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Montgomery County Breast Cancer Study: Demographic Analysis of Breast Cancer in Montgomery County, Ohio

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Abstract

Background: Disparities exist in cancer incidence and mortality between specific population groups in the United States. Breast cancer is the second most common form of cancer diagnosed in women. Breast cancer ranks as the second highest leading cause of death for women in the state of Ohio and in the United States. Perhaps more concerning, breast cancer is the leading cause of death for Hispanic women and ranks second for white, black, Asian, and Native American women. Specifically, women of low socioeconomic status (SES) have been shown to have lower rates of survival. **Methods**: A descriptive study of breast cancer primary prevention and early detection factors was conducted on Montgomery County women using acquired data sets and secondary sources of data. In addition, a descriptive analysis of women with breast cancer in Montgomery County was conducted. **Results:** Montgomery County had the highest breast cancer incidence compared to Ohio, the United States, and other Metropolitan counties in Ohio with similar population sizes and demographics. Additionally, Montgomery County had a high percentage of women who were diagnosed at a late stage. Chances of survival decrease as stages progress. Montgomery County has a lower median household income than either Ohio or the United States. It also has a higher percentage of families below the poverty level when compared to Ohio. SES is associated with an increased risk of developing and dying from cancer. Montgomery County has a high percentage of individuals who smoke tobacco and do not get any physical activity. Approximately 80 percent of women with breast cancer in Montgomery County survived. **Discussion:** The SES of women in Montgomery County, the high number of people who use tobacco, below average breast feeding numbers, and high percentage of obese and overweight individuals compounded with a higher percentage of individuals who do not get any exercise contribute to a high rate of breast cancer incidence in Montgomery County. Health disparities exist, but more data needs to be collected to confirm the correlation. African American women face higher mortality rates in Montgomery County than any other race. Interventions for Montgomery County specifically include smoking cessation programs, nutrition programs which address diet and physical activity, increased awareness for breastfeeding, and improved access to screening for minority populations.

Montgomery County Breast Cancer Study

Demographic analysis of breast cancer in Montgomery County, Ohio

The leading cause of death worldwide is cancer (malignant neoplasms). In 2007, it accounted for nearly 8 million deaths globally. Surprisingly, more than 50% of all cancer related deaths occur in developed countries (WHO, 2009). In 2006, the second leading cause of death in the United States was cancer, with 559,888 deaths (Centers for Disease Control and Prevention [CDC] "Death Statistics", 2006). Cancer prevention is a fundamental goal for public health agencies in the United States and worldwide.

Breast cancer will affect 1 in 8 women in their lifetime. It is the second most common form of cancer diagnosed in women, after skin cancer, at 119.3 per 100,000 women (CDC, 2010). In 2009, an estimated 192,370 new cases of invasive breast cancer were expected to be diagnosed in women in the United States as well as 62,280 new cases of non-invasive (in situ) breast cancer (Breast Cancer Statistics, 2010). In Ohio, there was an average of 8,030 cases of breast cancer annually from 2002-2006 (American Cancer Society [ACS], 2010).

There are essential concepts that public health agencies need to target in order to help prevent cancer. Primary steps include the implementation of efficient interventions to address the need for improved access to cancer screening, the elimination of barriers to healthcare for the unemployed/uninsured, the elimination of barriers to early detection and screening, and the unequal access to improved cancer treatments. Increased efficiency from public health agencies can decrease the incidence and mortality from cancer in the United States and for the entire world. Addressing the modifiable factors of disease can further decrease the incidence of cancer worldwide.

There are numerous risk factors for breast cancer. A risk factor is a variable associated with an increased risk of disease. There are both modifiable and non-modifiable risk factors for

breast cancer. Modifiable risk factors include alcohol use, obesity, age of childbirth, hormone replacement therapy, breastfeeding, exposure to radiation, physical activity, and oral contraceptive use. After tobacco abuse, dietary factors are the second most preventable cause of cancer death. It has been estimated that approximately 35% of all cancers can be prevented with appropriate diet (Danaei et al., 2005). Non-modifiable risk factors are age, gender, family history, genes, age of menarche, and menopause (National Cancer Institute [NCI], 2009).

Disparities exist in cancer incidence and mortality between specific population groups in the United States. For women, incidence rates are higher among white women but African American women are more likely to die from cancer. Breast cancer ranks as the second highest leading cause of death for women in the state of Ohio and in the United States (ACS, 2009). Perhaps more concerning, breast cancer is the leading cause of death for Hispanic women and ranks second for white, black, Asian, and Native American women (CDC, 2010). Specifically, women of low socioeconomic status (SES) have been shown to have lower rates of survival. A 2001 study analyzing the link between socioeconomic status and breast cancer found that socioeconomic status was directly related to breast cancer incidence. Hispanic and Asian women were at higher risk when of a lower SES than white and black women (Yost et al., 2001). Other studies have also yielded similar results. When looking at five-year survival rates for all cancer sites, people who lived in more affluent census tracts were more likely to survive longer than those in poorer census tracts (Ward et al., 2004). Similarly, black and Hispanic women of a lower socioeconomic status are at higher risk for being diagnosed at a late stage and therefore experience advance stage symptoms and higher mortality rates (Richardson et al., 1992).

The 2006 postcensal estimate population of Montgomery County was 550,564, 46% of which are aged 40 and older and 31% are age 50 and older. Cancer incidence increases with age.

Further, the population is 52% female and 77% white. Nationally and in Ohio as well, breast cancer incidence rates are higher among whites compared to blacks. Montgomery County has a lower median household income than either Ohio or the United States. It also has a higher percentage of families below the poverty level when compared to Ohio. For 2001-2005, Montgomery County had the highest breast cancer incidence compared to Ohio, the United States, and other Metropolitan counties in Ohio with similar population sizes and demographics. Additionally, Montgomery County had a higher percentage of women who were diagnosed with breast cancer at a late stage than the Ohio average. Generally, the later the stage when the cancer is diagnosed is correlated with increased mortality rates (Ohio Cancer Incidence Surveillance System, 2008).

The primary purpose of this study is to describe primary and secondary (early detection) breast cancer risk factors specific to Montgomery County, Ohio using available data sets and secondary data sources. The project aimed to determine the demographic characteristics of women with breast cancer in Montgomery County, Ohio. Additionally, the project addresses the prevalence of various risk factors associated with breast cancer patients in the county. Lastly, an objective of the project will be to describe socioeconomic related variables such as birth place, census tract data, primary payer at diagnosis, etc to determine if a relationship does exist between socioeconomic status and breast cancer incidence in Montgomery County. The goal is to provide relevant and useful data to aid in future programs and interventions essential to cancer prevention.

Literature Review

Breast cancer starts in the tissues of the breast. There are two types of breast cancer: ductal and lobular. Ductal, the majority of diagnosed breast cancers, starts in the tubes or ducts that move milk from the breast to the nipple. Lobular starts in parts of the breast, lobules, that produce milk. There are no symptoms for early stage breast cancer, which stresses the importance of routine screenings. As the cancer grows, the woman might notice a lump on her breast or near her armpit. She could feel changes in the size, feel, shape of the breast and nipple. Furthermore, she could experience fluid discharge from the nipple. Symptoms of an advanced stage of breast cancer vary from excessive bone pain to ulcers of the skin (Kelly & Levine, 1999).

Modifiable Risk Factors

Chronic alcohol consumption has a strong correlation with the development of cancers of the upper alimentary tract, oropharynx, larynx, esophagus, large intestine, and the liver. (Poschul, 2004). Alcohol is a known risk factor for breast cancer, especially in postmenopausal women. Regular consumption of alcohol can lead to an increased risk of developing breast cancer. Specifically, women who regularly consume alcohol are at higher risk of developing estrogen receptor/progesterone receptor positive breast cancer. In 1998, an analysis of six prospective studies with a total of 322,647 women who were evaluated for up to 11 years showed that alcohol consumption was associated with a linear increase in breast cancer (Smith-Warner et al., 1998). Furthermore, low to moderate alcohol intake increases the risk of many cancers in women. For every drink consumed per day, the increase in incidence for women in developed countries is 11 (per 1000 women) for breast cancer, 1 (per 1000 women) for cancers of the oral cavity and pharynx, 1 (per 1000 women) for cancer of the rectum, and 0.7 (per 1000

women) for cancers of the esophagus, larynx, and liver (Allen et al., 2009). Reducing alcohol consumption will reduce the risk of women in developing breast cancer.

There is a direct correlation between body mass index (BMI) and breast cancer. Obese women experience an increased risk for developing breast cancer after starting menopause (Ha, 2010). However, a higher weight and or BMI is associated with a reduced risk of developing breast cancer in pre-menopausal women. In a study of 73,542 premenopausal and 103,344 postmenopausal women the correlation between obesity/BMI and breast cancer was analyzed. For postmenopausal women who were not taking exogenous hormones, obesity was a significant risk factor in developing breast cancer whereas weight gain and BMI showed an inverse relationship with breast cancer in premenopausal women (Lahmann et al., 2004).

A controversial topic in the medical field has been the possible health effects from the "Western diet". It is particularly concerning to the women of the United States because their diets often are high in fat and low in fiber. Compound that with lack of physical activity, inadequate exercise and the timing of weight gain can significantly increase the incidence of breast cancer. The first time physical activity was linked to a decrease in incidence of breast cancer was in 1985, when Frish (2005) analyzed the decrease incidence of breast cancer in former college athletes. Since then, numerous studies have confirmed these results. In a population-based, case-control study including 918 case subjects with 918 age-matched control subjects found that recreational physical activity is associated with a decreased risk of breast cancer. Physical activity was measured by asking for the frequency of vigorous physical activity and subsequently assigning the duration and intensity of the workout (Verloop et al., 2000). Physical activity may exert its effects through changes in menstrual characteristics, alterations in immune function, and hormonal changes throughout the body. In 1997, a workshop was held to

analyze whether physical activity served as a protective factor for breast cancer (Friedenreich, 1998). The convention analyzed 21 previously conducted studies, which reported physical activity in relation to breast cancer outcomes. There was epidemiologic evidence from 15 of the 21 studies that physical activity reduces the risk of developing breast cancer. However, studies have been unable to quantify the effect physical activity has on breast cancer, for example, the intensity, duration, and frequency of activity (Friedenreich, 1998).

There are several pregnancy-related factors that affect the development of breast cancer. A woman has a lower risk of developing breast cancer the earlier she has her first child and the more children she has. Additionally, a woman who has her first child after the age of 30 has the same risk as a nulliparous woman, or a woman who never gave birth (NCI, 2009). Studies have shown that ductal breast carcinoma risk is highest among nulliparous woman and the risk decreases the younger the woman is when she has her first child. Conversely, the risk of infiltrating lobular breast carcinoma was similarly lower for nulliparous women but remained higher for women who had gave birth at an older age (Livolsi et al., 2006). Early age at menarche and late age of menopause have also been linked to an increase in the development of breast cancer. The long-term use of combined estrogen/progesterone hormone replacement therapy and the long-term use of oral contraceptives increase the risk breast cancer (NCI, 2009). Conversely, breastfeeding has shown to be a protective factor in the development of breast cancer. However, confounders do exist for studies about breastfeeding since women who tend to breast feed are usually more educated and have higher incomes (Kelsey, 1993).

Socioeconomic status was previously mentioned to have a relationship with breast cancer incidence and mortality. An indicator of SES, insurance status, also shows a relationship with last stage diagnosis and mortality. Women with private health insurance are more likely to be

screened for breast cancer and their treatment regimen may differ after initial diagnosis. Uninsured patients and those on federally assisted programs have shown to be diagnosed with advantaged stage cancer compared to those women with private insurance. Expectedly, women who were uninsured showed poorer survival outcomes which stresses the need from improved access to cancer screening for the uninsured (Ayanian, 1993).

The link between the use of tobacco and breast cancer has shown conflicting results and the etiology is not yet clear. Yet, literature exists that shows a moderate risk of breast cancer with duration of smoking. A series of cohort and case-control studies found that moderate or strong associations between breast cancer and smoking were found in 50% of the studies. Enough data exists to consider tobacco use as a preventable risk factor for breast cancer (Nagata, 2006).

Increased fruit and vegetable consumption is associated with a decreased risk of developing not only breast cancer but other cancers as well. The risk of developing cancer is doubled for people who do not meet the daily requirement of fruit and vegetables in their diet. Diets high in fruit and vegetables serve as a protective factor for cancer of the breast, lung, esophagus, larynx, oral cavity, pancreas, stomach, colon, bladder, cervical, ovarian, and endometrium (Block et al., 1992).

Mortality rates for the majority of causes of death are significantly higher for single women than for married women. Further, mortality rates for breast cancer are highest for single women when compared to other causes of death. The risk for single, young women can be twice as high as that for women who were ever married (Janerich et al., 1982). Three reasons have been identified as to why single women face higher mortality rates than married women. First, unmarried women are often diagnosed with late stage breast cancer. Second, unmarried women

are more likely not to undergo treatment. Lastly, unmarried women who undergo treatment face poor survival rates (Goodwill et al., 1987).

The later the stage at diagnosis for women with breast cancer the poorer chance of survival. Women who do not get routine mammograms are at a higher risk of developing breast cancer at a later stage- stressing the importance of routine screenings. The risk increases for older women. Older women who undergo routine mammograms are more likely to be diagnosed with early stage breast cancer and have greater chances for survival (McCarthy et al., 2000).

Non-modifiable Risk Factors

There are numerous risk factors for breast cancer that cannot be altered. The risk of developing breast cancer increases linearly with age. Breast cancer is strongly associated to gender as well. Men account for less than 1% of all breast cancers. Women are 100 times as likely to develop breast cancer as men (Giordano, 2002). As previously mentioned, early age at menarche and late age of menopause have been linked to an increase in the development of breast cancer (Kelsey, 1993).

Radiation is another nonmodifiable risk factor of breast cancer. There are numerous different types of radiation. The types of radiation, which have been linked to genetic damage and ultimately cancer, are ionizing radiation and ultraviolet radiation. People are generally exposed to ionizing radiation in three different mechanisms: natural background radiation from our solar system and soil, non-medical synthetic radiation which occurred from the testing of nuclear weapons above ground, and medical radiation arising from diagnostic tests and therapy (ACS, 2010). Particularly, women younger than the age of 20 are at a higher risk of developing radiation-associated breast cancer than at any other older age group. Ionizing radiation is an

established risk factor for breast cancer exhibiting a linear relationship as risk increases with exposure (Ronckers et al., 2004).

Family history also shows a strong correlation with risk of developing breast cancer. Research shows that as high as 20% of breast cancers are linked to family history of disease. Further, even if the relative is a third-degree relative the risk is still higher (Slattery, 1993).

Genetic mutations is a non-modifiable risk factor that can influence whether a woman develops breast cancer. The most prevalent genetic mutations are found in the BRCA1 and BRCA2 genes, which normally produce proteins that aid in protecting from cancer. However, if a woman receives a defective gene from one of her parents, the risk increases significantly. Women with BRCA mutations have up to an 80% chance of developing breast cancer (Foulkes, 2003).

Methods

A descriptive study of breast cancer primary prevention and early detection factors was conducted on Montgomery County women using acquired data sets and secondary sources of data. In addition, a descriptive analysis of women with breast cancer in Montgomery County was conducted. Prevalence of risk factors and breast cancer incidence and mortality rates were calculated from data sets or retrieved from existing data sources. Montgomery is classified as a Metropolitan county, and when possible, data from Montgomery County was compared to counties of similar regional demographics, as well as comparisons to Ohio and the United States. The counties used for comparison included Lucas, Stark, and Summit Counties.

The primary breast cancer prevention factors assessed for Montgomery County women included: race, age, income, insurance status, breastfeeding, age at first birth, heavy drinking,

smoking, weight, fruit and vegetable consumption, and physical activity. Secondary data sources for the primary prevention factors are listed below.

- United States Census Bureau
- Ohio Health Jurisdiction Cancer Profiles, Ohio Cancer Incidence Surveillance System, Ohio Department of Health
- Ohio Family Health Survey, 2004
- 2008 Pediatric Nutrition Surveillance Ohio
- 2008 Healthy Ohio Community Profiles
- 2006 Behavioral Risk Factor Surveillance System

For breastfeeding and age at first birth, vital statistic data for Montgomery County, 2006-2008 was analyzed.

The early detection factors assessed for Montgomery County included: incidence rates for female breast cancer, overall and by stage of diagnosis; incidence and mortality rates for all cancer sites; invasive female breast cancer rate; staged female breast cancer percents; average annual number and percent of female breast cancer cases, by stage at diagnosis; female breast cancer mortality; and percent of women receiving a mammogram every two years. Secondary data sources for the early detection factors are listed below.

- Ohio Health Jurisdiction Cancer Profiles, Ohio Cancer Incidence Surveillance System, Ohio Department of Health
- Ohio Public Information Warehouse, Ohio Department of Health
- Cancer Incidence and Mortality Among Ohio Residences, 2001-2005. Ohio Cancer Incidence Surveillance System, Ohio Department of Health, March 2008.

In addition the Ohio Cancer Incidence and Surveillance System (OCISS) data for women in Montgomery County with breast cancer was obtained through an internal review board, and

was used to calculate incidences and prevalence of breast cancer by the stage of cancer at diagnosis.

The data acquired from OCISS was also used to create a descriptive analysis of the women with breast cancer. Factors analyzed included race, age at diagnosis, marital status, primary payer at diagnosis, tobacco use, alcohol use, family history of cancer, breast cancer staging, breast cancer survival, and socioeconomic status (SES). Primary payer at diagnosis was used to analyze the data for a possible relationship between SES and breast cancer incidence.

Results

1. Primary Prevention Factors

Table 1. ***Average Annual Population Estimates for Montgomery County by Age Group, Gender, and Race, 2001-2005***[1,3]

Age Group	Gender		Race		Total Population[2]
	Male	Female	White	Black	
<20	75.845	72,921	105,705	40,184	148,766
20+	188,873	212,925	318,956	75,164	401,798
40+	116,033	138,416	206,261	44,181	254,449
50+	75,598	95,575	140,578	28,208	171,173
All ages	264,718	285,846	424,661	115,349	550,564

[1]Vintage 2006 postcensal estimates for July 1, 2001-2005, U.S. Census Bureau, 2007

[2]Total population includes whites, blacks, and all additional races.

[3]Table adapted from Montgomery County Cancer Profiles, Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2008

The 2001-2005 average annual population for Montgomery County is 550,564, of which 46 percent in age 40 and older and 31 percent is age 50 and older. The risk of cancer increases with advancing age. The population is 52 percent female and 77 percent white. Nationally and in Ohio as well, breast cancer incidence rates are higher among whites compared to blacks.

Table 2. ***Socioeconomic Profile of Montgomery County with Comparison to Ohio and the US***[1,2]

Socioeconomic Measure	**Montgomery County**	Ohio	US
Median Household Income ($)	**40,156**	40,956	41,994
% Families Below Poverty Level	**8.30%**	7.80%	9.20%
% No High School Diploma (Age 25+)	**16.50%**	17.00%	19.60%
% Female-headed Households with children <18	**8.40%**	7.30%	7.20%
% Uninsured[3,4]	**12.60%**	12.50%	17.30%

[1]Table adapted from Montgomery County Cancer Profiles, Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2008.
[2]Data Source: Census 2000 Demographic Profiles, U.S. Census Bureau, Summary File 1(SF1) and Summary File 3(SF3)
[3]Health Insurance Coverage in Ohio, 2004: *The Roles of Public and Private programs in Assuring Access to Health Care*. Results from the Ohio Family Health Survey. Ohio Department of Job and Family Services, March 2005.
[4]*Income, Poverty, and Health Insurance Coverage in the United States: 2004*. Current Population Reports, Consumer Income. U.S. Census Bureau, 2005.

Socioeconomic indicators associated with cancer risk are presented in Table 2. These factors: Low median household income and a high prevalence of families below the poverty level, persons with no high school diploma, female-headed households (witch children <18) and uninsured are associated with an increased risk of developing and dying from cancer. Montgomery County has a lower median household income than either Ohio or the United States. It also has a higher percentage of families below the poverty level when compared to Ohio

Table 3. ***Breast Cancer and Cancer Related Health Behaviors/Risk Factors***

County	2006 Population	% Ever Breastfed[a]	% Breastfed at least 6 months[a]	% Breastfed at least 12 months[a]	% Heavy Drinking [b]	% Current Smoker [b]	% Over weight [b]	% Obese [b]	% <5 Fruit/ Veg [b]	% No Physical Activity [b]
Montgomery	**550,564**	**50.8**	**16.7**	**11.0**	**4.7**	**22.0**	**34.4**	**27.3**	**78.1**	**26.4**
Lucas	451,464	42.8	17.1	11.7	4.3	23.9	37.7	26.4	82.7	23.2
Stark	379,775	39.8	11.8	7.8	4.1	25.1	35.5	28.3	77.1	23.8
Summit	546,103	49.4	14.0	8.6	5.7	22.0	35.7	25.2	77.5	22.1
Ohio	11,478,006	46.1	21.0	11.0	5.3	23.4	36.2	26.5	73.7	24.4
U.S.	298,362,973	59.8	25.4	17.5	5.1 [c]	17.9 [c]	36.2 [c]	26.9 [c]	76.6 [c]	25.0

[a]Data Source: 2008 Pediatric Nutrition Surveillance Ohio: http://www.odh.ohio.gov/healthStats/data/pednss/pednss.aspx
[b]Data Source: 2004-2007 Ohio Behavioral Risk Factor Surveillance System (BRFSS), ODH
[c]2009 data used

Counties showed little variation with regard to percent heavy drinking, percent current smoker, percent overweight, percent obese, percent <5 Fruit/Vegetables, and % no physical activity in a month. Montgomery County is below the national average for those women who have ever breast fed, breastfed at least 6 months, and breastfed at least 12 months. Breast cancer risk decreases for women who have ever breast fed and for longer periods of time. Montgomery County is also approximately four percentage points above the national average for those who smoke tobacco and also have more people who consume less than five fruits or vegetable servings a day. Breast cancer risk increases with smoking. Montgomery County also has a higher number of individuals who reported having no physical activity for a month. Breast cancer decreases with increases in physical activity.

Table 4. ***Breastfeeding at hospital discharge***[a]

	Breastfed at Discharge		Did Not Breastfeed		Unknown	
Category	n	%	n	%	n	%
Total	14096	65.1	7089	32.8	460	2.1
Race/Ethnicity						
Caucasian	10446	69.3	4372	29.0	256	1.7
African American	3169	52.7	2645	44.0	200	3.3
Native American	41	78.8	11	21.2	0	0.0
Chinese	34	77.3	9	20.5	1	2.3
Japanese	23	95.8	1	4.2	0	0.0
Filipino	71	93.4	4	5.3	1	1.3
Other API	308	86.8	45	12.7	2	0.6
Education						
< 8th Grade	234	50.1	222	47.5	11	2.4
9th through 12th grade	1529	41.0	2111	56.5	93	2.5
High School/GED	3209	55.8	2430	42.1	132	2.3
Some College	3593	70.4	1390	27.2	119	2.3
Associate Degree	1337	75.8	397	22.6	32	1.8
Bachelor's Degree	2777	87.5	360	11.3	38	1.2
Master's Degree	1178	87.5	155	11.5	14	1.0
Doctoral Degree	243	91.4	19	7.1	4	1.5
Age						
< 20	1386	51.9	1204	45.1	82	3.1
20-24	3586	58.1	2443	39.6	143	2.3
25-29	4468	68.7	1905	29.3	126	1.9
30-34	3102	74.6	988	23.8	68	1.6
35+	1554	72.5	549	25.6	39	1.8
Marital Status						
Married	8622	78.5	2187	19.9	176	1.6
Not Married	5474	51.4	4902	46.0	284	2.7
WIC						
Yes	5028	53.5	4147	44.1	223	2.4
No	9052	74.3	2933	24.1	198	1.6
Insurance						
Medicaid	4635	50.7	4280	46.8	230	2.5
Private Insurance	7977	77.6	2160	21.0	139	1.4
Self Pay	703	64.2	369	33.7	23	2.1
CHAMPUS or TRICARE	553	81.1	121	17.7	8	1.2
Other Government Ins	69	52.3	57	43.2	2	3.2
Other	45	72.6	15	24.2	2	3.2

[a]Data Source: Ohio Department of Health Birth Certificates, 2006-2007.

Breastfeeding serves as a protective factor for the development of breast cancer, or it decreases the incidence of breast cancer. In Montgomery County, the prevalence of breastfeeding at hospital discharge was 65.1 percent. There were large disparities in breastfeeding at discharge with regard to race, education, age, marital status, WIC participation, and Insurance at diagnosis. Although the sample size was small, Asians were most likely to breastfeed at discharge and African Americans were least likely. Education level showed a direct relationship with breastfeeding. Those who had obtained higher levels of education were more likely to breastfeed. Women who were 30-34 years of age, were married, and who did not participate in WIC were most likely to breastfeed. Additionally, those with private insurance or military insurance were more likely to breastfeed.

Table 5. ***Age at First Birth, 1995-2007***[a]

Category	n	Mean	Standard deviation
Total	8942	24.1	5.7
Race/Ethnicity			
Caucasian	6360	24.8	5.6
African American	2344	21.7	5.3
Native American	20	23.7	5.2
Chinese	21	28.8	3.7
Japanese	9	31.9	5.3
Filipino	31	29.4	7.1
Other API	155	27.8	4.7
Education			
< 8th Grade	182	17.7	3.8
9th through 12th grade	1644	18.9	3.3
High School/GED	2338	22.4	4.5
Some College	1999	24.4	5.2
Associate	641	27.6	4.8
Bachelor's Degree	1377	28.6	4.0
Master's Degree	613	29.9	3.7
Doctorate Degree	135	30.8	3.9
WIC[b]			
Yes	4027	21.1	4.1
No	4888	26.6	5.4
Insurance			
Medicaid	3628	20.9	3.9
Private Ins	4491	26.7	5.4
Self Pay	370	22.9	5.2
CHAMPUS or TRICARE	290	25.2	5.2
Other Government Ins	47	24.7	6.5
Other	20	24.8	5.6

[a]Data Source: Ohio Department of Health Birth Certificates, 1995-2007.
[b]WIC data only available for years 2006-2007.

Breast cancer risk increases with older age at first birth. The average age at first birth for women in Montgomery County was 24.1 years. African Americans, women with less than a 12th

grade education, and those receiving WIC services had a lower mean age at first birth. Additionally, women on Medicaid had a lower age of first birth than other insurances.

2. Early Detection Factors

Table 6. ***Average Annual Number and Age-adjusted Rates of Invasive Cancer Cases and Cancer Deaths for all Sites/Types in Montgomery County with Comparisons to Ohio and the US, 2001-5[1-2]***

	All Cancer Sites/Types			
	Incidence		Mortality	
Place	Cases	Rate per 100,000	Cases	Rate per 100,000
Montgomery	**2,796**	**462.2**	**1,228**	**200.6**
Lucas	2,216	479.1	1000	213.7
Stark	2,047	460.4	851	185.9
Summit	2,799	464.6	1,244	203.3
Ohio	56,415	465.1	24,845	203.3
United States		467.4		189.8

[1]Data Source: County Cancer Profiles, Ohio Cancer Incidence Surveillance System, Ohio Department of Health.
[2]Rates were calculated using vintage 2006 postcensal estimates for July 1, 2001-2005, (U.S. Census Bureau, 2007). Rates are direct age-adjusted to the U.S. 2000 standard population.

Invasive breast cancer has begun to break through normal tissue barriers and infiltrate the surrounding areas. Invasive breast cancer can spread to other areas of the body and also to vital organs. The Montgomery County cancer incidence rate for all sites/types combined (462.2/100,000) is lower than the incidence rate for the United States, Ohio, and all comparison counties except Stark. The cancer mortality rate for all sites/types combined is lower in Montgomery County (200.6 per 100,000), than in Ohio, but higher than the mortality rate for the United States. Higher mortality rates may be associated with a later stage at diagnosis, lack of access to care, inadequate treatment or other factors that should be addressed in cancer control initiatives.

Table 7. ***Female Breast Cancer Incidence, Mortality, Screening, and Late Stage Diagnosis for Montgomery and comparison counties, Ohio, and the United States***

		Rate per 100,000		Percent	
County	2006 Population	Incidence [a]	Mortality [a]	Mammogram past 2 years [c]	Late Stage DX [a]
Montgomery	**550,564**	**129.4**	**27.5**	**77.3**	**27.9**
Lucas	451,464	121.8	27.4	75.8	28.2
Stark	379,775	121.6	27.5	73.7	24.1
Summit	546,103	122.6	28.3	75.5	29.2
Ohio	11,478,006	121.9	27.5	75.4	27.3
U.S. [b]	298,362,973	126.1	25.0	76.5	29.6

[a]Data source: 2001-2005 Ohio Cancer Incidence Surveillance System, ODH
[b]Data source: SEER Program, National Cancer Institute (US data)
[c]Data source: 2004-2007 Ohio Behavioral Risk Factor Surveillance System (BRFSS), ODH

For 2001-2005, Montgomery County had the highest breast cancer incidence compared to Ohio, the United States, and other Metropolitan counties in Ohio with similar population sizes and demographics. For 2001-2005, Montgomery County had a higher breast cancer mortality rate (27.5 per 100,000) than the national average. Further, Montgomery County had the highest percentage of women who had a mammogram in the last two years. Montgomery County had a higher percentage of women who were diagnosed with breast cancer at a late stage than the Ohio average.

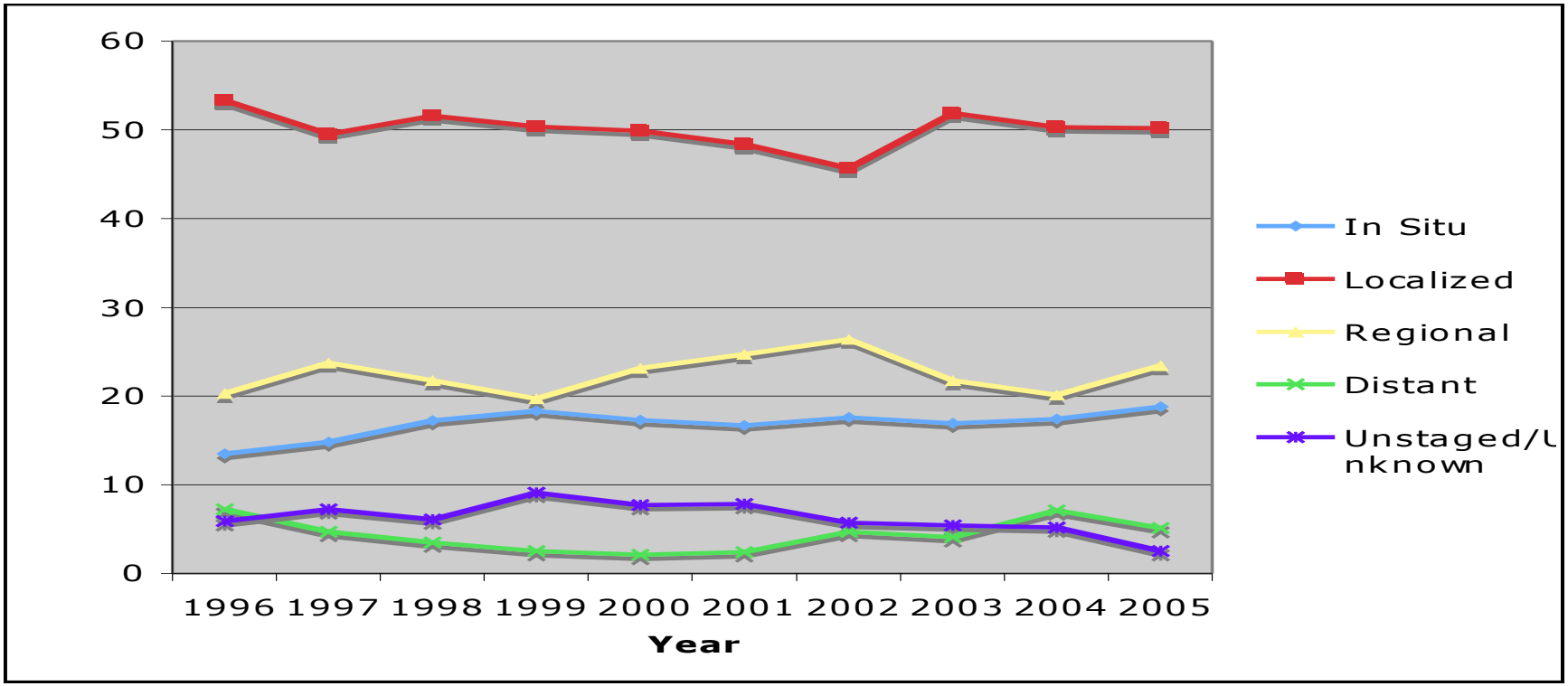
Table 8. ***Average Annual Number and Percent of Female Breast Cancer Cases, by County of Residence and Stage at Diagnosis, 2001-2005***[1]

	In Situ		Localized		Regional		Distant		Unstaged/Unknown		Total
	Cases	Percent	Cases	Percent	Cases	Percent	Cases	Percent	Cases	Percent	Cases
Montgomery	**91**	**17.5**	**257**	**49.3**	**121**	**23.2**	**24**	**4.6**	**28**	**5.4**	**521**
Lucas	75	19.4	188	48.6	93	24	18	4.7	13	3.3	387
Stark	87	23	180	47.6	81	21.4	10	2.7	20	5.3	378
Summit	75	15.6	248	51.5	122	25.3	19	3.9	18	3.7	482
Ohio	1,821	18.4	4,904	49.6	2,307	23.3	386	3.9	466	4.7	9,884

[1]Data Source: Cancer Incidence and Mortality Among Ohio Residences, 2001-2005. Ohio Cancer Incidence Surveillance System, Ohio Department of Health, March 2008.

Montgomery and Lucas County had the highest percent of distant stage at diagnosis. Distant stage is a late stage diagnosis, and is associated with higher mortality rates. Montgomery County had the lowest percent of in situ and localized stages at diagnosis (66.8 percent) of other metropolitan counties and Ohio. In situ and localized stages at diagnosis are considered early stage diagnoses. Lower percents of early stage diagnosis are associated with higher mortality rates.

Figure 1. **Staged Female Breast Cancer Trends, Montgomery County, Ohio, 1996-2005**[a]



[a]Data Source: Ohio Department of Health, Ohio Public Health Information Warehouse, http://publicapps.odh.ohio.gov/pwh/pwhmain.aspx

The stages of breast cancer diagnosis are highest for the localized stage (early), followed by regional (late), in situ (early), unknown, and distant (late). The cancer stages, in order of increasing spread, are in situ, localized, regional, and distant. In situ and localized tumors are referred to as early-stage tumors, and regional and distant tumors are referred to as late-stage tumors.

TABLE 9. Incidence rates for female breast cancer, by stage at diagnosis[ab]

US	1999	2000	2001	2002	2003
Stage at diagnosis	Rate	Rate	Rate	Rate	Rate
In situ	28	28.6	29.2	29.3	28.5
Localized	82.1	79.4	79.1	77.2	71.9
Regional	38.7	38.4	38.8	38.1	36.3
Distant	5.9	5.8	5.7	5.5	5.4
Unstaged	7.3	7.1	6.8	6.3	5.7

Montgomery County	1996		1997		1998		1999		2000		2001		2002		2003		2004		2005	
Stage at diagnosis -	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n	Rate	n
In situ	21.3	62	28.2	82	32.3	94	30.3	88	28.6	83	29.2	85	31	90	31	90	31.3	91	34.1	99
Localized	84.3	245	94.3	274	96.7	281	83.6	243	82.6	240	85	247	80.5	234	95.3	277	90.5	263	90.5	263
Regional	31.9	93	45.1	131	40.6	118	32.7	95	38.2	111	43.3	126	46.4	135	39.9	116	36.1	105	42.3	123
Distant	11.4	33	8.9	26	6.5	19	4.1	12	3.4	10	4.1	12	8.3	24	7.6	22	12.7	37	9.3	27
Unstaged	9.3	27	13.8	40	11.4	33	15.1	44	12.7	37	15.1	40	9.9	29	9.9	29	9.3	27	4.5	13

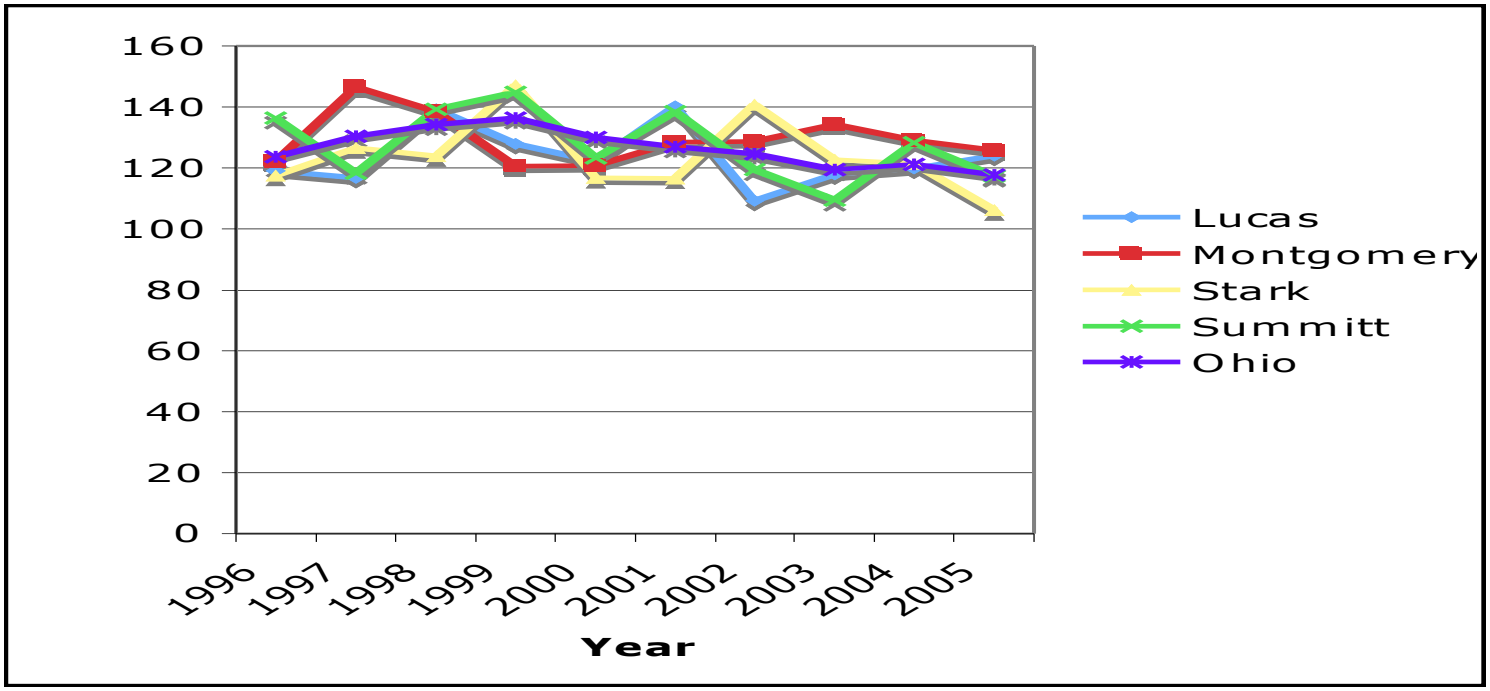
Montgomery County	1996-2000	2001-2003	2004-2005
Stage at diagnosis -	Rate	Rate	Rate
In situ	28.1	30.4	32.7
Localized	88.3	86.9	90.5
Regional*	37.7	42.6	39.2
Distant	6.9	6.6	11.0
Unstaged*	12.5	11.3	6.9

*Compare to US data.

[a] New cases diagnosed per 100,000 females
[b] Data Sources: Ohio Cancer Incidence Surveillance System (OCISS), 1996-2006, ODH; Centers for Disease Control and Prevention (CDC). MMWR 2007;56 (US data)
[c] Incidence calculated using 2000 Census Data

- Rates of In situ, Localized, Regional, Distant, and Unknown cancer stages for Montgomery County are higher than US data.

***Figure 2*. Invasive Female Breast Cancer Incidence Trend of Montgomery and other metropolitan counties of Ohio, 1995-2005[a].**



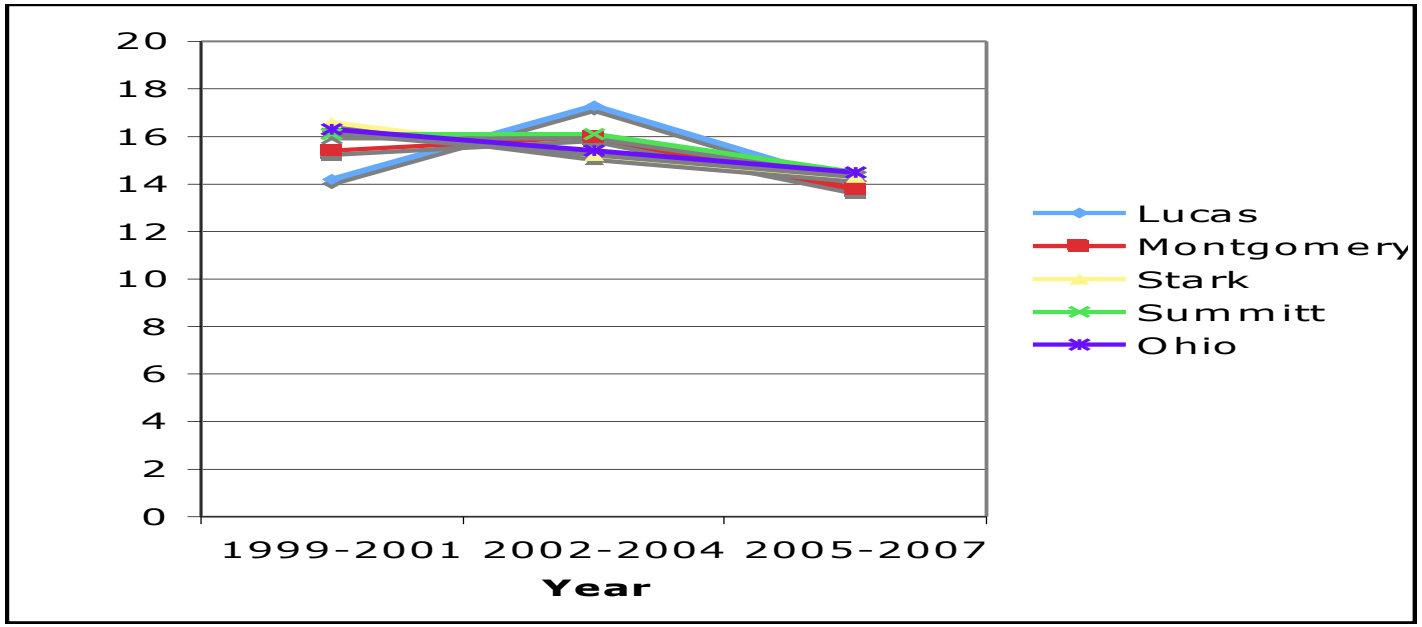
[a]Data Source: Ohio Department of Health, Ohio Public Health Information, http://publicapps.odh.ohio.gov/pwh/pwhmain.aspx

A somewhat consistent trend seen for the counties although some variation exists. Ohio data is more stable, most likely due to larger number of cases.

Notes:
Invasive Cancer -- A malignant tumor that has infiltrated the tissue of the organ of origin.

Malignant -- A cancerous condition. Malignant tumors can invade and destroy nearby tissue and spread to other parts of the body.

Figure 3. **Female Breast Cancer Mortality trend of Montgomery and other metropolitan counties in Ohio, 1999--2007[a]**



[a]Data Source: Ohio Department of Health, Ohio Public Health Information Warehouse, http://publicapps.odh.ohio.gov/pwh/pwhmain.aspx

For 2005-2007, Montgomery County had the lowest Mortality rate when compared to similar metropolitan counties and the state average.

***Figure 4*. Average Annual Age-adjusted Incidence Rates of Invasive Female Breast Cancer, by Census Tract, in Montgomery County, 1996-2005[1-4]**

[1] Data Source: County Cancer Profiles Ohio Cancer Incidence Surveillance System, Ohio Department of Health, 2008.
[2] Rates are per 100,000 and were calculated using vintage 2006 intercensal estimates for July 1, 1996-1999 and postcensal estimates for July 1, 2000-2005, (U.S. Census Bureau, 2007). Rates are direct age-adjusted to the U.S. 2000 standard population.
[3] NOTE: Large census tracts may appear to have higher rates and risks due to their size—interpret with caution.
[4] Cut points for rate quartiles were derived from the distribution for the State of Ohio.
*Rates may be unstable and are not presented when the count for 1996-2005 is less than five (i.e., average annual count is <1). A small number (less than 1%) of unusually high outlying incidence rates are also not present

Larger census tracts seem to have the highest rates of breast cancer incidence. However, as noted above, they may appear to have higher rates due to their size. There is no trend or particular region which seems to have a higher rate of breast cancer incidence according to census tract quartiles.

3. Descriptive Analysis of Women With Breast Cancer in Montgomery County

Table 10. ***Characteristics of Montgomery County Women with Breast Cancer 1996-2006***[1]

	Total		Early Stage Diagnosis		Late Stage Diagnosis	
Category	n	%	n	%	n	%
Total	5619	100.0	3754	100.0	1524	100.0
Demographics						
Race/Ethnicity						
Caucasian	4175	74.3	2808	74.8	1120	73.5
African American	866	15.4	551	14.7	259	16.9
Other/Unknown	576	10.3	395	10.5	145	9.5
Age at Diagnosis						
< 30	16	0.3	3	<.1	10	0.7
30-39	226	4.0	124	3.3	92	6.0
40-49	850	15.1	556	14.8	264	17.3
50-59	1233	21.9	830	22.1	352	23.1
60-69	1315	23.4	913	24.3	328	21.5
70-79	1258	22.4	871	23.2	324	21.3
80-89	627	11.2	419	11.2	127	8.3
90+	94	1.7	38	1.0	27	1.8
Marital Status						
Single	555	9.9	368	9.8	165	10.8
Married	2760	49.1	1893	50.4	762	50.0
Divorced/Separated	648	11.5	420	11.2	199	13.1
Widowed	1282	22.8	853	22.7	315	20.7
Unknown	326	5.8	188	5.0	75	4.9
Primary Payer at Diagnosis						
Not insured	111	1.9	66	1.8	40	2.6
Private insurance	1675	29.8	1159	30.9	483	31.7
Medicaid	109	1.9	62	1.7	43	2.8
Medicare	2290	40.8	1634	43.5	582	38.2
Military	38	0.7	28	0.7	10	0.7
Insured NOS	727	12.9	494	13.2	216	14.2
Unknown	584	10.4	291	7.8	143	9.4

Risk Factors						
Tobacco Use						
Never	2091	37.2	1447	38.5	599	39.3
Current tobacco use	1826	32.5	1277	34.0	518	34.0
Previous tobacco use	690	12.3	488	13.0	183	12.0
Unknown	935	16.6	520	13.9	218	14.3
Alcohol Use						
No history	1541	27.4	1049	27.9	461	30.2
Current use of alcohol	1165	20.7	833	22.2	315	20.7
Past history of alcohol use	58	1.0	34	.9	21	1.4
Unknown	1179	20.9	701	18.7	283	18.6
Family History of Cancer						
No	1541	27.4	1049	27.9	461	30.2
Yes	2340	41.6	1684	44.9	625	41.0
Unknown	1560	27.8	938	25.0	406	26.6
Other						
Breast Cancer Survival[2]						
Yes	4510	80.3	3288	87.6	1110	72.8
No	399	7.1	132	5.4	194	7.3

[1]Data Source: Ohio Department of Health, Ohio Cancer Incidence Surveillance System, 1996-2006.
[2]No Survival included all cancer-related deaths.

Women with breast cancer in Montgomery County were predominantly of Caucasian race, 50-79 in age, married, had Medicare as their insurance, 32.5 percent currently use tobacco, and had no alcohol use history but did have a family history of cancer. Approximately 80 percent of women with breast cancer in Montgomery County survived. A majority of women with breast cancer were diagnosed when the cancer was localized. A total of 66.8 percent of breast cancer patients were diagnosed at an early stage of cancer. Only small numerical differences were seen in demographic characteristics of women who were diagnosed with breast cancer at an early stage versus a late stage.

Table 11. ***SES indicators: Industry and Occupational codes defined by Census.*** [1]

SES indicator	Data Collected (%)	Data not Collected (%)
Industry	2.3	97.7
Occupational	2.4	97.6

[1]Data Source: Ohio Department of Health, Ohio Cancer Incidence Surveillance System, 1996-2006.

Little data was collected to further examine SES and breast cancer incidence and mortality. Industry and Occupational information can be useful in identifying possible occupational and industrial hazards as well as establishing SES categories. There was much data collected as free form text but analysis of this data would be very difficult and not very useful without predetermined census categories.

Table 12. ***Analyzing health disparities by Race.*** [1]

Race	Alive	%	Dead	%
Caucasian	3317	73.5	307	76.9
African American	668	14.8	69	17.3
Other/Unknown	525	11.6	23	5.8
Total	4510	100.0	399	100.0

[1]Data Source: Ohio Department of Health, Ohio Cancer Incidence Surveillance System, 1996-2006.

There is a significant health disparity among the African American population. From 1996-2006, approximately 15 percent of women diagnosed with breast cancer in Montgomery County were African American. The mortality rate over that time period was approximately 17 percent.

Table 13. ***Current and history of Tobacco use analyzed with Breast Cancer deaths.*** [1]

Tobacco Use	**Dead**	**%**
Never Used	125	34.2
Current Use	120	32.9
Previous Use	48	13.1
Unknown	73	19.9
Total	366	100.0

[1]Data Source: Ohio Department of Health, Ohio Cancer Incidence Surveillance System, 1996-2006.

Table 14. ***Current and history of Alcohol use analyzed with Breast Cancer deaths.*** [1]

Alcohol Use	**Dead**	**%**
Never Used	217	60.6
Current Use	50	13.9
Previous Use	9	2.5
Unknown	82	22.9
Total	358	100.0

[1]Data Source: Ohio Department of Health, Ohio Cancer Incidence Surveillance System, 1996-2006.

There is no significant disparity between the percent of women with breast cancer who drink alcohol and smoke tobacco in Montgomery County and the percent of women who exhibit these behaviors and have died from breast cancer.

Discussion

Primary Prevention Factors

Primary breast cancer risk factors evaluated included demographics (race, age, socioeconomic status) and cancer related health factors (smoking, alcohol, overweight, obesity, physical activity, fruit and vegetable consumption, age at first birth, and breastfeeding).

For socioeconomic status, Montgomery County had a lower mean income than Ohio and the United States. Montgomery had a higher percentage of families below the poverty level than Ohio but less than the national average. Montgomery also had a higher percentage of female-headed households with children under the age of eighteen. The percentage of uninsured in Montgomery County was more than the Ohio average, but significantly less than the national average. These socioeconomic indicators can contribute to an increased incidence of breast cancer. Montgomery County has a higher incidence of breast cancer than comparable metropolitan counties, Ohio, and the United States. Possible causes for the below poverty level averages can be attributed to the decline in manufacturing in the region and the rise of unemployment. On a positive note, the data does not show an increased mortality rate due to the increases in the socioeconomic indicators.

Montgomery County showed little variation with regard to percent heavy drinking, percent current smoker, percent overweight, percent obese, percent <5 Fruit/Vegetables, and % no physical activity in a month. Montgomery County was below the national average for women who had ever breastfed, who had breastfed at least 6 months, and those who had breastfed at least 12 months. Since breastfeeding serves as a protective factor for breast cancer, below average numbers can serve as a possible reason breast cancer incidence is particularly high in Montgomery County. Further, African American, women with less than a high school education,

and women enrolled in Medicaid were least likely to breastfeed. Montgomery County has a high mortality rate for African American women. Additionally, women with little education and Medicaid insurance are of a lower SES and by not breastfeeding expose themselves to higher risks of developing and dying from breast cancer

Additionally, Montgomery County was approximately 4 percentage points above the national average for those who currently smoke. The data shows that the risk of developing breast cancer was more likely if the individual was a current or previous smoker. Due to large amounts of missing data a similar conclusion cannot be drawn with alcohol use. Montgomery also had the highest percentage of people who reported no physical activity in one month when compared to other metropolitan counties, Ohio, and the United States. Literature review found that little or no physical activity can lead to an increased incidence in breast cancer. Simply focusing more attention to smoking cessation programs and interventions targeting exercise and physical activity can assist in decreasing the incidence of breast cancer in Montgomery County.

Previous studies have found that the longer a woman waits to have her first child, the higher her risk of developing breast cancer becomes. However, the results of this study show no clear trend. African Americans, those with less than a high school education, and women enrolled in Medicaid had a lower first age of birth. It could be possible that these women received no protective factor from having their first child early in life because of other confounders that increase their chances of developing breast cancer.

Early Detection Factors

Secondary breast cancer risk factors evaluated included breast cancer incidence, breast cancer mortality, breast cancer stage of diagnosis, and percent receiving mammograms. In

addition to tabular data, data were plotted by year to view trends in breast cancer incidence, mortality, and staging.

Montgomery had a low rate of cancer incidence and mortality from all sites combined but had the highest breast cancer incidence when compared with other metropolitan counties, Ohio, and the United States. It also had the second highest mortality rate from breast cancer. Higher mortality rates may be associated with a later stage at diagnosis, lack of access to care, inadequate treatment or other factors that should be addressed in cancer control initiatives. There was little variation in the percent of women who were diagnosed at a late stage when compared to other metropolitan counties. However, Montgomery County had a higher percentage of women diagnosed with a late stage than Ohio, but less than the national average. Reasons for this high breast cancer incidence can include (a) the SES of women in Montgomery County, (b) higher number of people who use tobacco, (c) below average breast feeding numbers, and (d) high percentage of obese and overweight individuals compounded with a higher percentage of individuals who do not get any exercise.

Breast cancer by stage at diagnosis (2001-2005) indicated that Montgomery County had the second highest percent of breast cancer cases diagnosed at the distant stage than other metropolitan counties and Ohio. Distant stage is considered a late stage diagnosis, and is associated with higher mortality rates. Again, SES status is associated with late stage diagnosis and ultimately breast cancer mortality. Montgomery County has a higher percentage of families below the poverty level and a higher percentage of families headed by a female. Both of these SES indicators are associated with an increased risk of developing and dying from breast cancer. In addition, Montgomery County had the highest percent of unstaged/unknown stage of diagnosis than any comparable counties and Ohio. Correct stage of diagnosis is vital for

statistical analysis to assess a population's social and behavioral tendencies, to target specific population groups, and to evaluate the efficacy of early detection programs. Unstaged/unknown cases can also cause problems with the treatment plan of individuals. However, Montgomery County does have the highest percentage of women who have had a mammogram in the last two years.

For the period 1996-2006, Montgomery County had 5,619 breast cancer cases reported in the OCISS, of which 399 had a vital status of 'dead' due the cancer. Over that time span, Montgomery County has seen an increase in the rate of early stage at diagnosis. The past few years have shown variability with regional and distant stages at diagnosis. There has been a decrease in the rate of regional and unstaged women, while there has been an increase in the rate of those diagnosed at a distant stage. Still, rates of in situ, localized, regional, distant, and unknown cancer stages for Montgomery County are higher than US data.

Descriptive Analysis of Women with Breast Cancer in Montgomery County

Ohio Cancer Incidence Surveillance System data for Montgomery County was analyzed to describe characteristics of women with breast cancer.

Women with breast cancer in Montgomery County were predominantly of Caucasian race, 50-79 in age, married, with Medicare insurance, never used tobacco, and had no alcohol use history and did have a family history of cancer. Since Montgomery County is 77 percent Caucasian and 46 percent of the population is above the age of 40 the results fit the demographic. Women with early stage diagnosis and late stage diagnosis of breast cancer had similar demographic and risk factor characteristics. African American women were more likely to be diagnosed at a late stage. This is confirmed by literature review which states that Caucasian women suffer higher rates of incidence from breast cancer but African American women are

more likely to die from it. African American women in Montgomery County were more likely to be diagnosed at a late stage which is associated with higher mortality rates. Age, marital status, tobacco use showed little variation between early and late stages. Interestingly, women who had no history of alcohol use showed greater risk of developing late stage breast cancer. Women who had no family history of breast cancer were at higher risk of developing late stage breast cancer. This does not correspond with literature review which found that alcohol is a definite risk factor for breast cancer. However, there were large amounts of missing data in the OCISS database with regards to the risk factors tobacco use, alcohol use, and family history of breast cancer. The SES status indicator, primary payer at diagnosis, showed that women who were uninsured, had Medicaid, and who were insured but not otherwise specified had a higher chance of developing late stage breast cancer. Again, this confirms the literature review which states that the women of lower SES are more likely to be diagnosed at a late stage and thus suffer higher rates of mortality. Approximately 80 percent of women with breast cancer in Montgomery County survived. Three hundred and ninety nine women died from breast cancer and as expected a greater percentage of those were diagnosed at a late stage.

Risk factor data available in the Ohio Incidence Surveillance System include tobacco use, alcohol use, and family history of breast cancer. These risk factors had a relatively high percent of unknown data, ranging from 16.6 percent for tobacco use to 20.9 percent and 27.8 percent for alcohol use, and family history respectively. This is a possible limitation of this study. Improved data collection of risk factors could increase knowledge of specific population risk factors that need to be addressed in the community. An additionally SES indicator used was Industry and Occupational Codes defined by the United States Census. However, little data was collected to further examine SES and breast cancer incidence and mortality. Approximately 98 percent of

Industry and Occupational data was not collected. There was some data collected as free form text but analysis of this data would not prove useful with predetermined census categories. The large amounts of missing data in the OCISS database serves as a limitation of this study.

An analysis of health disparities by race found a significant disparity among the African American population. From 1996-2006, approximately 15 percent of women diagnosed with breast cancer in Montgomery County were African American. The mortality rate over that time was approximately 17 percent. There was no significant disparity between the percent of women with breast cancer who drink alcohol and smoke tobacco in Montgomery County and the percent of women who exhibit these behaviors and have died from breast cancer.

Conclusion

Although the data does show that health disparities exist with regards to breast cancer incidence and mortality and race/ethnicity and SES, collection and analysis of more data needs to be done to find a causal relationship. Still, essential measures need to be implemented to reduce cancer related health behaviors/risk factors, improve early detection screening and programs, and to address the problem of the uninsured/unemployed in Montgomery County. There needs to be improved collection of missing or unknown data. Improvements can always be made to early detection programs including the quality and quantity of. Lastly, there can be primary prevention programs and increased distribution of literature which address behavioral outcomes of breastfeeding, fruit & vegetable consumption, tobacco use, alcohol use, cancer screening information, physical activity, and much more. Interventions for Montgomery County specifically include smoking cessation programs, nutrition programs which address diet and physical activity, increased awareness for breastfeeding, and improved access to screening for minority populations.

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Appendix I: 17 Public Health Core Competencies Met

1. Selects and defines variables relevant to defined public health problems
2. Identifies relevant and appropriate data and information sources
3. Obtains and interprets information regarding risks and benefits to the community
4. Utilizes current techniques in decision analysis and health planning
5. Communicates effectively both in writing and orally, or in other ways
6. Advocates for public health programs and resources
7. Identifies the role of cultural, social, and behavioral factors in determining the delivery of public health services
8. Develops a lifelong commitment to rigorous critical thinking
9. Identifies the limitations of research and the importance of observations and interrelationships
10. Identifies and applies basic research methods used in public health
11. Collaborates with community partners to promote the health of the population
12. Understands the dynamic forces contributing to cultural diversity
13. Solicits input from individuals and organizations
14. Effectively presents accurate demographic, statistical, programmatic, and scientific information for professional and lay audiences
15. Listens to others in an unbiased manner, respects points of view of others, and promotes the expression of diverse opinions and perspectives
16. Makes relevant inferences from quantitative and qualitative data
17. Evaluates the integrity and comparability of data and identifies gaps in data sources