Catchment Analysis

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Rationale

The National Cancer Institute recently updated guidance for Community Outreach and Engagement (COE) for Comprehensive Cancer Centers. The guidelines are meant to enhance focus of COE on the catchment area served by the Cancer Center and programs will be evaluated on their success toward achieving these guidelines. Priorities under the guidelines include consideration of the needs of the catchment area in research across all programs (basic, clinical, translational and population sciences) and incorporation of input from community members and organizations in the catchment area to determine issues of particular relevance. The long-term goal is to reduce the cancer burden in the catchment area through cancer control efforts. One step required to improve understanding of the cancer burden is to analyze the demographics and cancer burden in the catchment area. In the following paragraphs, demographic and cancer data from the National Program of Cancer Registries (NPCR), the Minnesota Cancer Reporting System (MCRS), the Minnesota State Demography Center, and the Minnesota Department of Health were used to identify the needs of the catchment area, defined as the state of Minnesota.

Demographic Characteristics of the Minnesota Population

The state of Minnesota had a total population of 5,629,416 in 2018.[1] Overall, 80% of the Minnesota population is comprised of individuals of non-Hispanic white (NHW) race although the population is becoming more diverse. The percentage of individuals of NHW race decreases in younger age groups, with approximately 33% of individuals under the age of 10 reporting race/ethnicity of Black, Hispanic/Latino, Asian/Pacific Islander, American Indian/Alaskan Native or two or more races **(Figure 1)**. MN has a larger rural population than the national average (23% vs 15%, respectively).[2] Immigrants make up 8.2% of the Minnesota population, including the largest Somali immigrant population and the second largest Hmong immigrant population in the United States.[3,4]

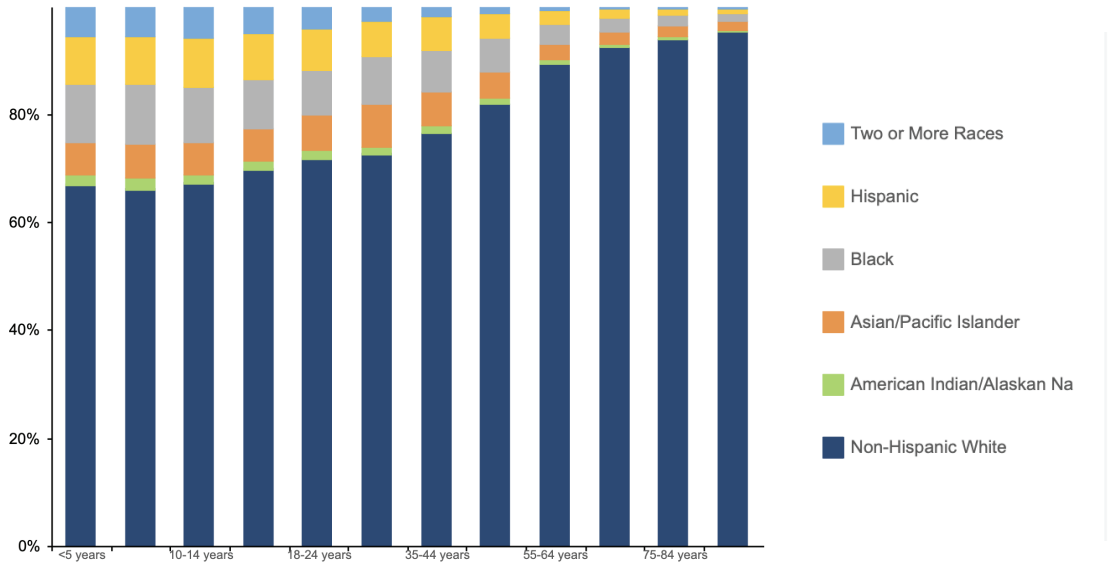

Figure 1. Distribution of race/ethnicity by age group in Minnesota.

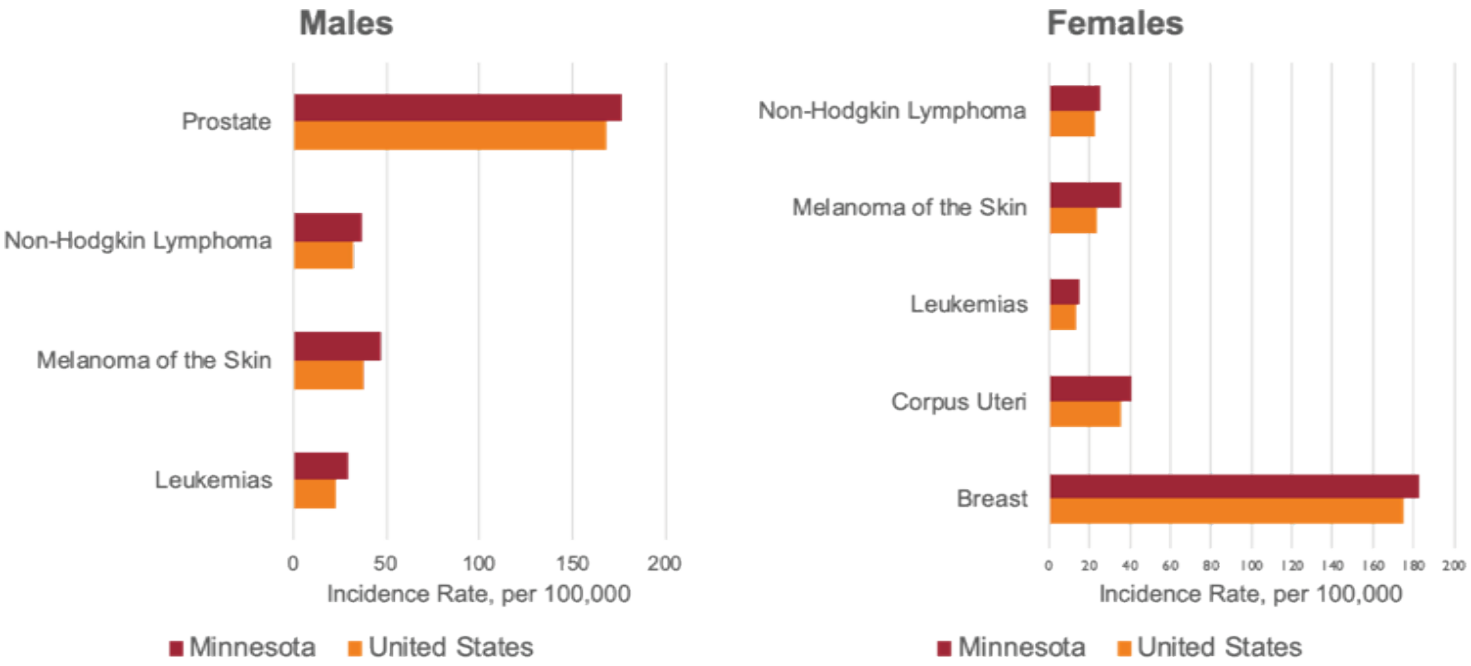

Figure 2. Cancers with higher incidence in Minnesota compared with the United States
Source: WONDER Online Database, 2008-2017

Comparison of Cancer Incidence and Mortality in Minnesota with the United States

Cancer incidence and mortality data from 2008-2016 were obtained from the WONDER Online Database for the state of Minnesota and the United States.[5] Sex-stratified incidence and mortality rates were compared for adults (ages 20+ years) and children (ages 0-19 years) to identify cancers with higher rates in Minnesota compared with the United States. For adults, the analysis was restricted to leading cancer sites as identified by CDC (brain and other nervous system, breast, cervix uteri, colon and rectum, corpus uteri, esophagus, gallbladder, kidney and renal pelvis, larynx, leukemias, liver, lung and bronchus, melanoma of the skin, myeloma, Non-Hodgkin lymphoma, oral cavity and pharynx, ovary, pancreas, prostate, stomach, thyroid, and urinary bladder.) For children, cancers were classified according to the International Classification of Childhood Cancer.[6]

In comparisons of cancer incidence, rates of non-Hodgkin lymphoma, melanoma, and leukemias were higher in both males and females in Minnesota when compared with the United States population **(Figure 2)**. In addition, rates of prostate cancer were higher in males while cancers of the breast and corpus uteri were higher in Minnesotan females.

In general, there were no large differences in mortality from specific cancers in Minnesotans compared with the population of the United States. Cancer mortality was higher in MN males for non-Hodgkin lymphoma, leukemias, kidney cancer and brain and other central nervous system tumors when compared with US males **(Table 1)**. For females, Minnesotans had higher mortality rates from non-Hodgkin lymphoma and cancers of the esophagus and corpus uteri **(Table 1)**.

For cancer in children, rates were similar in children in Minnesota compared with the United States overall. For females, there were no significant differences in incidence for any of the major childhood cancer subgroups. For males, slightly higher incidence rates were observed for the following ICCC subgroups in Minnesota compared with the United States: II. Lymphoma and reticuloendothelial neoplasms (38.9 vs 33.4 per 100,000); III. CNS and misc intracranial and intraspinal neoplasms (35.3 vs 34.1 per 100,000); IV. Sympathetic nervous system tumors (13.5 vs 9.1 per 100,000); and VI. Renal tumors (10.5 vs 6.6 per 100,000).

Table 1. Cancers with higher mortality rates in Minnesota compared with the United States		
Cancer	**Minnesota Mortality per 100,000 (95% CI)**	**United States Mortality per 100,000 (95% CI)**
Males		
Non-Hodgkin lymphoma	9.6 (9.2-10.1)	8.6 (8.5-8.6)
Leukemias	10.9 (10.4-11.4)	10 (9.9-10)
Kidney and renal pelvis	7.2 (6.8-7.6)	6.8 (6.8-6.9)
Brain and other central nervous system	7.3 (6.9-7.7)	6.8 (6.7-6.8)
Females		
Non-Hodgkin lymphoma	5.4 (5.1-5.7)	5.1 (5.1-5.2)
Esophagus	2.2 (2-3.3)	1.8 (1.8-1.8)
Corpus uteri	3.0 (2.8-3.3)	2.6 (2.6-2.6)

***CI: Confidence Interval**

Racial/Ethnic Disparities in Cancer Incidence and Mortality in Minnesota

Disparities in cancer incidence and mortality are observed both overall and for specific cancer types in Minnesota. For cancer overall, incidence rates are highest for the American Indian/Alaskan Native (AIAN) population and lowest for Asian/Pacific Islanders (API) **(Figure 3).**

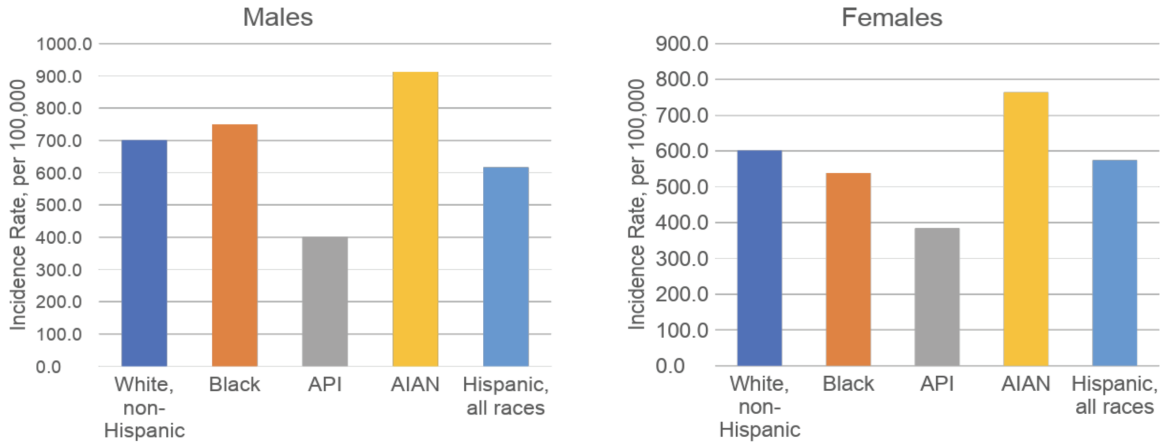

Figure 3. Cancer incidence overall by race and ethnicity. Source: Minnesota Cancer Reporting System, 2008-2017.

For specific cancers in males, notable disparities are observed for the AIAN population for colorectal, lung and kidney cancers **(Figure 4A).** Rates for prostate and pancreatic cancers were higher in the Black population and all groups had much higher rates of liver cancer when compared with non-Hispanic whites (NHW). Similar disparitities were observed in females, with high rates of colorectal, lung, kidney and cervical cancers in AIAN women **(Figure 4B).**

In addition to disparities in incidence rates, mortality associated with these cancers also differs by race and ethnicity, with poorer outcomes for colorectal and lung cancers in AIAN males and females when compared with NHW individuals. Black males and females have worse pancreatic cancer outcomes as compared with NHW males and females. Prostate cancer mortality rates are higher in AIAN and Black males and all groups have higher liver cancer mortality when compared with NHW men.

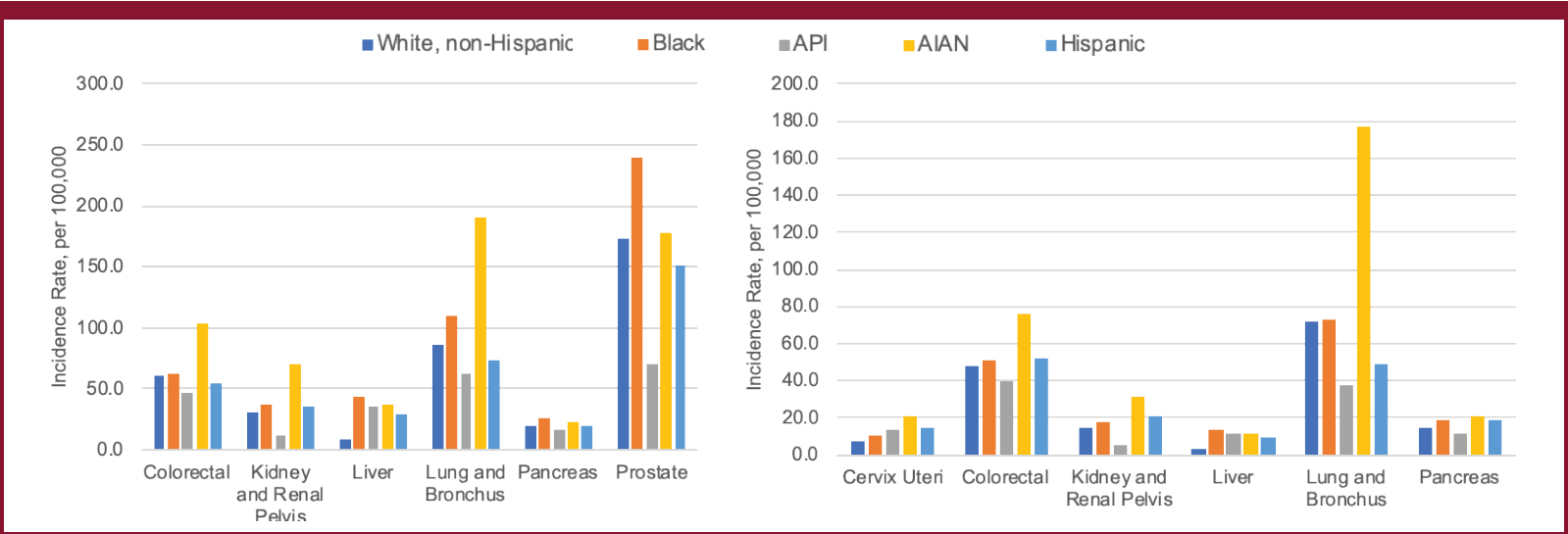

Figure 4. Incidence rates for specific cancers by race and ethnicity for males (A) and females (B).

Immigrant populations are also an important group to consider within the catchment area. A recent publication evaluating cancer rates in the Hmong population highlighted lower rates of cancer overall but higher rates of infection-related cancers (e.g., nasopharyngeal, stomach, liver and cervical cancers) in this population.[7] Data on cancer incidence and mortality in the Somali population are not readily availible. Obtaining relevant data to address this gap is a priority area going forward.

Geographic Variation in Cancer Incidence and Mortality in Minnesota

The rural population represents an important component of the MCC catchment area. Minnesota has a larger rural population than the national average (27% vs. 15%)[2]. This is relevant because individuals living in rural areas are older, have higher levels of poverty, lower levels of education, and often lack access to health care, all of which may impact cancer incidence and mortality[8]. Using data from the Minnesota Cancer Reporting System (MCRS; the state cancer registry), we identified differences in cancer incidence and mortality in comparisons of rural and urban populations **(Figure 5).**

Differences in cancer mortality were also observed, with higher mortality associated with kidney and colorectal cancers in males and females in rural areas and higher rates of prostate and lung cancers in males living in rural areas **(Figure 6).**

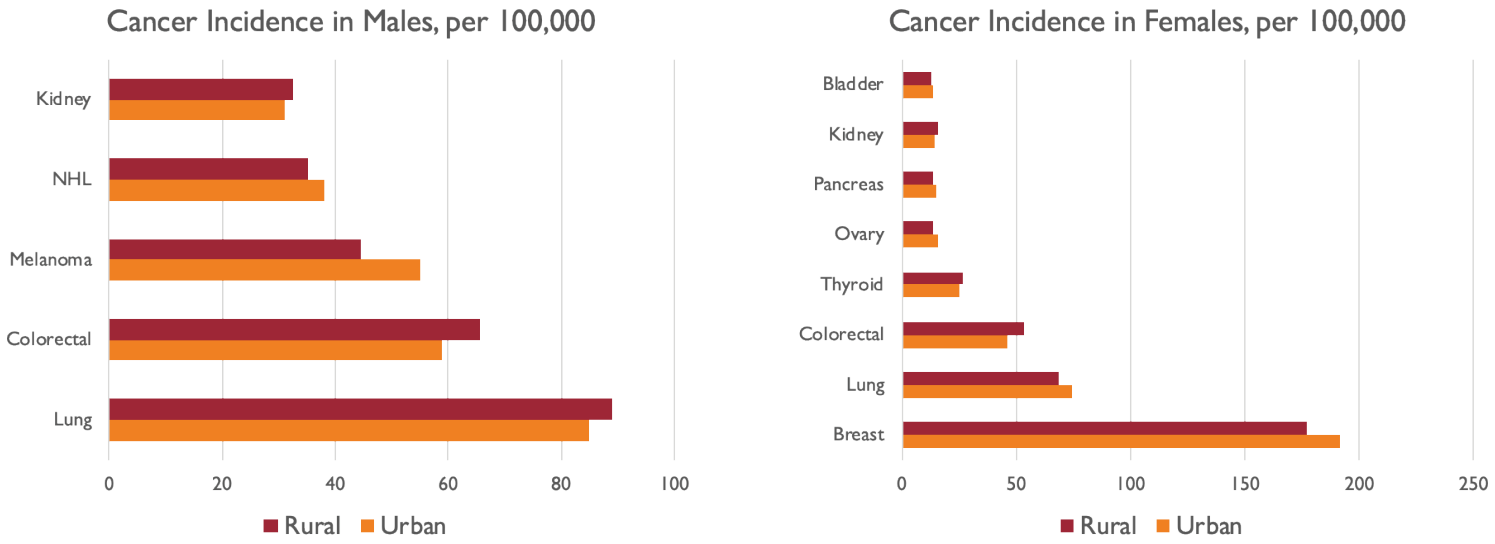

Figure 5. Incidence rates for cancers with different rates in males and females in rural vs. urban areas
Source: Minnesota Cancer Reporting System, 2008-2017

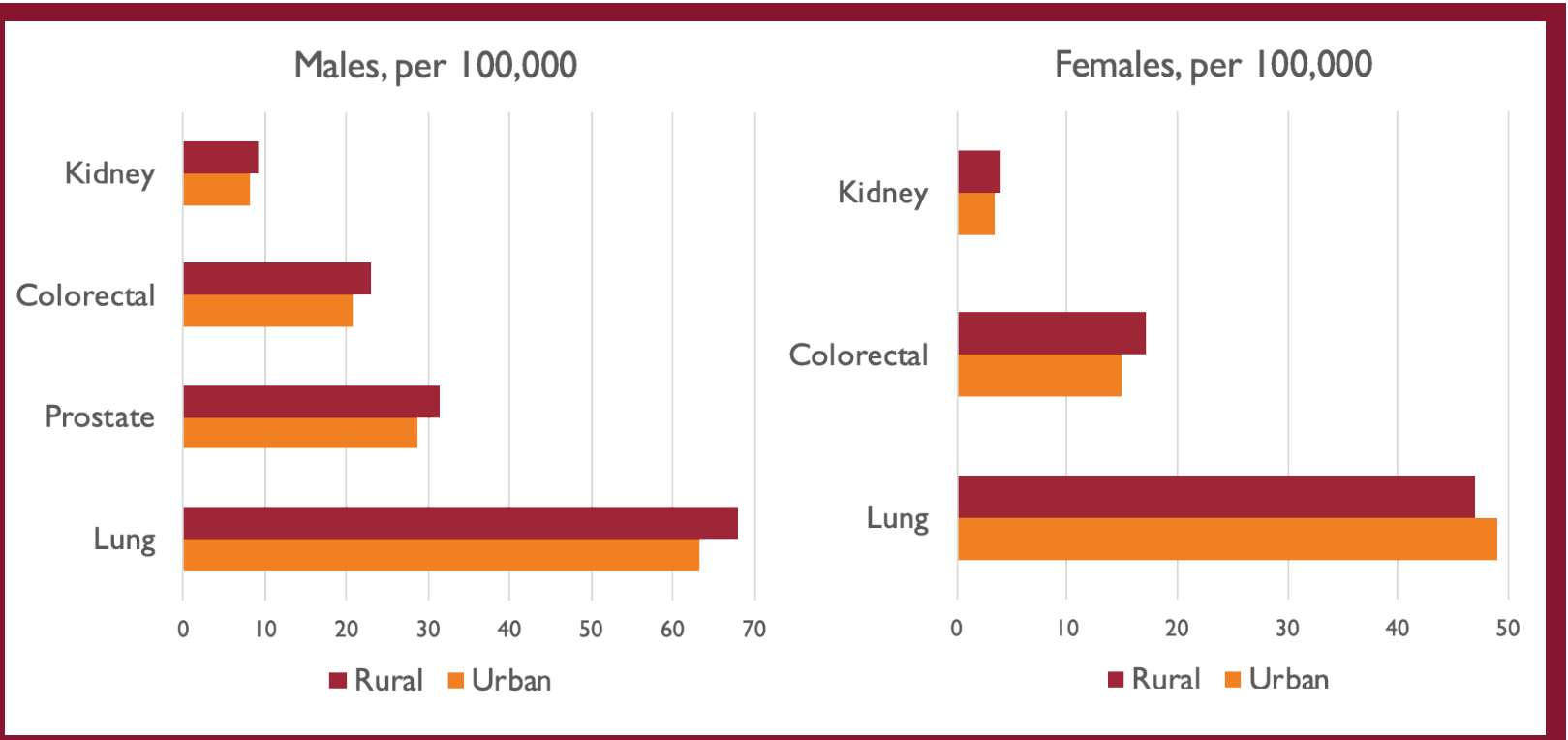

Figure 6. Cancers with mortality difference in rural vs. urban areas in males and females
Source: Minnesota Cancer Reporting System, 2008-2017

Cancer Screening Disparities

Statewide cancer screening rates are available from the Behavioral Risk Factor Surveillance System (BRFSS).[9] For colorectal cancer, 73% of Minnesotans ages 50-75 years met the U.S. Preventive Services Taskforce (USPSTF) guidelines which ranks 9th in the nation. Similarly, screening rates are high for breast and cervical cancer, with 71% and 87% of women up to date according to screening guidelines and ranking 16th and 15th in the nation, respectively. Despite the high rates overall, disparities in screening rates by race and ethnicity are observed, especially for colorectal cancer **(Figure 7)**. Colorectal cancer screening rates available from MN Community Measurement also highlight low screening rates in immigrant populations, with screening rates below 50% for individuals whose preferred language is Hmong, Somali or Spanish.[10]

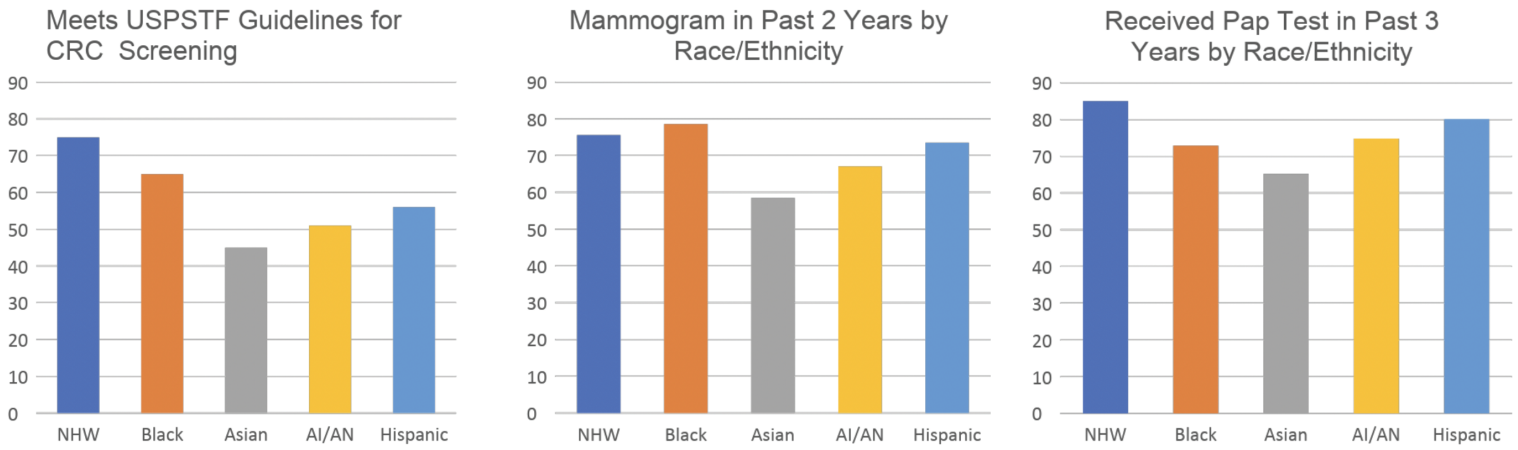

Figure 7. Cancer screening rates by race and ethnicity. Source: BRFSS Prevalence Data 2018

Cancer Survivors in Minnesota

Cancer prevalence data from the Minnesota Cancer Reporting System were used to estimate the number of cancer survivors in Minnesota. An individual is considered a cancer survivor from the time of diagnosis to the end of life.[11] Based on data from MCRS, there were 263,330 cancer survivors in Minnesota in 2015 representing 4.8% of the population.[12] As expected, the prevalence of cancer survivors increases with age and rises to greater than 15% in adults over age 65 years **(Figure 8).**

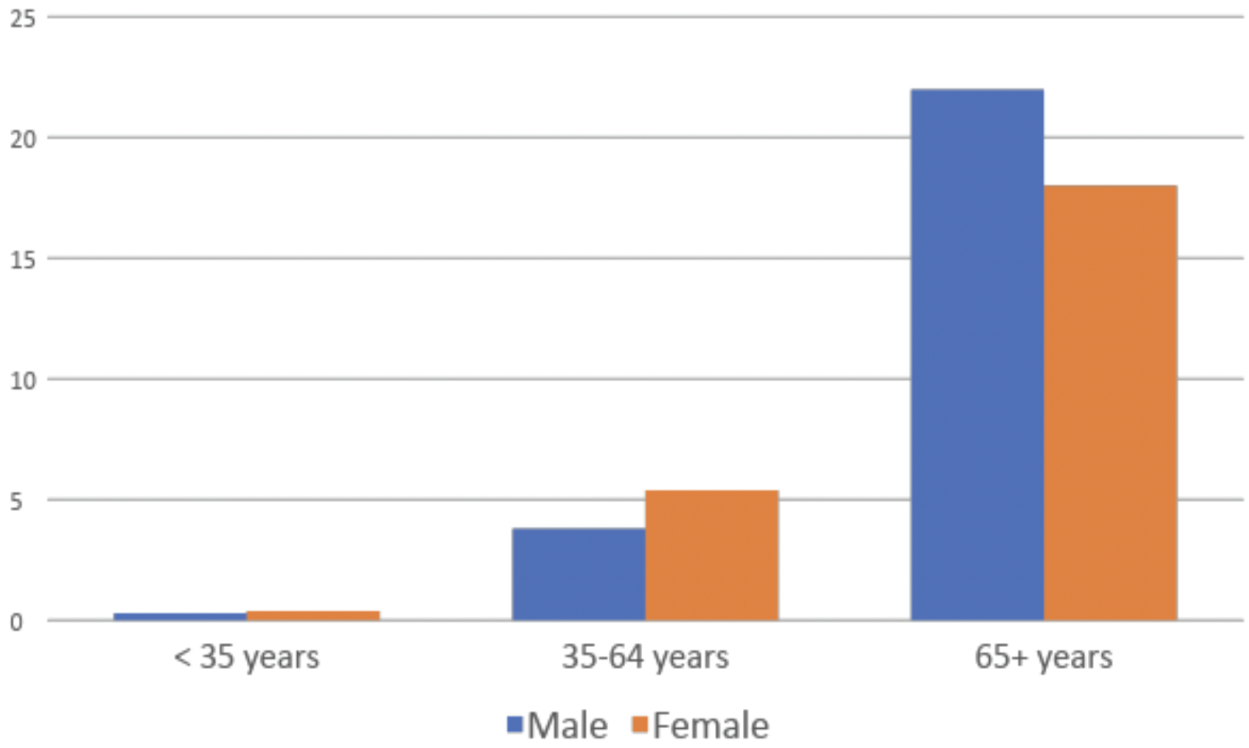

Figure 8. Lifetime Cancer Prevalence by Age Group and Sex in Minnesota.
Source: MDH Cancer Prevalence in Minnesota 2015

Relevant Environmental Exposures in the MCC Catchment Area

In addition to differences in cancer incidence and mortality rates, a number of relevant environmental exposures related to cancer also exist in the catchment area. One area of concern in the community is the potential role of PFAS exposure in carcinogenesis due to known exposure associated with manufacturing at 3M. The cancer risks are not conclusive although the CDC Agency for Toxic Substances and Disease Registry (ATSDR) notes a potential increase in risk of kidney and testicular cancers following exposure.[13] Taconite mining in the northeastern part of the state is also a unique exposure and has relevance given work from the Department of Environmental Health Sciences demonstrating an increased risk of mesothelioma in taconite mine workers.[14] Other relevant exposures include arsenic from private wells and radon, which are both cancer causing and have established geographic variation in Minnesota.

Recommendations for Priorities to Address Cancer Burden in the Catchment Area

Based on the initial analyses presented above, several areas stand out as potential areas of priority for the catchment area. These include:

1. Notable populations in Minnesota
- Large rural population
- Somali and Hmong immigrant populations
- American Indian population

2. Cancers with higher incidence in Minnesota compared with the United States
- Leukemia and non-Hodgkin lymphoma (NHL)
- Melanoma
- Prostate cancer in males
- Breast cancer in females

3. Cancers with disparities in Minnesota
- Colorectal and lung cancer incidence and mortality in the American Indian population
- Colorectal cancer incidence and mortality in the rural population
- Racial/ethnic disparities in prostate cancer mortality
- Racial/ethnic disparities in liver cancer incidence and mortality
- Infection related cancers in the Hmong population

4. Opportunities to address disparities through screening and behavioral factors
- Tobacco cessation and rates of cancer screening in the American Indian population
- Rural/urban differences in smoking, obesity and colorectal cancer screening
- Low rates of cancer screening in the Somali population

5. Environmental exposures relevant in the Minnesota population
- PFAS, taconite mining, arsenic and radon

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