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# Stage of Diagnosis of Breast Cancer and Socioeconomic Status in a Universal Healthcare System: A Population-based study in Emilia-Romagna, Italy

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**Master of Public Health Program**  
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# Introduction

- Breast Cancer Epidemiology
  - 1.3 million women diagnosed/year worldwide
  - 465,000 deaths/year worldwide
  - 2008 age-adjusted incidence and mortality rates
    - United States: 76.0 and 14.7 per 100,000
    - Italy: 86.3 and 16.1 per 100,000
    - United Kingdom: 87.9 and 18.6 per 100,000

# Socioeconomic Status (SES)

- One's social standing in terms of income, education, and occupation-often closely interconnected
- Lower SES-associated with poorer health outcomes, higher morbidity and mortality



# Previous Studies

- Clegg and colleagues (2009)
- Impact of SES on cancer incidence and stage at diagnosis
- 26844 cancer patients from 1973-2001 in the US
- Lower income associated with increased risk of late-stage breast cancer
  - OR=2.30 for lowest income bracket
  - Lower SES associated with later stages at diagnosis across all cancers

# Previous Studies

- Yu (2009)
- Surveillance, Epidemiology, and End Results (SEER) database
- 112,543 women from 1998-2002
- Composite measure of SES used-number of years of education, federal poverty line
- Inverse association found between SES and risk of dying from breast cancer
- Women living in lowest SES areas had highest percent of advanced stage disease

# A Possible Explanation

- Partly explained by lack of access to health insurance and preventive services
  - US has 50.7 (16.7%) million uninsured
- Not present in universal healthcare systems

# Italian Healthcare System

- Universal healthcare system
- Servizio Sanitario Nazionale (SSN)
- Ranked 2<sup>nd</sup> by WHO behind France
  - US ranked 37
- Administered through local healthcare authorities
- Healthcare provided to all Italian citizens



# Study Objectives

- Describe the population of women with breast cancer in Emilia-Romagna, Italy
- Explore relationship between SES and stage of diagnosis of breast cancer in a universal healthcare system

# Materials and Methods

- Approved by TJU IRB
- Collaboration
  - Regional Cancer Care Commission of the Regione Emilia-Romagna (RER)
  - Agenzia Sanitaria e Sociale Regionale
  - Center for Research in Medical Education and Health Care at Jefferson Medical College

# Materials and Methods

- Study population-women with incident breast cancer from 2002-2003 in Emilia-Romagna, Italy
  - Women identified from 2002-2003 regional cancer registries (n=6,545)
  - Cancer stage based on the AJCC'S TNM classification
  - SES data available for 3,992 of these women
    - Datasets merged using unique anonymous identifier
    - 61% match rate



# Materials and Methods

- Exclusion criteria
  - Stage 0 cancers
  - Lymphoma/sarcoma
  - Tumors identified within previous 2 years
- Women with no cancer stage removed from final analysis (n=3,478)



**Socioeconomic Data Matched to Analytic File, 2002-2003**

	# without SES data	# with SES data
<b>TOTAL</b>	2,553	3,992
<b>Year</b>		
2002	1272 (49.8%)	2029 (50.8%)
2003	1281 (50.2%)	1963 (49.2%)
<b>Age Group</b>		
20-49	636 (24.9%)	727 (18.2%)
50-69	1131 (44.3%)	1856 (46.5%)
70+	786 (30.8%)	1409 (35.3%)
<b>Stage</b>		
I	1077 (42.2%)	1597 (40.0%)
II	846 (33.1%)	1340 (33.6%)
III	248 (9.7%)	416 (10.4%)
IV	71 (2.8%)	125 (3.1%)
NS	311 (12.2%)	514 (12.9%)

# Materials and Methods

- Age
  - 20-49
  - 50-69 (Screening window in 2002-2003)
  - 70+
- Index of deprivation
  - Composite measure with indicators of educational level, occupation, housing status (rents or owns), household density, and type of family
  - Score of 0, 1, 2+
- Descriptive statistics for all variables of interest
- Multivariable logistic regression to determine association between SES variables and late stage III/IV breast cancer

# Results

**Table 1: Demographic Variables and Cancer Stage at Diagnosis 2002-2003**

	AJCC I	AJCC II	AJCC III	AJCC IV	Total
Total	1,597 (45.9%)	1,340 (38.5%)	416 (12.0%)	125 (3.6%)	3,478 (100.0%)
Age					
20-49 years	303 (45.5%)	276 (41.4%)	65 (9.8%)	22 (3.3%)	666 (100.0%)
50-69 years	929 (52.7%)	626 (35.5%)	167 (9.5%)	42 (2.4%)	1,764 (100.0%)
70+ years	365 (34.8%)	438 (41.8%)	184 (17.6%)	61 (5.8%)	1,048 (100.0%)
Marital Status					
Single	122 (43.3%)	104 (36.9%)	44 (15.6%)	12 (4.3%)	282 (100.0%)
Married	1,098 (48.8%)	862 (38.2%)	232 (10.3%)	60 (2.7%)	2,252 (100.0%)
Separated / Divorced	97 (53.0%)	62 (33.4%)	15 (8.2%)	9 (4.9%)	183 (100.0%)
Widowed	280 (36.8%)	312 (41.0%)	125 (16.4%)	44 (5.8%)	761 (100.0%)



**Table 2: Socioeconomic Variables and Cancer Stage at Diagnosis 2002-2003**

	AJCC I	AJCC II	AJCC III	AJCC IV	Total
Total	1,597 (45.9%)	1,340 (38.5%)	416 (12.0%)	125 (3.6%)	3,478 (100.0%)
Index of Deprivation					
Zero	564 (51.4%)	393 (35.8%)	112 (10.2%)	29 (2.6%)	1,098 (100.0%)
One	783 (44.8%)	692 (39.6%)	205 (11.7%)	68 (3.9%)	1,748 (100.0%)
Two +	249 (39.5%)	255 (40.4%)	99 (15.7%)	28 (4.4%)	631 (100.0%)
Education					
Low	169 (38.1%)	198 (44.7%)	60 (13.5%)	16 (3.6%)	443 (100.0%)
Medium	1,132 (45.7%)	954 (38.5%)	292 (11.8%)	97 (3.9%)	2,475 (100.0%)
High	296 (52.9%)	188 (33.6%)	64 (11.4%)	12 (2.1%)	560 (100.0%)

Occupation	AJCC I	AJCC II	AJCC III	AJCC IV	Total
Business Professional/Manager	265 (50.2%)	201 (38.1%)	47 (8.9%)	15 (2.8%)	528 (100.0%)
Office Worker/Small Business Owner/Self-employed	472 (48.8%)	367 (38.0%)	106 (11.0%)	22 (2.3%)	967 (100.0%)
Blue Collar Worker	218 (44.0%)	196 (39.6%)	58 (11.7%)	23 (4.6%)	495 (100.0%)
Retired/On Leave/In Military	584 (43.9%)	510 (38.3%)	181 (13.6%)	55 (4.1%)	1,330 (100.0%)
Unemployed/Student/Housewife	58 (36.7%)	66 (41.8%)	24 (15.2%)	10 (6.3%)	158 (100.0%)

Family Size	AJCC I	AJCC II	AJCC III	AJCC IV	Total
1 Individual	259 (39.9%)	256 (39.4%)	97 (14.9%)	37 (5.7%)	649 (100.0%)
2-4 Individuals	1,238 (47.7%)	1,003 (38.6%)	279 (10.7%)	78 (3.0%)	2,598 (100.0%)
5 + Individuals	100 (43.3%)	81 (35.1%)	40 (17.3%)	10 (4.3%)	231 (100.0%)
<hr/>					
Family Type					
Two-Parent Family	1,280 (47.2%)	1,042 (38.4%)	306 (11.3%)	83 (3.1%)	2,711 (100.0%)
Single-Parent Family	61 (48.4%)	44 (34.9%)	16 (12.7%)	5 (4.0%)	126 (100.0%)
Single	256 (39.9%)	254 (39.6%)	94 (14.7%)	37 (5.8%)	641 (100.0%)

**Table 3: Logistic model predicting Stage III/IV breast cancer**

	OR	95% Confidence Int.	
Age group (reference - age 50-69)			
Age 20-49	1.11	0.85	1.46
Age 70+*	2.02	1.61	2.53
Marital status (reference – Married)			
Single*	1.55	1.12	2.14
Separated / divorced	1.04	0.66	1.63
Widowed*	1.34	1.05	1.70
Index of deprivation (reference – 1)			
0	0.97	0.77	1.23
2+*	1.45	1.14	1.84

p&lt;0.05



**Table 4: Logistic model predicting Stage III/IV breast cancer with SES Variables**

Odds Ratio Estimates			
Effect	Point Estimate	95% <u>Wald</u> Confidence Limits	
		Age Group (Reference - Age 50-69)	
20-49	1.12	0.84	1.50
70+ *	2.03	1.59	2.58
Marital Status (Reference - Married)			
Single*	1.67	1.17	2.38
Separated / Divorced	1.13	0.69	1.85
Widowed*	1.49	1.10	2.02
Education Level (Reference - Medium)			
High	0.99	0.75	1.32
Low	0.83	0.63	1.10
Occupation (Reference - Office Worker/Self-employed)			
Blue Collar Worker	1.24	0.91	1.69
Business Professional/ Manager	0.83	0.59	1.16
Retired/On Leave/In Military	1.15	0.86	1.52
Unemployed/Student/ Housewife	1.25	0.76	2.04
Family Size (Reference - 2-4 Individuals)			
1 Individual	1.65	0.40	7.13
5 + Individuals*	1.94	1.37	2.76
Family Type (Reference - Two-Parent Family)			
Single-Parent Family	1.11	0.65	1.91
Single	0.52	0.12	2.22

p&lt;0.05

# Discussion

- Variables associated with late stage breast cancer
  - Over the age of 70
  - Single
  - Widowed
  - Index of deprivation score 2+
  - Family Size of 5+

# Age

- 2002-2003-screening window of 50-69
  - Jan 1, 2010-window widened to 45-74
  - 8-14 million euro/year investment
- Future investigators looking at effect of age with new screening window

# Marital Status

- Findings consistent with other research
- Previous studies
  - Osborne and colleagues (2005)
    - Unmarried women more likely to be diagnosed with stage II-IV breast cancer versus stage I (OR=1.17)
  - Ali and Rajan (2008)
    - Unmarried women had highest association with late stage breast cancer (OR=3.31)
- Reduced social networks and social support



# Index of Deprivation

- Consistent with other studies
  - Adams and Forman (2004)
  - SES and progression of breast cancer at diagnosis in Yorkshire, England
  - 12,793 women from 1998-2000
  - SES-Townsend Deprivation Score divided into fifths
  - Women from more deprived areas-more advanced disease at diagnosis than those from less deprived areas



# Family Size

- 5 or more-possible that demanding household makes for personal neglect
- Outreach program
  - Target population of mothers in large households
  - Emphasize importance of regular mammography screening

# Other Possible Reasons for Link

- Mammography
  - Lack of knowledge
  - Adherence rates
    - Emilia-Romagna-72.4%
    - Italy-59.9%
- Access to care
  - Shortage in medical technology
    - US-Twice as many MRI machines/million people, 25% more CT scanners
  - Avg. wait time for mammography-70 days
  - Best-equipped hospitals in northern Italy have even longer wait times
    - Draw patients from poorer southern regions
- Future researchers should examine these variables for associations with SES

# Limitations

- 61% match rate between datasets
  - 64.2% of the women 70+ years of age matched
  - 53.3% of women aged 20-49
  - Possibly skewed this data towards an older population
- Index of deprivation
  - May not be reliable indicator
  - Limited information on calculation
  - Education level, occupation, family type-not significant
- No data on household income
  - 65% of population married



# Conclusions

- Association between SES and stage of diagnosis of breast cancer still present in a universal healthcare system
- Severity of gradient-less than competitive systems
  - Only true SES variable-index of deprivation
  - Education level, occupation type not significant

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