectal cancer screening in the Hispanic population: A review of the literature	Hispanics over 49 years in the United States in primary care community centers.	Five studies were reviewed including four RCTs	Systematic review with aim of reviewing to determine effectiveness of CRC promotion interventions on screening among Hispanic adults.	2	Increase in CRC knowledge and screening (FOBT) completion.	Increased FOBT completion does not mean understanding of need for regular screening, so ongoing CRC education to promote CRC screening is necessary among Hispanics
Tong/United States	2017	Lay health educators increase colorectal cancer screening among Hmong Americans: A cluster randomized controlled	In this study, 329 Asian Americans in California participated	329	RCT with control group to determine whether bilingual/bicultural education increases CRC screening.	1	Higher CRC knowledge influenced increased CRC screening outcomes (adjusted odds ratio, 1.71; 95% confidence	More bilingual educators should be trained to improve CRC knowledge

		trial					interval, 1.26-2.32).	
Winkler/Unit-ed States	2022	Decreasing colorectal cancer screening disparities: A culturally tailored patient navigation program for Hispanic patients	Hispanics 31-85 years in acute care teaching facility in Rhode Island.	698	Experimental design with the objective of evaluating utilization of colonoscopy among Hispanics with CTPNP.	1	Culturally tailored patient navigation program increased colonoscopy completion in 85% of participants in this study.	Education provided through CTPNP enhanced participants participation in their own care
Hamdan	2021	Exploring the barriers toward colorectal cancer screening: A literature review.	Nine articles involving adults 50-75 years of age in primary care setting.	Nine articles	Literature review to explore barriers of CRC screening by FOBT.	5	Three main barriers including knowledge deficit, personal beliefs, and organizational barriers were identified.	Educational activities tailored toward these barriers can increase awareness and rates of CRC screening
Goding/unit-	2019	Current	Four	Four	The purpose	5	Patterns of	Reducing risk factors

ed States		prevalence of major cancer risk factors and screening test use in the United States: Disparities by education and race/ethnicity	population-based surveys (2015-2017) in the United States were reviewed. The surveys used include NHIS, BRFSS, NHANES, NIS-Teen. Surveys were self-reported by adults over 18 years	surveys	of this literature review was to provide a comprehensive overview of prevalence of major cancer risk factors and screening utilization, and disparities by education and race/ethnicity.		cancer risk factors and screening suggest education and cultural factors influence behavior towards screening utilization.	require national, state, local, social, and individual behavioral interventions
Byrd/United States	2019	Barriers and facilitators to colorectal cancer screening within a Hispanic population.	Fifty-six Hispanics (50-75 years) in clinic and community centers at EL Paso, TX participate	56	Qualitative/ exploratory study with the purpose of understanding barriers/facilitators of CRC	3	Overall, lack of knowledge about CRC. Barriers include cost, fear, embarrassment.	Culturally tailored educational intervention can mitigate screening barriers among Hispanics. Patients are more likely to complete CRC screening using any option with education

			d in this study		screening and preference for stool-based tests.		Facilitators include in-person education and provider recommendation.	
Wang/United States	2013	Barriers to colorectal cancer screening in Hispanics in the United States: An integrative review	Findings from eight studies done between 2002 and 2012 in the United States and involving Hispanic adults over 23 years were synthesized.	Eight studies	Systematic review to synthesize research on barriers of CRC screening among Hispanic populations.	3	Barriers include fear of CRC diagnosis, cost, lack of awareness/ health literacy/education, lack of provider recommendation. Language barrier was significant among Hispanics.	Culture-sensitive education can mitigate most screening barriers among Hispanics
Sanchez/united States	2013	Assessing colorectal cancer	Hispanic adults over 40		Non-experimental study to	3	Colorectal Cancer screening	Expanding education and increasing physician-patient

		screening behaviors and knowledge among at-risk Hispanics in southern New Mexico	years at community events in New Mexico participated		understand factors influencing low CRC screening rates among Hispanic adults in New Mexico.		was influenced positively by CRC knowledge and physician-patient CRC interactions.	interactions will promote CRC screening and decrease mortality rates among Hispanics
Gonzales/United States	2012	Surveillance of colorectal cancer screening in New Mexico Hispanics and non-Hispanic whites.	Telephone surveys involving 3303 respondents from New Mexico	3303	Non-experimental study to compare prevalence and utilization of CRC screening between Hispanics and non-Hispanic Whites.	3	Low CRC prevalence and utilization among Hispanics (47%), compared to Whites (60%); 31% (95% CI 0.51 – 0.94) Hispanic males and 45% (95% CI 0.44, 0.70) Hispanic females are less likely to	Providers can help patients understand risk factors which are mostly modifiable using culture/language appropriate approach to reduce risk factors and promote screening

							screen, compared to Whites males and females respectively.	
Viramontes/United States	2020	Colorectal cancer screening among Hispanics in the United States: Disparities, modalities, predictors, and regional variation	About 40.7% of 400,000 Hispanics and non-Hispanic White adults, 50-75 years of age, responded to BRFSS self-report survey	162,800	Cross sectional analysis with the aim of examining CRC screening modalities, predictors, and disparities among Hispanic and non-Hispanic whites.	3	Screening rates were 53.4% (*n* = 12,395) for Hispanics and 70.4% (*n* = 186,331); $p < 0.001$. Screening rates are lower in Hispanics compared to non-Hispanic Whites.	Multi-level barriers including culture, language, and lack of knowledge need to be targeted
Mojica/United States	2018	Interventions promoting colorectal cancer screening among Latino men: A systematic	Seven articles involving CRC screening behaviors among Latino	Seven articles	Systematic review to evaluate effectiveness of CRC interventions and strategies	2	One-on-one education alone was effective in increasing screening	Interpersonal, language, and culture appropriate interactions increase screening rates among Latino men

		review	men in the community or primary care setting were reviewed		that increase screening among Latino men.		rates. Using small educational media and offering FOBT contributed to increasing screening rates.	

Note. *BRFSS = Behavioral Risk Factor Surveillance System*; *CRC = Colorectal cancer*; *CTPNP = Culturally tailored patient navigation program*; *FIT = Fecal immunochemical test*; *FOBT = Fecal occult blood test*, *RCT = Randomized control trial*.

Appendix B: Dashboard of Variables and Associated Database Sources Grouped by SDOH Category

Variables	Data Source	Item Description	SDOH Category
1. Behavior Risk Factor –Routine Visit How Long (HCA)	BRFSS	About how long has it been since you last visited a doctor for a routine checkup?	Healthcare and Access
2. Behavior Risk Factor – Routine Visit Past Year (HCA)	BRFSS	Percentage of adult who had a routine checkup in the past year.	Healthcare and Access
3. Behavior Risk Factor – At Least One Doctor (HCA)	BRFSS	Percentage of adults who have at least one doctor.	Healthcare and Access
4. Behavior Risk Factor – Primary Care Practitioner (HCA)	BRFSS	Do you have one person you think of as your personal doctor or health care provider?	Healthcare and Access
5. Behavior Risk Factor – Cost Issue (HCA)	BRFSS	Was there a time in the past 12 months when you needed to see a doctor but could not because of the cost?	Healthcare and Access
6. Community – Preventive Care	HNT	Adults 45+ who received recommended preventive CRC screening: Females	Healthcare and Access
7. Community – Preventive Care	HNT	Adults 45+ who received recommended preventive services: Males	Healthcare and Access
8. Community – Preventive Care	HNT	Percent of preventable CRC in the Hispanic population	Healthcare and Access
9. Community - Transportation	HNT	Total cost of transportation per household [automobile and transit]	Economy
10. Community – Economy	HNT	Hispanic adults 45+ living below the poverty line	Economy
11. Community - Education	HNT	Hispanic adults 45+ with a high school diploma or higher	Education
12. Cost of care	THCIC	Total Charges per episode of care services	Healthcare and Access

Note. Social Determinants of Health (SDOH) Categories based on *Healthy People 2030*

Behavior Risk Factor Surveillance Survey (BRFSS) located at https://www.cdc.gov/brfss/index.html

HCA = Health Care Access category of BRFSSHealthyNorthTexas.org (HNT) located at https://www.healthyntexas.org/

The THCIC is the Texas Health Care Information Collection warehouse of the Texas Department of Health and Human Services.

https://www.dshs.texas.gov/texas-health-care-information-collection/about-thcic

Appendix C: SWOT Analysis Table

Strengths	**Weaknesses**
● Reliable Data ● Knowledgeable team members ● Access to multiple data ● Data analysis	● Inexperience with large data sets ● Inexperience with creating dashboards and scorecards. ● Possibility that there will not be enough data
Opportunities	**Threats**
● To identify SDOH that impact CRC screening ● To increase CRC screening in Hispanics ● To develop dashboards and scorecards	● Natural disasters ● Phishing ● Data breaches

Appendix D: Risk management Plan

Risk	Probability	Impact	Mitigation of Risk	Contingency Plan
Natural disasters	Occasional	critical	Data back up	Storage of data in a cloud (McBride et al., 2023.)
Phishing	Likely	Critical	Educate team about scam risks	Report suspected scam promptly to appropriate information technology departments (McBride et al., 2023).
Data breaches	Likely	Critical	Data encryption	Data storage using Health Cloud (McBride et al., 2023).
Inexperience with creating dashboards and scorecards using large data sets	Likely	Critical	Collaboration with team members with expertise in creating dashboards using big data	Continual interprofessional collaboration
Lack of data	Likely	Critical	Modification of variables and benchmark data	Modification of variables and collaboration with data specialist

Appendix E: ICD-10 Codes Associated with Colorectal Cancer

ICD-10 Code	ICD-10 Description
Z12.11	Encounter for screening for malignant neoplasm of colon
Z12.12	Encounter for screening for malignant neoplasm of rectum
Z15.0	Genetic susceptibility to malignant neoplasm
Z80.0	Family history of malignant neoplasm of digestive organs
Z85.038	Personal history of colon cancer
Z86.010	Personal history of colonic polyps
R93.3	Abnormal findings on diagnostic imaging of other parts of digestive tract
K63.5	Polyp of colon
G0105	Colorectal cancer screening; colonoscopy on individual at high risk
G0121	Colorectal cancer screening: Colonoscopy on individual not meeting criteria for high risk
D12.2	Benign neoplasm of ascending colon
D12.4	Benign neoplasm of descending colon
D12.5	Benign neoplasm of sigmoid colon
D12.7	Benign neoplasm of rectosigmoid junction
C18.2	Malignant neoplasm: Ascending colon
C18.4	Malignant neoplasm of transverse colon
C18.7	Malignant neoplasm: Sigmoid colon
C18.8	Malignant neoplasm of overlapping sites of colon
C18.9	malignant neoplasm of colon unspecified
C19	Malignant neoplasm of rectosigmoid junction

Appendix F: Project Plan Activity Gantt Chart

	Project Plan Activity	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7	Week 8
2	a. Review project details and address any needed changes								
3	1.Collect, prepare, and clean data of THCIC database								
4	2. Collect, prepare, and clean data of BRFSS database								
5	3. Collect, prepare, and clean data of HNT database								
6	4. THCIC - Enter data of applicable outpatient CRC visits via Excel								
7	5. THCIC - Review data of applicable outpatient CRC visits via Excel								
8	6. THCIC - Analyze data for red, green and yellow status of data of applicable outpatient CRC visits via Excel								
9	7. BRFSS - Enter data of applicable outpatient CRC visits via Excel								
10	8. BRFSS - Review data of applicable outpatient CRC visits via Excel								
11	9. BRFSS - Analyze data for red, green and yellow status of data of applicable outpatient CRC visits via Excel								
12	10. HNT - Enter data of applicable outpatient CRC visits via Excel								
13	11. HNT - Review data of applicable outpatient CRC visits via Excel								
14	12. HNT - Analyze data for red, green and yellow status of data of applicable outpatient CRC visits via Excel								
15	13. Create scorecard values, relationship to practice, and user education materials, finalize project								

Note. Data collection: Identifying trends in CRC screening in relation to the economic, educational, and healthcare access status of Hispanic adults using the Texas Healthcare Information Collection (THCIC) database. Data analysis: Analysis of the relationships between identified SDOH and CRC screening rates in Hispanic adults. Project Summary: Creation of a balanced scorecard using identified trends and patterns.

Appendix G: Balanced Scorecard (75001 – 75149)

L64

	A	B	D	E	F	G	H	I	J	K
	CUSTOMERS: Dallas County Zip Codes for % CRC Compared to Target [Red=Worse Than, Yellow=Equal to, Green=Better Than]	Health Equity Index (HNT)	Percent of preventable CRC in adults COMPARED to North Texas (HNT)	Percent of average Cost of transportation per household COMPARED to Texas (HNT)	Percent of Adults living below the poverty line COMPARED to North Texas (HNT)	Percent of Adults with a high school diploma or higher COMPARED to North Texas (HNT)	Percent of average Charges per colon cancer care services COMPARED to North Texas (THCIC)	Percentage of adults 18 years and older who have at least one doctor COMPARED to Texas (BRFSS Texas)	Percentage of time in the past 12 months when you needed to see a doctor but could not because of the cost? = 1 Yes	Percentage of adults who have had a routine checkup in the past year COMPARED to Texas (BRFSS)
2	75001	17.8	97.9%	144.5%	58.2%	109.9%	85.0%	65.3%	74.2%	107.3%
3	75006	35.2	92.6%	140.6%	41.8%	94.6%	106.0%	65.3%	74.2%	107.3%
4	75019	2.3	97.4%	136.1%	16.4%	112.7%	92.7%	65.3%	74.2%	107.3%
5	75038	25.5	93.3%	126.4%	60.4%	108.0%	106.6%	65.3%	74.2%	107.3%
6	75039	5.2	98.9%	99.1%	11.2%	114.4%	105.6%	65.3%	74.2%	107.3%
7	75040	41.3	89.4%	124.1%	61.9%	86.6%	102.1%	65.3%	74.2%	107.3%
8	75041	76.3	85.3%	103.6%	123.9%	76.4%	106.5%	65.3%	74.2%	107.3%
9	75042	64.0	86.7%	107.6%	96.3%	79.4%	104.5%	65.3%	74.2%	107.3%
10	75043	35.8	95.3%	126.7%	66.4%	96.0%	95.1%	65.3%	74.2%	107.3%
11	75044	20.8	95.6%	116.8%	46.3%	103.9%	94.7%	65.3%	74.2%	107.3%
12	75048	9.5	97.4%	100.7%	24.6%	108.1%	94.0%	65.3%	74.2%	107.3%
13	75050	58.0	89.9%	121.6%	84.3%	91.3%	112.2%	65.3%	74.2%	107.3%
14	75051	84.5	85.8%	114.2%	144.0%	78.2%	133.2%	65.3%	74.2%	107.3%
15	75052	18.4	94.7%	119.5%	46.3%	99.4%	119.5%	65.3%	74.2%	107.3%
16	75060	72.2	85.0%	130.7%	76.9%	73.4%	112.1%	65.3%	74.2%	107.3%
17	75061	80.0	84.6%	100.7%	100.0%	73.9%	107.4%	65.3%	74.2%	107.3%
18	75062	47.9	92.4%	144.7%	49.3%	87.0%	100.6%	65.3%	74.2%	107.3%
19	75063	6.4	99.8%	104.3%	42.5%	111.1%	98.3%	65.3%	74.2%	107.3%
20	75080	19.1	101.4%	134.1%	55.2%	104.8%	100.9%	65.3%	74.2%	107.3%
21	75081	17.0	99.2%	136.7%	45.5%	102.4%	97.9%	65.3%	74.2%	107.3%
22	75088	9.8	97.7%	134.1%	33.6%	108.7%	87.5%	65.3%	74.2%	107.3%
23	75089	10.8	96.4%	140.5%	53.0%	108.3%	91.3%	65.3%	74.2%	107.3%
24	75104	17.3	97.6%	116.8%	67.2%	103.5%	108.8%	65.3%	74.2%	107.3%
25	75115	24.2	102.0%	134.1%	41.0%	104.8%	105.0%	65.3%	74.2%	107.3%
26	75116	73.8	92.3%	108.7%	56.7%	93.5%	120.4%	65.3%	74.2%	107.3%
27	75134	43.1	93.9%	130.5%	67.2%	94.8%	117.2%	65.3%	74.2%	107.3%
28	75137	28.3	98.5%	127.8%	46.3%	100.5%	108.3%	65.3%	74.2%	107.3%
29	75141	95.8	79.1%	124.6%	253.0%	82.2%	97.8%	65.3%	74.2%	107.3%
30	75146	39.2	96.8%	111.9%	93.3%	102.3%	113.0%	65.3%	74.2%	107.3%
31	75149	50.2	88.7%	129.5%	96.3%	87.7%	98.9%	65.3%	74.2%	107.3%

Master Indicators | BSC Customer Variables | +

Appendix Gi: Balanced Scorecard (75149 – 75226)

L64

	A	B	D	E	F	G	H	I	J	K
1	CUSTOMERS: Dallas County Zip Codes for % CRC Compared to Target [Red=Worse Than, Yellow=Equal to, Green=Better Than]	Health Equity Index (HNT)	Percent of preventable CRC in adults COMPARED to North Texas (HNT)	Percent of average Cost of transportation per household COMPARED to Texas (HNT)	Percent of Adults living below the poverty line COMPARED to North Texas (HNT)	Percent of Adults with a high school diploma or higher COMPARED to North Texas (HNT)	Percent of average Charges per colon cancer care services COMPARED to North Texas (THCIC)	Percentage of adults 18 years and older who have at least one doctor COMPARED to Texas (BRFSS Texas)	Percentage of time in the past 12 months when you needed to see a doctor but could not because of the cost? = 1 Yes	Percentage of adults who have had a routine checkup in the past year COMPARED to Texas (BRFSS)
31	75149	50.2	88.7%	129.5%	96.3%	87.7%	98.9%	65.3%	74.2%	107.3%
32	75150	41.2	91.5%	122.8%	79.1%	92.7%	93.2%	65.3%	74.2%	107.3%
33	75159	60.1	86.5%	132.3%	60.4%	87.0%	120.0%	65.3%	74.2%	107.3%
34	75172	75.8	82.9%	115.1%	109.7%	78.9%	142.1%	65.3%	74.2%	107.3%
35	75180	76.6	82.9%	136.5%	68.7%	77.6%	100.6%	65.3%	74.2%	107.3%
36	75181	10.9	92.1%	147.5%	47.0%	98.2%	92.5%	65.3%	74.2%	107.3%
37	75182	9.3	95.6%	139.9%	61.2%	110.4%	85.1%	65.3%	74.2%	107.3%
38	75201	2.7	99.2%	138.7%	46.3%	112.7%	80.7%	65.3%	74.2%	107.3%
39	75202	4.2	98.8%	113.8%	68.7%	113.4%	110.5%	65.3%	74.2%	107.3%
40	75203	94.0	84.0%	105.9%	182.8%	79.4%	123.7%	65.3%	74.2%	107.3%
41	75204	15.1	96.2%	109.6%	72.4%	107.7%	77.0%	65.3%	74.2%	107.3%
42	75205	1.7	104.8%	120.1%	33.6%	114.0%	69.1%	65.3%	74.2%	107.3%
43	75206	8.9	98.0%	121.1%	39.6%	109.1%	83.2%	65.3%	74.2%	107.3%
44	75207	18.0	79.6%	142.4%	0.0%	90.2%	84.2%	65.3%	74.2%	107.3%
45	75208	58.0	86.7%	103.2%	79.1%	86.7%	101.2%	65.3%	74.2%	107.3%
46	75209	5.6	102.7%	133.1%	20.9%	108.3%	76.4%	65.3%	74.2%	107.3%
47	75210	90.4	87.7%	120.2%	141.8%	71.4%	121.1%	65.3%	74.2%	107.3%
48	75211	89.3	79.4%	141.0%	133.6%	69.3%	114.0%	65.3%	74.2%	107.3%
49	75212	93.7	81.2%	126.7%	170.1%	69.6%	120.6%	65.3%	74.2%	107.3%
50	75214	5.4	101.7%	128.8%	17.2%	110.6%	70.5%	65.3%	74.2%	107.3%
51	75215	76.9	89.9%	99.7%	174.6%	84.7%	109.4%	65.3%	74.2%	107.3%
52	75216	94.1	89.4%	124.8%	200.7%	81.5%	127.5%	65.3%	74.2%	107.3%
53	75217	90.2	81.1%	123.4%	177.6%	65.2%	112.9%	65.3%	74.2%	107.3%
54	75218	7.4	101.7%	103.5%	32.1%	105.8%	74.6%	65.3%	74.2%	107.3%
55	75219	9.2	101.1%	132.8%	33.6%	108.4%	80.9%	65.3%	74.2%	107.3%
56	75220	91.4	85.5%	146.7%	122.4%	66.3%	108.5%	65.3%	74.2%	107.3%
57	75223	74.2	82.8%	137.1%	79.1%	71.6%	89.9%	65.3%	74.2%	107.3%
58	75224	89.6	85.9%	129.8%	114.2%	73.2%	121.8%	65.3%	74.2%	107.3%
59	75225	1.9	107.0%	126.4%	21.6%	113.8%	70.0%	65.3%	74.2%	107.3%
60	75226	41.4	83.1%	144.5%	79.1%	88.7%	166.9%	65.3%	74.2%	107.3%

Appendix Gii: Balanced Scorecard (75226 – 75254)

L64

1	A	B	D	E	F	G	H	I	J	K
	CUSTOMERS: Dallas County Zip Codes for % CRC Compared to Target [Red=Worse Than, Yellow=Equal to, Green=Better Than]	Health Equity Index (HNT)	Percent of preventable CRC in adults COMPARED to North Texas (HNT)	Percent of average Cost of transportation per household COMPARED to Texas (HNT)	Percent of Adults living below the poverty line COMPARED to North Texas (HNT)	Percent of Adults with a high school diploma or higher COMPARED to North Texas (HNT)	Percent of average Charges per colon cancer care services COMPARED to North Texas (THCIC)	Percentage of adults 18 years and older who have at least one doctor COMPARED to Texas (BRFSS Texas)	Percentage of time in the past 12 months when you needed to see a doctor but could not because of the cost? = 1 Yes	Percentage of adults who have had a routine checkup in the past year COMPARED to Texas (BRFSS)
60	75226	41.4	83.1%	144.5%	79.1%	88.7%	166.9%	65.3%	74.2%	107.3%
61	75227	68.2	84.7%	144.4%	113.4%	80.6%	100.1%	65.3%	74.2%	107.3%
62	75228	71.8	85.8%	133.0%	119.4%	83.2%	95.6%	65.3%	74.2%	107.3%
63	75229	18.8	99.4%	116.2%	52.2%	93.0%	88.4%	65.3%	74.2%	107.3%
64	75230	6.0	105.4%	140.9%	31.3%	111.3%	90.3%	65.3%	74.2%	107.3%
65	75231	65.7	90.2%	119.5%	126.9%	94.1%	116.2%	65.3%	74.2%	107.3%
66	75232	72.5	97.6%	131.6%	116.4%	94.1%	105.4%	65.3%	74.2%	107.3%
67	75233	89.4	92.4%	116.4%	128.4%	82.6%	94.6%	65.3%	74.2%	107.3%
68	75234	25.8	95.8%	133.9%	57.5%	92.4%	102.5%	65.3%	74.2%	107.3%
69	75235	68.4	88.7%	131.9%	119.4%	86.6%	169.1%	65.3%	74.2%	107.3%
70	75236	59.2	86.7%	128.1%	106.7%	89.9%	117.6%	65.3%	74.2%	107.3%
71	75237	87.1	88.2%	120.7%	191.0%	94.9%	160.3%	65.3%	74.2%	107.3%
72	75238	18.4	98.8%	138.8%	48.5%	104.6%	72.2%	65.3%	74.2%	107.3%
73	75240	77.5	90.5%	110.1%	122.4%	83.0%	105.9%	65.3%	74.2%	107.3%
74	75241	78.7	97.1%	132.0%	176.9%	92.4%	121.4%	65.3%	74.2%	107.3%
75	75243	61.9	92.6%	130.7%	144.0%	98.2%	98.6%	65.3%	74.2%	107.3%
76	75244	7.0	103.8%	117.2%	447.8%	111.2%	94.7%	65.3%	74.2%	107.3%
77	75246	57.9	84.7%	136.6%	167.9%	92.7%	109.9%	65.3%	74.2%	107.3%
78	75247	94.8	98.0%	129.8%	497.8%	82.2%	75.6%	65.3%	74.2%	107.3%
79	75248	10.7	104.5%	124.1%	19.4%	110.8%	88.6%	65.3%	74.2%	107.3%
80	75249	21.0	95.9%	138.0%	28.4%	101.8%	106.9%	65.3%	74.2%	107.3%
81	75251	24.1	101.8%	127.0%	18.7%	113.0%	121.1%	65.3%	74.2%	107.3%
82	75253	82.3	82.0%	110.7%	177.6%	69.2%	102.9%	65.3%	74.2%	107.3%
83	75254	31.5	95.5%	143.3%	85.8%	103.0%	110.6%	65.3%	74.2%	107.3%

Appendix H: Zip Code Demographic Characteristics (75001 – 75137)

I19 8%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	Dallas County Zip Codes	Health Equity Index (HNT)	Median Income level (HNT)	Median Income level in Dallas (HNT)	Median Income level In North Texas (HNT)	People Living Below Poverty Level (HNT)	People Living Below Poverty Level In Dallas (HNT)	People Living Below Poverty Level In North Texas (HNT)	People Living Below Poverty Level Healthy people 2030 Target (HNT)	Adults With Health Insurance Dallas County (HNT)	People With Health Insurance Healthy People 2030 Target (HNT)	People Living With Disability (HNT)	People Living With Disability North Texas (HNT)	Persons With High School Diploma (HNT)	Persons With High School Diploma Dallas County (HNT)	Persons With High School Diploma North Texas (HNT)	Population With Language Other Than English Spoken At Home (HNT)	Population with language other than English spoken at home in Dallas County (HNT)	Polpulation With Language Other Than English Spoken At Home North Texas (HNT)	Mean Travel Time (HNT)	Mean Travel Time Dallas County (HNT)	Homeownership (HNT)	Homeownership Dallas County (HNT)
2	75001	17.8	$73,383	$65,011	$1,161,349	9.2%	14.2%	11.0%	8.0%	71.7%	92.4%	4.7%	9.8%	95.3%	80.7%	86.7%	29.7%	43.1%	30.9%	23.6 mins	27.6 mins	14.2%	46.5%
3	75006	35.2	$73,088	$65,011	$1,161,349	7.4%	14.2%	11.0%	8.0%	71.7%	92.4%	6.8%	9.8%	82.0%	80.7%	86.7%	52.5%	43.1%	30.9%	23.7 mins	27.6 mins	49.4%	46.5%
4	75019	2.3	$124,652	$65,011	$1,161,349	2.8%	14.2%	11.0%	8.0%	71.7%	92.4%	5.2%	9.8%	97.7%	80.7%	86.7%	39.5%	43.1%	30.9%	24.3 mins	27.6 mins	64.4%	46.5%
5	75038	25.5	64,678	$65,011	$1,161,349	11.2%	14.2%	11.0%	8.0%	71.7%	92.4%	5.4%	9.8%	93.6%	80.7%	86.7%	50.5%	43.1%	30.9%	22.6 mins	27.6 mins	16.6%	46.5%
6	75039	5.2	$99,156	$65,011	$1,161,349	4.8%	14.2%	11.0%	8.0%	71.7%	92.4%	4.2%	9.8%	99.2%	80.7%	86.7%	44.5%	43.1%	30.9%	20.9 mins	27.6 mins	13.8%	46.5%
7	75040	41.3	$65,141	$65,011	$1,161,349	11.8%	14.2%	11.0%	8.0%	71.7%	92.4%	7.8%	9.8%	75.1%	80.7%	86.7%	53.8%	43.1%	30.9%	29.4 mins	27.6 mins	66.0%	46.5%
8	75041	76.3	$58,945	$65,011	$1,161,349	19.7%	14.2%	11.0%	8.0%	71.7%	92.4%	7.2%	9.8%	66.2%	80.7%	86.7%	66.5%	43.1%	30.9%	30.o mins	27.6 mins	57.4%	46.5%
9	75042	64.0	$53,919	$65,011	$1,161,349	15.0%	14.2%	11.0%	8.0%	71.7%	92.4%	7.6%	9.8%	68.8%	80.7%	86.7%	65.4%	43.1%	30.9%	26.5 mins	27.6 mins	54.5%	46.5%
10	75043	35.8	$66,211	$65,011	$1,161,349	11.0%	14.2%	11.0%	8.0%	71.7%	92.4%	10.8%	9.8%	83.2%	80.7%	86.7%	38.7%	43.1%	30.9%	31.8 mins	27.6 mins	57.6%	46.5%
11	75044	20.8	$78,701	$65,011	$1,161,349	9.9%	14.2%	11.0%	8.0%	71.7%	92.4%	8.7%	9.8%	90.1%	80.7%	86.7%	43.4%	43.1%	30.9%	29.5 mins	27.6 mins	63.1%	46.5%
12	75048	9.5	$114,256	$65,011	$1,161,349	2.7%	14.2%	11.0%	8.0%	71.7%	92.4%	8.6%	9.8%	93.7%	80.7%	86.7%	27.6%	43.1%	30.9%	31.1 mins	27.6 mins	88.4%	46.5%
13	75050	58.0	$64,435	$65,011	$1,161,349	14.3%	14.2%	11.0%	8.0%	71.7%	92.4%	8.4%	9.8%	79.2%	80.7%	86.7%	51.0%	43.1%	30.9%	26.2 mins	27.6 mins	40.7%	46.5%
14	75051	84.5	$42,675	$65,011	$1,161,349	21.0%	14.2%	11.0%	8.0%	71.7%	92.4%	14.0%	9.8%	67.8%	80.7%	86.7%	59.6%	43.1%	30.9%	27.3 mins	27.6 mins	43.7%	46.5%
15	75052	18.4	$82,395	$65,011	$1,161,349	7.7%	14.2%	11.0%	8.0%	71.7%	92.4%	9.1%	9.8%	86.2%	80.7%	86.7%	37.7%	43.1%	30.9%	29.3 mins	27.6 mins	64.5%	46.5%
16	75060	72.2	$61,964	$65,011	$1,161,349	14.2%	14.2%	11.0%	8.0%	71.7%	92.4%	8.0%	9.8%	63.6%	80.7%	86.7%	64.9%	43.1%	30.9%	26.8 mins	27.6 mins	59.8%	46.5%
17	75061	80.0	$52,446	$65,011	$1,161,349	15.4%	14.2%	11.0%	8.0%	71.7%	92.4%	8.4%	9.8%	64.1%	80.7%	86.7%	69.5%	43.1%	30.9%	26.2 mins	27.6 mins	36.9%	46.5%
18	75062	47.9	$63,151	$65,011	$1,161,349	8.3%	14.2%	11.0%	8.0%	71.7%	92.4%	7.1%	9.8%	75.4%	80.7%	86.7%	60.4%	43.1%	30.9%	23.3 mins	27.6 mins	39.5%	46.5%
19	75063	6.4	$97,704	$65,011	$1,161,349	6.8%	14.2%	11.0%	8.0%	71.7%	92.4%	4.0%	9.8%	96.3%	80.7%	86.7%	57.9%	43.1%	30.9%	22 mins	27.6 mins	34.9%	46.5%
20	75080	19.1	$80,294	$65,011	$1,161,349	14.9%	14.2%	11.0%	8.0%	71.7%	92.4%	8.9%	9.8%	90.9%	80.7%	86.7%	30.8%	43.1%	30.9%	24.3 mins	27.6 mins	50.7%	46.5%
21	75081	17.0	$83,551	$65,011	$1,161,349	8.3%	14.2%	11.0%	8.0%	71.7%	92.4%	10.4%	9.8%	88.8%	80.7%	86.7%	37.5%	43.1%	30.9%	24.9 mins	27.6 mins	50.3%	46.5%
22	75088	9.8	$96,279	$65,011	$1,161,349	6.0%	14.2%	11.0%	8.0%	71.7%	92.4%	10.1%	9.8%	94.2%	80.7%	86.7%	18.9%	43.1%	30.9%	31.0 mins	27.6 mins	79.7%	46.5%
23	75089	10.8	$106,758	$65,011	$1,161,349	8.1%	14.2%	11.0%	8.0%	71.7%	92.4%	8.0%	9.8%	93.9%	80.7%	86.7%	26.8%	43.1%	30.9%	33.4 mins	27.6 mins	78.0%	46.5%
24	75104	17.3	$78,259	$65,011	$1,161,349	9.3%	14.2%	11.0%	8.0%	71.7%	92.4%	11.3%	9.8%	89.7%	80.7%	86.7%	22.4%	43.1%	30.9%	31.7 mins	27.6 mins	68.1%	46.5%
25	75115	24.2	$79,805	$65,011	$1,161,349	8.0%	14.2%	11.0%	8.0%	71.7%	92.4%	12.4%	9.8%	90.9%	80.7%	86.7%	13.5%	43.1%	30.9%	30.5 mins	27.6 mins	64.8%	46.5%
26	75116	73.8	$51,765	$65,011	$1,161,349	10.3%	14.2%	11.0%	8.0%	71.7%	92.4%	11.9%	9.8%	81.1%	80.7%	86.7%	35.0%	43.1%	30.9%	29.2 mins	27.6 mins	55.3%	46.5%
27	75134	43.1	$59,211	$65,011	$1,161,349	11.7%	14.2%	11.0%	8.0%	71.7%	92.4%	12.8%	9.8%	82.2%	80.7%	86.7%	21.0%	43.1%	30.9%	31.9 mins	27.6 mins	71.2%	46.5%
28	75137	28.3	$78,254	$65,011	$1,161,349	8.2%	14.2%	11.0%	8.0%	71.7%	92.4%	11.3%	9.8%	87.1%	80.7%	86.7%	30.7%	43.1%	30.9%	26.3 mins	27.6 mins	66.0%	46.5%

Appendix Hi: Zip Code Demographic Characteristics (75137 – 75218)

I19 8%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	Dallas County Zip Codes	Health Equity Index (HNT)	Median Income level (HNT)	Median Income level in Dallas (HNT)	Median Income level In North Texas (HNT)	People Living Below Poverty Level (HNT)	People Living Below Poverty Level In Dallas (HNT)	People Living Below Poverty Level In North Texas (HNT)	People Living Below Poverty Level Healthy people 2030 Target (HNT)	Adults With Health Insurance Dallas County (HNT)	People With Health Insurance Healthy People 2030 Target (HNT)	People Living With Disability (HNT)	People Living With Disability North Texas (HNT)	Persons With High School Diploma (HNT)	Persons With High School Diploma Dallas County (HNT)	Persons With High School Diploma North Texas (HNT)	Population With Language Other Than English Spoken At Home (HNT)	Population with language other than English spoken at home in Dallas County (HNT)	Polpulation With Language Other Than English Spoken At Home North Texas (HNT)	Mean Travel Time (HNT)	Mean Travel Time Dallas County (HNT)	Homeownership (HNT)	Homeownership Dallas County (HNT)
28	75137	28.3	$78,254	$65,011	$1,161,349	8.2%	14.2%	11.0%	8.0%	71.7%	92.4%	11.3%	9.8%	87.1%	80.7%	86.7%	30.7%	43.1%	30.9%	26.3 mins	27.6 mins	66.0%	46.5%
29	75141	95.8	$37,125	$65,011	$1,161,349	31.3%	14.2%	11.0%	8.0%	71.7%	92.4%	10.2%	9.8%	71.3%	80.7%	86.7%	43.3%	43.1%	30.9%	32.1 mins	27.6 mins	46.9%	46.5%
30	75146	39.2	$61,482	$65,011	$1,161,349	17.0%	14.2%	11.0%	8.0%	71.7%	92.4%	10.8%	9.8%	88.7%	80.7%	86.7%	17.4%	43.1%	30.9%	30.6 mins	27.6 mins	58.0%	46.5%
31	75149	50.2	$57,136	$65,011	$1,161,349	13.5%	14.2%	11.0%	8.0%	71.7%	92.4%	15.5%	9.8%	76.0%	80.7%	86.7%	40.3%	43.1%	30.9%	31.9 mins	27.6 mins	62.7%	46.5%
32	75150	41.2	$61,423	$65,011	$1,161,349	11.6%	14.2%	11.0%	8.0%	71.7%	92.4%	10.0%	9.8%	80.4%	80.7%	86.7%	45.2%	43.1%	30.9%	30.3 mins	27.6 mins	45.8%	46.5%
33	75159	60.1	$63,543	$65,011	$1,161,349	12.4%	14.2%	11.0%	8.0%	71.7%	92.4%	13.4%	9.8%	75.4%	80.7%	86.7%	42.4%	43.1%	30.9%	37.9 mins	27.6 mins	70.6%	46.5%
34	75172	75.8	$57,895	$65,011	$1,161,349	23.0%	14.2%	11.0%	8.0%	71.7%	92.4%	14.8%	9.8%	68.4%	80.7%	86.7%	45.1%	43.1%	30.9%	30.4 mins	27.6 mins	58.0%	46.5%
35	75180	76.6	$54,670	$65,011	$1,161,349	12.2%	14.2%	11.0%	8.0%	71.7%	92.4%	14.8%	9.8%	67.3%	80.7%	86.7%	49.2%	43.1%	30.9%	36.7 mins	27.6 mins	57.9%	46.5%
36	75181	10.9	$97,061	$65,011	$1,161,349	7.2%	14.2%	11.0%	8.0%	71.7%	92.4%	11.0%	9.8%	85.1%	80.7%	86.7%	36.1%	43.1%	30.9%	34.8 mins	27.6 mins	84.1%	46.5%
37	75182	9.3	$137,656	$65,011	$1,161,349	7.9%	14.2%	11.0%	8.0%	71.7%	92.4%	8.8%	9.8%	95.7%	80.7%	86.7%	27.2%	43.1%	30.9%	29.7 mins	27.6 mins	82.2%	46.5%
38	75201	2.7	$95,907	$65,011	$1,161,349	15.9%	14.2%	11.0%	8.0%	71.7%	92.4%	7.3%	9.8%	97.7%	80.7%	86.7%	15.5%	43.1%	30.9%	22.2 mins	27.6 mins	9.8%	46.5%
39	75202	4.2	$86,827	$65,011	$1,161,349	8.3%	14.2%	11.0%	8.0%	71.7%	92.4%	5.5%	9.8%	98.3%	80.7%	86.7%	21.4%	43.1%	30.9%	21.9 mins	27.6 mins	25.3%	46.5%
40	75203	94.0	$40,079	$65,011	$1,161,349	32.3%	14.2%	11.0%	8.0%	71.7%	92.4%	16.7%	9.8%	68.8%	80.7%	86.7%	50.2%	43.1%	30.9%	31.3 mins	27.6 mins	31.5%	46.5%
41	75204	15.1	$83,050	$65,011	$1,161,349	12.4%	14.2%	11.0%	8.0%	71.7%	92.4%	7.1%	9.8%	93.4%	80.7%	86.7%	26.0%	43.1%	30.9%	22.5 mins	27.6 mins	17.2%	46.5%
42	75205	1.7	$164,409	$65,011	$1,161,349	7.7%	14.2%	11.0%	8.0%	71.7%	92.4%	4.2%	9.8%	98.8%	80.7%	86.7%	12.3%	43.1%	30.9%	19.4 mins	27.6 mins	52.2%	46.5%
43	75206	8.9	$79,468	$65,011	$1,161,349	11.8%	14.2%	11.0%	8.0%	71.7%	92.4%	7.4%	9.8%	94.6%	80.7%	86.7%	22.2%	43.1%	30.9%	22.4 mins	27.6 mins	24.7%	46.5%
44	75207	18.0	$78,393	$65,011	$1,161,349	10.4%	14.2%	11.0%	8.0%	71.7%	92.4%	3.6%	9.8%	78.2%	80.7%	86.7%	22.3%	43.1%	30.9%	22.0 mins	27.6 mins	0.4%	46.5%
45	75208	58.0	$68,000	$65,011	$1,161,349	12.0%	14.2%	11.0%	8.0%	71.7%	92.4%	9.4%	9.8%	75.2%	80.7%	86.7%	45.2%	43.1%	30.9%	26.2 mins	27.6 mins	50.2%	46.5%
46	75209	5.6	$103,130	$65,011	$1,161,349	5.9%	14.2%	11.0%	8.0%	71.7%	92.4%	8.0%	9.8%	93.9%	80.7%	86.7%	19.3%	43.1%	30.9%	21.2 mins	27.6 mins	54.4%	46.5%
47	75210	90.4	$32,852	$65,011	$1,161,349	23.3%	14.2%	11.0%	8.0%	71.7%	92.4%	15.6%	9.8%	61.9%	80.7%	86.7%	41.2%	43.1%	30.9%	38.8 mins	27.6 mins	28.0%	46.5%
48	75211	89.3	$50,368	$65,011	$1,161,349	20.4%	14.2%	11.0%	8.0%	71.7%	92.4%	10.2%	9.8%	60.1%	80.7%	86.7%	70.3%	43.1%	30.9%	27.1 mins	27.6 mins	49.8%	46.5%
49	75212	93.7	$42,115	$65,011	$1,161,349	23.9%	14.2%	11.0%	8.0%	71.7%	92.4%	15.2%	9.8%	60.3%	80.7%	86.7%	59.3%	43.1%	30.9%	25.2 mins	27.6 mins	49.7%	46.5%
50	75214	5.4	$104,583	$65,011	$1,161,349	6.1%	14.2%	11.0%	8.0%	71.7%	92.4%	7.1%	9.8%	95.9%	80.7%	86.7%	13.7%	43.1%	30.9%	24.8 mins	27.6 mins	51.0%	46.5%
51	75215	76.9	$32,077	$65,011	$1,161,349	28.5%	14.2%	11.0%	8.0%	71.7%	92.4%	18.9%	9.8%	73.4%	80.7%	86.7%	23.7%	43.1%	30.9%	26.8 mins	27.6 mins	27.4%	46.5%
52	75216	94.1	$31,063	$65,011	$1,161,349	32.0%	14.2%	11.0%	8.0%	71.7%	92.4%	19.5%	9.8%	70.7%	80.7%	86.7%	39.3%	43.1%	30.9%	30.8 mins	27.6 mins	46.0%	46.5%
53	75217	90.2	$44,384	$65,011	$1,161,349	27.0%	14.2%	11.0%	8.0%	71.7%	92.4%	8.4%	9.8%	56.5%	80.7%	86.7%	68.1%	43.1%	30.9%	36.1 mins	27.6 mins	54.3%	46.5%
54	75218	7.4	$95,500	$65,011	$1,161,349	6.8%	14.2%	11.0%	8.0%	71.7%	92.4%	10.2%	9.8%	91.7%	80.7%	86.7%	23.8%	43.1%	30.9%	24.7 mins	27.6 mins	58.1%	46.5%

Master Demo

Appendix Hii: Zip Code Demographic Characteristics (75218 – 75249)

I19 8%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	Dallas County Zip Codes	Health Equity Index (HNT)	Median Income level (HNT)	Median Income level in Dallas (HNT)	Median Income level In North Texas (HNT)	People Living Below Poverty Level (HNT)	People Living Below Poverty Level In Dallas (HNT)	People Living Below Poverty Level In North Texas (HNT)	People Living Below Poverty Level Healthy people 2030 Target (HNT)	Adults With Health Insurance Dallas County (HNT)	People With Health Insurance Healthy People 2030 Target (HNT)	People Living With Disability (HNT)	People Living With Disability North Texas (HNT)	Persons With High School Diploma (HNT)	Persons With High School Diploma Dallas County (HNT)	Persons With High School Diploma North Texas (HNT)	Population With Language Other Than English Spoken At Home (HNT)	Population with language other than English spoken at home in Dallas County (HNT)	Polpulation With Language Other Than English Spoken At Home North Texas (HNT)	Mean Travel Time (HNT)	Mean Travel Time Dallas County (HNT)	Homeownership (HNT)	Homeownership Dallas County (HNT)
54	75218	7.4	$95,500	$65,011	$1,161,349	6.8%	14.2%	11.0%	8.0%	71.7%	92.4%	10.2%	9.8%	91.7%	80.7%	86.7%	23.8%	43.1%	30.9%	24.7 mins	27.6 mins	58.1%	46.5%
55	75219	9.2	$81,205	$65,011	$1,161,349	9.2%	14.2%	11.0%	8.0%	71.7%	92.4%	7.6%	9.8%	94.0%	80.7%	86.7%	26.9%	43.1%	30.9%	22.2 mins	27.6 mins	26.2%	46.5%
56	75220	91.4	$51,125	$65,011	$1,161,349	19.5%	14.2%	11.0%	8.0%	71.7%	92.4%	7.7%	9.8%	57.5%	80.7%	86.7%	74.3%	43.1%	30.9%	27.1 mins	27.6 mins	27.6%	46.5%
57	75223	74.2	$61,505	$65,011	$1,161,349	15.9%	14.2%	11.0%	8.0%	71.7%	92.4%	9.4%	9.8%	62.1%	80.7%	86.7%	64.7%	43.1%	30.9%	27.7 mins	27.6 mins	40.0%	46.5%
58	75224	89.6	$46,137	$65,011	$1,161,349	18.9%	14.2%	11.0%	8.0%	71.7%	92.4%	13.5%	9.8%	63.5%	80.7%	86.7%	57.5%	43.1%	30.9%	28.4 mins	27.6 mins	47.8%	46.5%
59	75225	1.9	$169,547	$65,011	$1,161,349	3.6%	14.2%	11.0%	8.0%	71.7%	92.4%	7.0%	9.8%	98.7%	80.7%	86.7%	8.2%	43.1%	30.9%	19.2 mins	27.6 mins	71.6%	46.5%
60	75226	41.4	$60,290	$65,011	$1,161,349	24.6%	14.2%	11.0%	8.0%	71.7%	92.4%	14.1%	9.8%	76.9%	80.7%	86.7%	44.5%	43.1%	30.9%	25.3 min	27.6 mins	6.6%	46.5%
61	75227	68.2	$49,744	$65,011	$1,161,349	16.3%	14.2%	11.0%	8.0%	71.7%	92.4%	9.3%	9.8%	69.9%	80.7%	86.7%	55.2%	43.1%	30.9%	31.9 mins	27.6 mins	54.1%	46.5%
62	75228	71.8	$51,018	$65,011	$1,161,349	19.4%	14.2%	11.0%	8.0%	71.7%	92.4%	8.2%	9.8%	72.1%	80.7%	86.7%	52.8%	43.1%	30.9%	30.4 mins	27.6 mins	42.1%	46.5%
63	75229	18.8	$107,886	$65,011	$1,161,349	8.7%	14.2%	11.0%	8.0%	71.7%	92.4%	7.3%	9.8%	80.6%	80.7%	86.7%	43.2%	43.1%	30.9%	24.4 mins	27.6 mins	62.8%	46.5%
64	75230	6.0	$105,045	$65,011	$1,161,349	5.1%	14.2%	11.0%	8.0%	71.7%	92.4%	10.4%	9.8%	96.5%	80.7%	86.7%	18.7%	43.1%	30.9%	20.0 mins	27.6 mins	55.3%	46.5%
65	75231	65.7	$45,052	$65,011	$1,161,349	21.0%	14.2%	11.0%	8.0%	71.7%	92.4%	8.6%	9.8%	81.6%	80.7%	86.7%	46.1%	43.1%	30.9%	26.8 mins	27.6 mins	14.3%	46.5%
66	75232	72.5	$48,768	$65,011	$1,161,349	21.0%	14.2%	11.0%	8.0%	71.7%	92.4%	19.7%	9.8%	81.6%	80.7%	86.7%	30.0%	43.1%	30.9%	21.9 mins	27.6 mins	63.2%	46.5%
67	75233	89.4	$57,018	$65,011	$1,161,349	24.9%	14.2%	11.0%	8.0%	71.7%	92.4%	10.4%	9.8%	71.6%	80.7%	86.7%	52.2%	43.1%	30.9%	27.3 mins	27.6 mins	50.0%	46.5%
68	75234	25.8	$74,932	$65,011	$1,161,349	9.6%	14.2%	11.0%	8.0%	71.7%	92.4%	8.1%	9.8%	80.1%	80.7%	86.7%	52.9%	43.1%	30.9%	22.6 mins	27.6 mins	55.3%	46.5%
69	75235	68.4	$49,805	$65,011	$1,161,349	20.9%	14.2%	11.0%	8.0%	71.7%	92.4%	10.2%	9.8%	75.1%	80.7%	86.7%	54.6%	43.1%	30.9%	23.4 mins	27.6 mins	21.7%	46.5%
70	75236	59.2	$44,462	$65,011	$1,161,349	17.8%	14.2%	11.0%	8.0%	71.7%	92.4%	13.4%	9.8%	77.9%	80.7%	86.7%	35.7%	43.1%	30.9%	24.2 mins	27.6 mins	27.0%	46.5%
71	75237	87.1	$33,740	$65,011	$1,161,349	28.9%	14.2%	11.0%	8.0%	71.7%	92.4%	16.0%	9.8%	82.3%	80.7%	86.7%	16.3%	43.1%	30.9%	26.6 mins	27.6 mins	12.0%	46.5%
72	75238	18.4	$68,361	$65,011	$1,161,349	8.0%	14.2%	11.0%	8.0%	71.7%	92.4%	7.9%	9.8%	90.0%	80.7%	86.7%	26.4%	43.1%	30.9%	26.5 mins	27.6 mins	46.3%	46.5%
73	75240	77.5	$49,460	$65,011	$1,161,349	19.8%	14.2%	11.0%	8.0%	71.7%	92.4%	6.7%	9.8%	72.0%	80.7%	86.7%	57.5%	43.1%	30.9%	23.2 mins	27.6 mins	21.6%	46.5%
74	75241	78.7	$38,792	$65,011	$1,161,349	28.0%	14.2%	11.0%	8.0%	71.7%	92.4%	23.3%	9.8%	80.1%	80.7%	86.7%	23.0%	43.1%	30.9%	34.4 mins	27.6 mins	56.9%	46.5%
75	75243	61.9	$43,673	$65,011	$1,161,349	21.7%	14.2%	11.0%	8.0%	71.7%	92.4%	9.2%	9.8%	85.1%	80.7%	86.7%	42.8%	43.1%	30.9%	27.5 mins	27.6 mins	22.3%	46.5%
76	75244	7.0	$100,485	$65,011	$1,161,349	3.4%	14.2%	11.0%	8.0%	71.7%	92.4%	7.5%	9.8%	96.4%	80.7%	86.7%	28.6%	43.1%	30.9%	22.9 mins	27.6 mins	43.6%	46.5%
77	75246	57.9	$42,722	$65,011	$1,161,349	29.6%	14.2%	11.0%	8.0%	71.7%	92.4%	14.9%	9.8%	80.4%	80.7%	86.7%	34.2%	43.1%	30.9%	26.5 mins	27.6 mins	13.7%	46.5%
78	75247	94.8	$17,361	$65,011	$1,161,349	74.4%	14.2%	11.0%	8.0%	71.7%	92.4%	37.6%	9.8%	71.3%	80.7%	86.7%	18.4%	43.1%	30.9%	66.5 mins	27.6 mins	0.0%	46.5%
79	75248	10.7	$91,270	$65,011	$1,161,349	3.8%	14.2%	11.0%	8.0%	71.7%	92.4%	8.9%	9.8%	96.1%	80.7%	86.7%	20.4%	43.1%	30.9%	23.4 mins	27.6 mins	46.8%	46.5%
80	75249	21.0	$76,345	$65,011	$1,161,349	5.6%	14.2%	11.0%	8.0%	71.7%	92.4%	9.5%	9.8%	88.3%	80.7%	86.7%	30.1%	43.1%	30.9%	30.7 mins	27.6 mins	75.7%	46.5%

Master Demo

Appendix Hiii: Zip Code Demographic Characteristics (75249 – 75254)

I19 8%

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	Dallas County Zip Codes	Health Equity Index (HNT)	Median Income level (HNT)	Median Income level in Dallas (HNT)	Median Income level In North Texas (HNT)	People Living Below Poverty Level (HNT)	People Living Below Poverty Level In Dallas (HNT)	People Living Below Poverty Level In North Texas (HNT)	People Living Below Poverty Level Healthy people 2030 Target (HNT)	Adults With Health Insurance Dallas County (HNT)	People With Health Insurance Healthy People 2030 Target (HNT)	People Living With Disability (HNT)	People Living With Disability North Texas (HNT)	Persons With High School Diploma (HNT)	Persons With High School Diploma Dallas County (HNT)	Persons With High School Diploma North Texas (HNT)	Population With Language Other Than English Spoken At Home (HNT)	Population with language other than English spoken at home in Dallas County (HNT)	Polpulation With Language Other Than English Spoken At Home North Texas (HNT)	Mean Travel Time (HNT)	Mean Travel Time Dallas County (HNT)	Homeownership (HNT)	Homeownership Dallas County (HNT)
80	75249	21.0	$76,345	$65,011	$1,161,349	5.6%	14.2%	11.0%	8.0%	71.7%	92.4%	9.5%	9.8%	88.3%	80.7%	86.7%	30.1%	43.1%	30.9%	30.7 mins	27.6 mins	75.7%	46.5%
81	75251	24.1	$78,245	$65,011	$1,161,349	4.4%	14.2%	11.0%	8.0%	71.7%	92.4%	13.8%	9.8%	98.0%	80.7%	86.7%	18.6%	43.1%	30.9%	24.0 mins	27.6 mins	0.0%	46.5%
82	75253	82.3	$46,716	$65,011	$1,161,349	26.5%	14.2%	11.0%	8.0%	71.7%	92.4%	11.8%	9.8%	60.0%	80.7%	86.7%	67.3%	43.1%	30.9%	36.6 mins	27.6 mins	60.7%	46.5%
83	75254	31.5	$62,569	$65,011	$1,161,349	16.2%	14.2%	11.0%	8.0%	71.7%	92.4%	7.4%	9.8%	89.3%	80.7%	86.7%	36.7%	43.1%	30.9%	22.8 mins	27.6 mins	17.1%	46.5%

Appendix I

Educational Guide and Exercise One

Balanced Scorecard Educational Guide

Scorecards are tools used for tracking performance in healthcare to facilitate improvements in health outcomes. These tools involve the use of reliable metrics that focus on differences in quality of care and can be used to track performance for reimbursement and compliance purposes. They facilitate communication about performance with patients, healthcare teams, and communities. They facilitate the improvement of internal processes that promote the learning and growth of healthcare organizations by increasing provider engagement, which increases informed decision-making based on data. To improve care, scorecards have been used in various health sectors, including primary care, cardiology, mental health, nursing homes, and general surgery to improve care (Terhaar, 2021).

The balanced scorecard (BSC) developed in this project highlights the impact of social determinants of health (SDOH) on the performance of colorectal cancer (CRC) screening among Hispanic adults in Dallas County. It also includes a demographic spreadsheet (Master Demo) that shows the demographic characteristics of each zip code. The BSC is color-coded to reflect the level of performance of SDOH characteristics in each Dallas County zip code compared to the benchmark, North Texas: Red, poor performance; yellow, good performance; green, excellent performance. It takes less than five minutes to screen for SDOH using the BSC and demographic spreadsheet and to identify patient needs. The steps in using the BSC include the following.

1. Identify the patient's zip code from the BSC (Exercise 1, Step 1).
2. Identify the health equity index for the zip code (Exercise 1, Step 1).

3. Identify the CRC screening performance for the zip code from the BSC and the screening rate from the "master indicator" spreadsheet (Exercise 1, Steps 1 and 1a).
4. If CRC screening is worse than the benchmark (red), screening for SDOH is performed by identifying demographic characteristics for that zip code using the demographic spreadsheet to capture the possible factors for poor screening performance (Exercise 1, Step 2).
5. Develop a plan of care based on the identified demographic characteristics and potential needs of the population in the patient's zip code (Exercise 1, Step 2).

Ongoing Data Management

There is an opportunity to update the BSC with new evidence-based and publicly available data from the CDC's BRFSS, THCIC, and HNT databases to enhance the assessment of performance improvement and sustainability over time.

BRFSS Database: The CDC's BRFSS is a reliable source of evidence-based data used by the CDC to lead research and science to protect the health of the population in the United States (CDC, 2022).

HNT Database: The HNT database, like the BRFSS, is another reliable source of community health data files, open to the public for research to improve healthcare practice; therefore, no permission to access a database is required (Conduent Healthy Communities Institute, 2023).

THCIC Database: This database contains research files that are available to researchers. The data can be accessed to update the BSC.

Appendix Ii

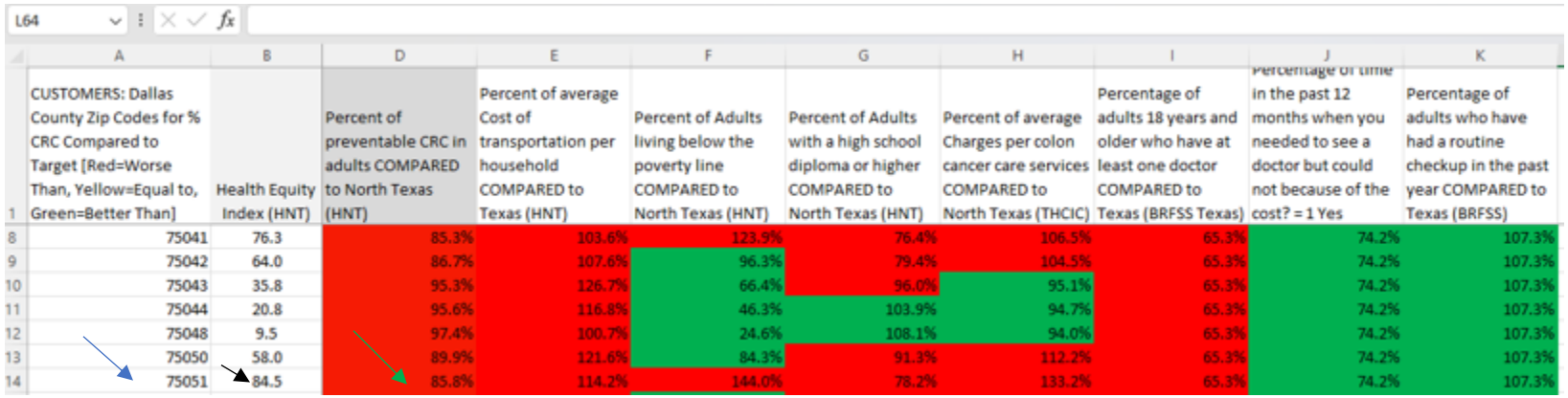
Exercise One

BSC Exercise 1: Use the BSC tool to screen for SDOH and develop a care plan for the population in zip code *75051*.

Step 1.

Identify the patient's zip code and the corresponding HEI and CRC screening rates as compared to the benchmark from the BSC, as shown below:

BSC



	A	B	D	E	F	G	H	I	J	K
1	CUSTOMERS: Dallas County Zip Codes for % CRC Compared to Target [Red=Worse Than, Yellow=Equal to, Green=Better Than]	Health Equity Index (HNT)	Percent of preventable CRC in adults COMPARED to North Texas (HNT)	Percent of average Cost of transportation per household COMPARED to Texas (HNT)	Percent of Adults living below the poverty line COMPARED to North Texas (HNT)	Percent of Adults with a high school diploma or higher COMPARED to North Texas (HNT)	Percent of average Charges per colon cancer care services COMPARED to North Texas (THCIC)	Percentage of adults 18 years and older who have at least one doctor COMPARED to Texas (BRFSS Texas)	Percentage of time in the past 12 months when you needed to see a doctor but could not because of the cost? = 1 Yes	Percentage of adults who have had a routine checkup in the past year COMPARED to Texas (BRFSS)
8	75041	76.3	85.3%	103.6%	123.9%	76.4%	106.5%	65.3%	74.2%	107.3%
9	75042	64.0	86.7%	107.6%	96.3%	79.4%	104.5%	65.3%	74.2%	107.3%
10	75043	35.8	95.3%	126.7%	66.4%	96.0%	95.1%	65.3%	74.2%	107.3%
11	75044	20.8	95.6%	116.8%	46.3%	103.9%	94.7%	65.3%	74.2%	107.3%
12	75048	9.5	97.4%	100.7%	24.6%	108.1%	94.0%	65.3%	74.2%	107.3%
13	75050	58.0	89.9%	121.6%	84.3%	91.3%	112.2%	65.3%	74.2%	107.3%
14	75051	84.5	85.8%	114.2%	144.0%	78.2%	133.2%	65.3%	74.2%	107.3%

Note. blue arrow indicates the patient's zip code (75051); the black arrow indicates the corresponding HEI of the zip code; and the green arrow is pointing to the screening performance for the zip code as compared to North Texas. HEI = 84.5 (indicating high socioeconomic factors that cause low health outcomes); CRC screening performance is coded red (indicates screening in this zip code is below the average rates compared to North Texas)

Step 1a.

Identify screening rate for the zip code as shown below:

Master Indicator Spreadsheet

	A	B	C	D	E	F	G	H	I	J	K	L	M	
1	Dallas County Zip Codes	Health Equity Index (HNT)	Adults 45+ who received recommended CRC screening (HNT)	Adults 45+ who received recommended CRC screening in North Texas (HNT)	Percent of preventable CRC in adults (HNT)	Percent of preventable CRC in adults in North Texas (HNT)	Average Cost of transportation per household (HNT)	Average Cost of transportation per household in Texas (HNT)	Adults living below the poverty line (HNT)	Adults living below the poverty line in North Texas (HNT)	Adults with a high school diploma or higher (HNT)	Adults with a high school diploma or higher in North Texas (HNT)	Average Charges per colon cancer care services (THCIC)	Avera Charg colon care North (THCI
2	75001	17.8	62.4%	58.9%	64.7%	66.1%	$14,868	$10,286	7.8%	13.4%	95.3%	86.7%	$5,408	
3	75006	35.2	56.7%	58.9%	61.2%	66.1%	$14,461	$10,286	5.6%	13.4%	82.0%	86.7%	$6,743	
4	75019	2.3	62.4%	58.9%	64.4%	66.1%	$14,002	$10,286	2.2%	13.4%	97.7%	86.7%	$5,898	
5	75038	25.5	57.0%	58.9%	61.7%	66.1%	$13,003	$10,286	8.1%	13.4%	93.6%	86.7%	$6,781	
6	75039	5.2	63.3%	58.9%	65.4%	66.1%	$10,196	$10,286	1.5%	13.4%	99.2%	86.7%	$6,718	
7	75040	41.3	53.8%	58.9%	59.1%	66.1%	$12,763	$10,286	8.3%	13.4%	75.1%	86.7%	$6,497	
8	75041	76.3	50.4%	58.9%	56.4%	66.1%	$10,652	$10,286	16.6%	13.4%	66.2%	86.7%	$6,777	
9	75042	64.0	50.9%	58.9%	57.3%	66.1%	$11,068	$10,286	12.9%	13.4%	68.8%	86.7%	$6,648	
10	75043	35.8	58.7%	58.9%	63.0%	66.1%	$13,028	$10,286	8.9%	13.4%	83.2%	86.7%	$6,054	
11	75044	20.8	59.1%	58.9%	63.2%	66.1%	$12,011	$10,286	6.2%	13.4%	90.1%	86.7%	$6,025	
12	75048	9.5	61.4%	58.9%	64.4%	66.1%	$10,356	$10,286	3.3%	13.4%	93.8%	86.7%	$5,982	
13	75050	58.0	54.5%	58.9%	59.4%	66.1%	$12,511	$10,286	11.3%	13.4%	79.2%	86.7%	$7,138	
14	75051	84.5	50.3%	58.9%	56.7%	66.1%	$11,745	$10,286	19.3%	13.4%	67.8%	86.7%	$8,476	

Note. Row 14 shows the CRC screening rates and the percentage of preventable CRC for the zip code (75051). The screening rate was 50.3%, as compared with 58.9% in North Texas.

Step 2.

Identify demographic variables for the zip code (75051), as shown in row 14.

Demographic Spreadsheet

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W
1	Dallas County Zip Codes	Health Equity Index (HNT)	Median Income level (HNT)	Median Income level in Dallas (HNT)	Median Income level In North Texas (HNT)	People Living Below Poverty Level (HNT)	People Living Below Poverty Level In Dallas (HNT)	People Living Below Poverty Level In North Texas (HNT)	People Living Below Poverty Level Healthy people 2030 Target (HNT)	Adults With Health Insurance Dallas County (HNT)	People With Health Insurance Healthy People 2030 Target (HNT)	People Living With Disability (HNT)	People Living With Disability North Texas (HNT)	Persons With High School Diploma (HNT)	Persons With High School Diploma Dallas County (HNT)	Persons With High School Diploma North Texas (HNT)	Population With Language Other Than English Spoken At Home (HNT)	Population with language other than English spoken at home in Dallas County (HNT)	Polpulation With Language Other Than English Spoken At Home North Texas (HNT)	Mean Travel Time (HNT)	Mean Travel Time Dallas County (HNT)	Homeownership (HNT)	Homeownership Dallas County (HNT)
4	75019	2.3	$124,652	$65,011	$1,161,349	2.8%	14.2%	11.0%	8.0%	71.7%	92.4%	5.2%	9.8%	97.7%	80.7%	86.7%	39.5%	43.1%	30.9%	24.3 mins	27.6 mins	64.4%	46.5%
5	75038	25.5	64,678	$65,011	$1,161,349	11.2%	14.2%	11.0%	8.0%	71.7%	92.4%	5.4%	9.8%	93.6%	80.7%	86.7%	50.5%	43.1%	30.9%	22.6 mins	27.6 mins	16.6%	46.5%
6	75039	5.2	$99,156	$65,011	$1,161,349	4.8%	14.2%	11.0%	8.0%	71.7%	92.4%	4.2%	9.8%	99.2%	80.7%	86.7%	44.5%	43.1%	30.9%	20.9 mins	27.6 mins	13.8%	46.5%
7	75040	41.3	$65,141	$65,011	$1,161,349	11.8%	14.2%	11.0%	8.0%	71.7%	92.4%	7.8%	9.8%	75.1%	80.7%	86.7%	53.8%	43.1%	30.9%	29.4 mins	27.6 mins	66.0%	46.5%
8	75041	76.3	$58,945	$65,011	$1,161,349	19.7%	14.2%	11.0%	8.0%	71.7%	92.4%	7.2%	9.8%	66.2%	80.7%	86.7%	66.5%	43.1%	30.9%	30.0 mins	27.6 mins	57.4%	46.5%
9	75042	64.0	$53,919	$65,011	$1,161,349	15.0%	14.2%	11.0%	8.0%	71.7%	92.4%	7.6%	9.8%	68.8%	80.7%	86.7%	65.4%	43.1%	30.9%	26.5 mins	27.6 mins	54.5%	46.5%
10	75043	35.8	$66,211	$65,011	$1,161,349	11.0%	14.2%	11.0%	8.0%	71.7%	92.4%	10.8%	9.8%	83.2%	80.7%	86.7%	38.7%	43.1%	30.9%	31.8 mins	27.6 mins	57.6%	46.5%
11	75044	20.8	$78,701	$65,011	$1,161,349	9.9%	14.2%	11.0%	8.0%	71.7%	92.4%	8.7%	9.8%	90.1%	80.7%	86.7%	43.4%	43.1%	30.9%	29.5 mins	27.6 mins	63.1%	46.5%
12	75048	9.5	$114,256	$65,011	$1,161,349	2.7%	14.2%	11.0%	8.0%	71.7%	92.4%	8.6%	9.8%	93.7%	80.7%	86.7%	27.6%	43.1%	30.9%	31.1 mins	27.6 mins	88.4%	46.5%
13	75050	58.0	$64,435	$65,011	$1,161,349	14.3%	14.2%	11.0%	8.0%	71.7%	92.4%	8.4%	9.8%	79.2%	80.7%	86.7%	51.0%	43.1%	30.9%	26.2 mins	27.6 mins	40.7%	46.5%
14	75051	84.5	$42,675	$65,011	$1,161,349	21.0%	14.2%	11.0%	8.0%	71.7%	92.4%	14.0%	9.8%	67.8%	80.7%	86.7%	59.6%	43.1%	30.9%	27.3 mins	27.6 mins	43.7%	46.5%

Note. Row 14 shows the demographic characteristics and variables for the zip code 75051. The population in this zip code has a low median income, high poverty level, lower education level, high disability level, and high population with languages other than English compared to Dallas County and North Texas. This indicates that care for this population must be tailored to the educational, economic, and language/cultural needs of the population in this zip code. For this population, it may be beneficial for providers to offer cost-effective screening, such as stool-based tests, rather than colon visualization procedures, language-appropriate education, and patient navigation, particularly for those with disabilities.

Appendix J: Human Subject Training

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UNIVERSITY OF TEXAS ARLINGTON

Human Subjects Protection Training (HSP): Training Completion Certificate

This document certifies that Joyce Acquah completed the training entitled "Human Subjects Protection Training (HSP)" on June 27th, 2023.

Training Start time: 06/27/2023 08:35 PM; Training End Time: 06/27/2023 08:59 PM

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