Survival Trends by Socioeconomic Status, 1998-2012:
A Shift in Disparities for Colorectal Cancer Survival

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Background
Colorectal Cancer – Incidence

3rd Most Common Cancer in Men & Women

Incidence Rate Overall, 2000 – 2013
47.6 per 100,000

Incidence Rate Trend, 2000 – 2013
-2.9 APC
Background
Colorectal Cancer – Socioeconomic Disparities

- Incidence
- Mortality
- Survival
Background
Colorectal Cancer – Healthy People

Healthy People 2010 Objectives

• Increase 5-Year Survival for Cancer Survivors
• Eliminate Health Disparities

Healthy People 2020 Objectives

• Increase 5-Year Survival for Cancer Survivors
• Eliminate Health Disparities AND Improve Health for ALL groups
Purpose
Research Questions

- Within each SES stratum, has survival increased, decreased, or remained the same?
- Between different SES strata, have disparities in survival persisted or changed since 1998?
Methodology
Cohort Selection

Source:
- 18 SEER Registries – November 2015 Submission
- N = 465,455

Included:
- Active Follow-Up
- Microscopically Confirmed

Excluded:
- Death Certificate
- Autopsy Only
Methodology
Defining Poverty Level

- **Low**: $\leq 10\%$
- **Mid**: $10\% - 19.9\%$
- **High**: $> 19.9\%$

Ward et al. (2004)
Cohort Distribution, Combined 1998 - 2012
By Low, Mid, and High Poverty Counties

- Low Poverty: 38%
- Mid Poverty: 3%
- High Poverty: 59%
Cohort Distribution, Combined 1998 - 2012
By Poverty Thresholds for **Males** and **Females**
Cohort Distribution, Combined 1998 - 2012
By Poverty Thresholds & Stage

0% 25% 50% 75% 100%
Low  Mid  High

Unstaged  Distant  Regional  Localized  In Situ
Methodology
Survival Analysis

• SEER*Stat
  – Age-Adjusted Cause-Specific One-Year Survival
    • Overall for each Stratum
    • By Year of Diagnosis for each Stratum

• JoinPoint
  – Trend Analysis
    • Average Annual Percent Change (AAPC)
    • Pairwise Comparisons
One-Year Survival, Combined 1998 – 2012
By Low, Mid, and High Poverty Counties

SES Only

Male

Female
AAPC in One Year Survival during 1998 – 2012
By Low, Mid, and High Poverty Counties

SES Only

Male

Female
<table>
<thead>
<tr>
<th>Test (Failed to Reject)</th>
<th>Mathematical Description</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Parallelism</td>
<td>$y = mx + b$</td>
<td>Persistent Disparities during Time Period</td>
</tr>
<tr>
<td>Coincidence</td>
<td>$y = mx + b$</td>
<td>No Disparities during Time Period</td>
</tr>
</tbody>
</table>
Disparities have persisted between 1998 & 2012 between each Poverty Threshold.
Comparison of One Year Survival Trends Between Poverty Thresholds - Males

Disparities have persisted between 1998 & 2012 between High Poverty & Other Thresholds
Comparison of One Year Survival Trends Between Poverty Thresholds - Females

Disparities have persisted between 1998 & 2012 between each Poverty Threshold.
One-Year Survival, Combined 1998 – 2012

By Low, Mid, and High Poverty Counties

SES Only

In Situ

Localized

Regional

Distant
AAPC in One Year Survival during 1998 – 2012
By Low, Mid, and High Poverty Counties

SES Only

In Situ

Localized

Regional

Distant
Comparison of One Year Survival Trends Between Poverty Thresholds - In Situ*

No Disparities were seen between 2000 & 2012 between High Poverty & Other Thresholds
Comparison of One Year Survival Trends Between Poverty Thresholds - Localized

Disparities have persisted between 1998 & 2012 between High Poverty & Other Thresholds
Comparison of One Year Survival Trends Between Poverty Thresholds - Regional

Disparities have persisted between 1998 & 2012 between High Poverty & Other Thresholds
Comparison of One Year Survival Trends Between Poverty Thresholds - Distant*

No Disparities were seen between 2000 & 2012 between Mid & High Poverty Thresholds
Comparison of One Year Survival Trends
Summary, 1998 – 2012

<table>
<thead>
<tr>
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<th>Mid – High</th>
<th>Low – Mid</th>
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</tr>
<tr>
<td>Male</td>
<td>Parallel</td>
<td>Parallel</td>
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</tr>
<tr>
<td>Female</td>
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Comparison of One Year Survival Trends Summary, 1998 – 2020 (Preliminary Forecasting)

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Conclusion
Summary of Results

Persisting Disparities

- Low Survival
- Mid Survival
- High Survival

Persisting Disparities

- Low Survival (up)
- Mid Survival (down)
- High Survival (up)
Conclusion

Future Directions

• Cox Proportional Hazards Modeling
  – Controlling for possible confounding variables associated with SES, Year of Diagnosis, and Survival

• More Formal Forecasting
  – Analyzing possible non-linear trends to predict survival more accurately through 2020
Thank You!