

Construction of a North American Cancer Survival Index to Measure Progress of Cancer Control Efforts

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4:00 – 5:30 pm

●●●● Acknowledgements

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More Acknowledgements

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- The findings and conclusions in this report are those of the authors and do not necessarily represent the official positions of the Centers for Disease Control and Prevention or the National Cancer Institute.

●●●● Learning Objectives

- The objective of this presentation is to share the methods used to construct a **North American cancer survival index** to measure progress of cancer control efforts.
- Participants will learn about differences in all-sites survival using the index versus an unadjusted measure.

Background

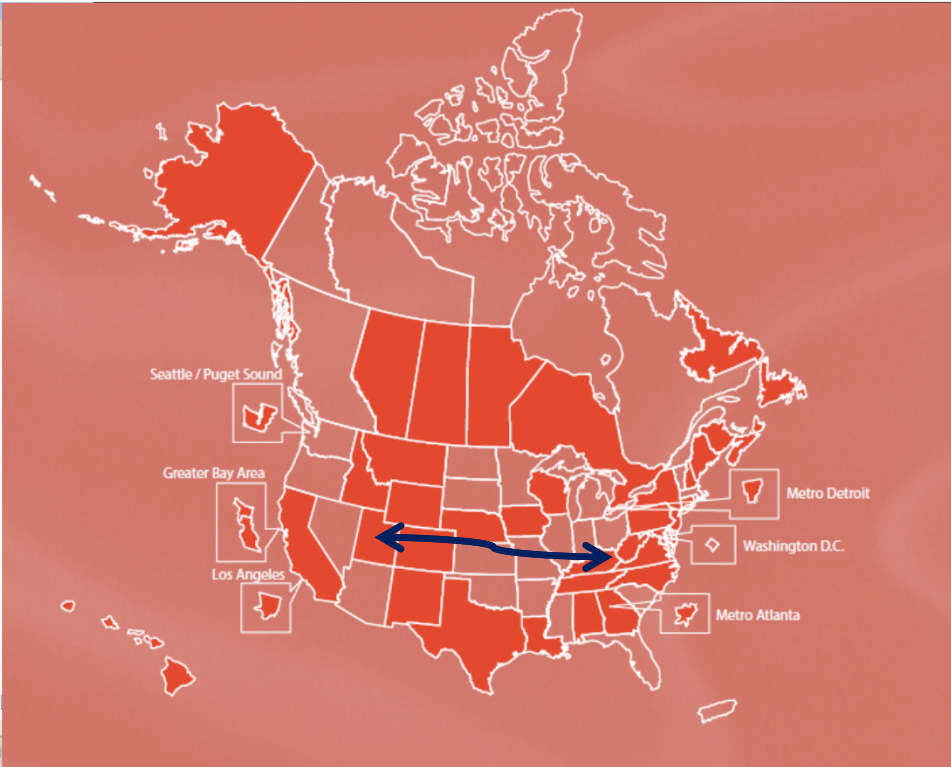
Cancer | Healthy People 2020 - Mozilla Firefox

https://www.healthypeople.gov/2020/topics-objectives/topic/cancer/objectives

hp2020 cancer survival

C-13 Increase the proportion of cancer survivors who are living 5 years or longer after diagnosis Revised

Baseline:	65.2 percent of persons with cancer were living 5 years or longer after diagnosis in 2007
Target:	71.7 percent
Target-Setting Method:	10 percent improvement
Data Sources:	Surveillance, Epidemiology, and End Results Program (SEER), NIH/NCI
Data:	<p> HP2020 data for this objective</p> <p> Spotlight on Disparities:</p> <ul style="list-style-type: none"> Disparities by sex <p> Details about the methodology and measurement of this HP2020 objective</p> <p>The HP2010 objective with the same definition was 03-15. Search data for all HP2010 objectives</p>
Revision History:	This objective was revised. Read more about the revision history .



Background

Case-mix adjusted survival indices

- EUROCORE
- Nordic Countries
- England Office for National Statistics

- now, **NAACCR**

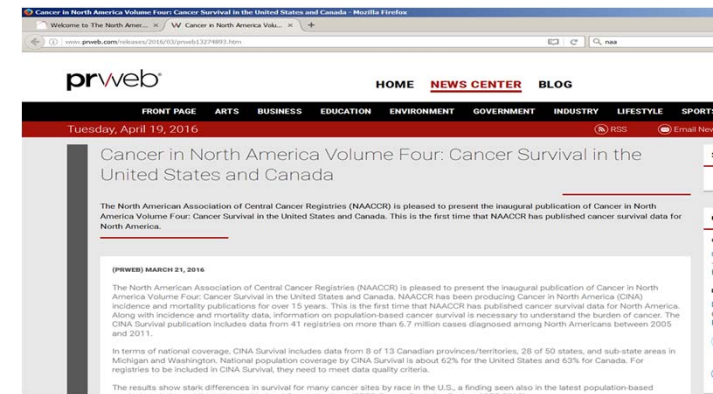
Methods

- Which topics to cover?

- ~~Relative Survival 101~~

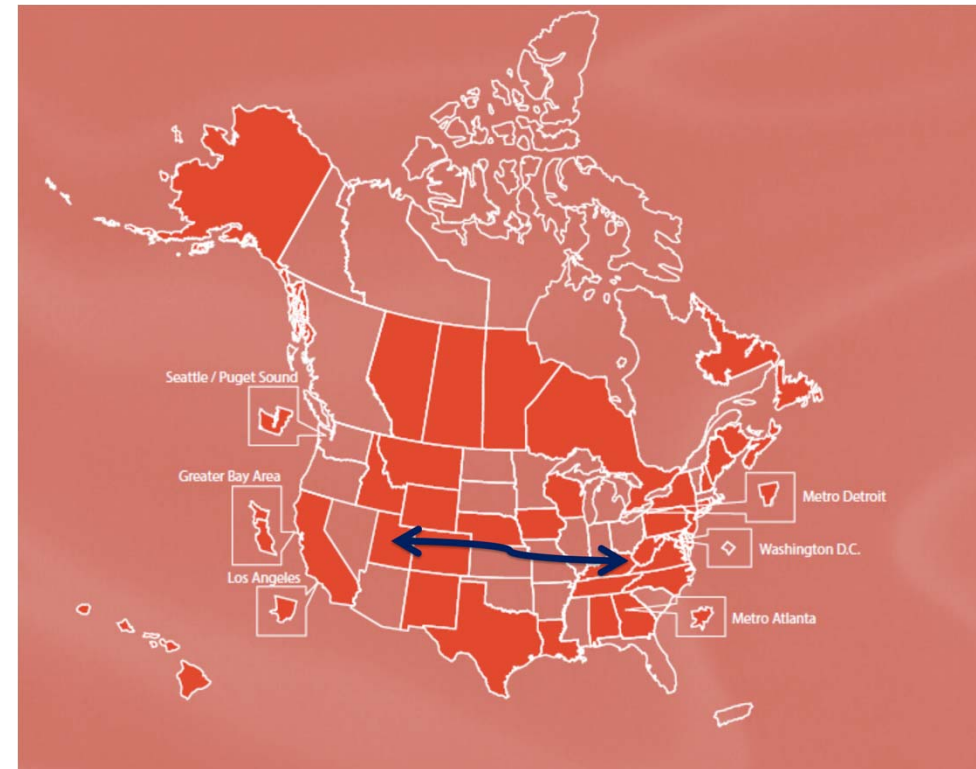
- Details of NAACCR CINA Survival calculations

- Details of the NAACCR Cancer Survival Index



●●●● Methods - NAACCR CINA Survival

- Data are from NAACCR December 2014 data submission
- 41 registries
- 2006-2011, FUP through 2011
- 2 sets of 5-year survival statistics:
 - **All Sites**
 - **Cancer Survival Index (CSI)**



●●●● Methods - NAACCR CINA Survival

- National population coverage:
 - 62% for the United States
 - 63% for Canada.

- For registries to be included in CINA Survival, they needed to:
 1. provide consent
 2. meet CINA incidence criteria for all relevant years, and
 3. either meet the SEER standards for follow-up or ascertain deaths through the study cutoff date (December 31, 2011)

●●●● Methods - NAACCR CINA Survival

- Malignant cases as defined by the SEER behavior recode for analysis
- Aged 15-99 at diagnosis during 2005-2011
- Follow-up/death ascertainment through the study cutoff date of December 31, 2011.
- Cases reported solely via death certificates or autopsy were excluded.
- Cases were censored at an achieved age of 100 years
- Using SEER 2007 Multiple Primary and Histology Coding Rules, we allowed for multiple primary cancers to be included for each patient, but only one record per patient was included in each survival estimate.
- SEER*Stat for survival calculations
- The survival duration in months was calculated based on complete dates.
 - Reported Alive: For registries meeting SEER follow-up standards (SEER registries plus Montana and Wyoming), the survival duration for alive patients was calculated through the date of last contact (or study cutoff, if earlier).
 - For registries conducting active follow-up, alive cases with no survival time were excluded from analysis.
 - Presumed Alive: For the remaining registries, survival duration for alive patients was calculated through December 31, 2011, with all patients not known to be dead presumed to be alive on this date.
- Expected survival was estimated from life tables matched to the cancer patients by age, sex, year, and geographic area, and for the United States, also by race and socioeconomic status (SES)
- Ederer II method to calculate expected survival.
- Actuarial method on monthly intervals
- Estimates are age standardized to the International Cancer Survival Standards.
- Results: **60-month age-standardized relative survival ratios (RSR)**

●●●● Methods – NAACCR CSI

- Cancer Survival Index

i indexes over primary site categories

S_i = age-standardized site-specific RSR

W_i = proportion of the incidence counts for site category i

$$CSI = \sum_i S_i W_i$$

$$standard\ error\ (CSI) = \left[\sum_i (standard\ error\ (S_i))^2 W_i^2 \right]^{1/2}$$



Weights NAACCR 2006-2008

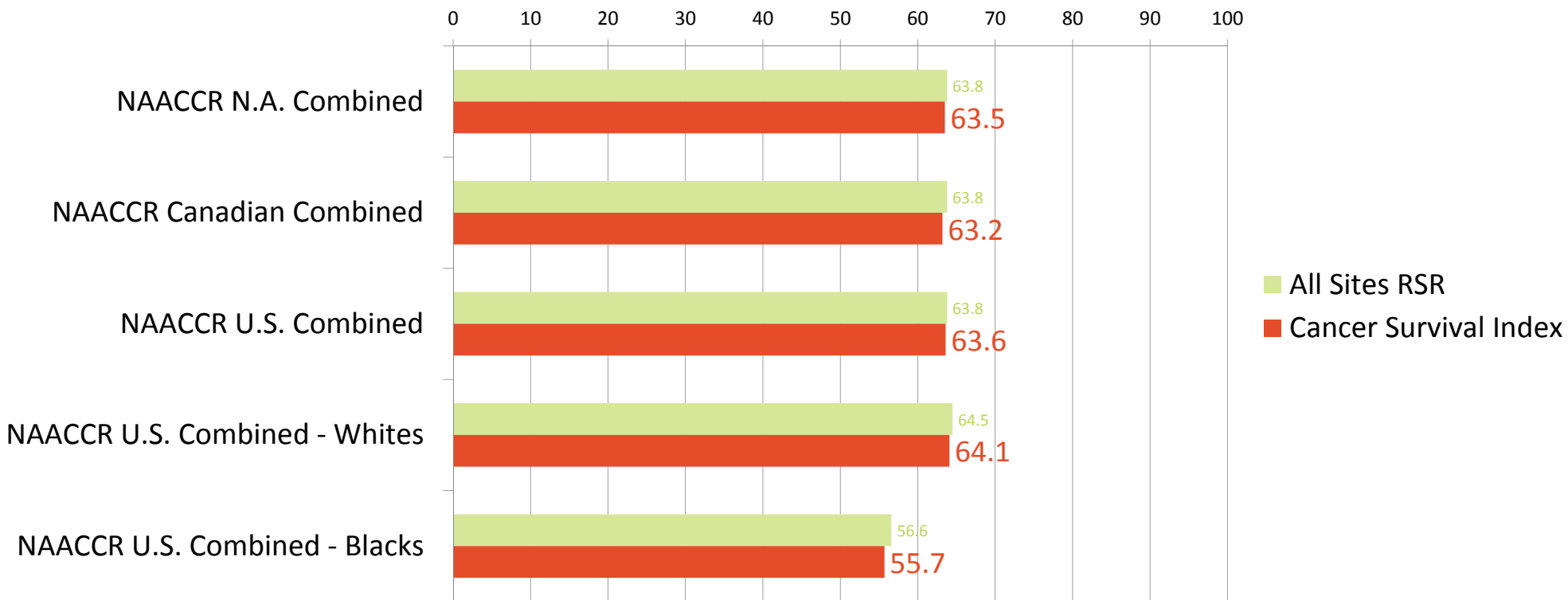
Cancer Primary Site	Sex-Specific		Combined	
	Males	Females	Males	Females
Brain & Other Nervous System	1.360	1.203	0.710	0.575
Breast	0.242	29.264	0.126	13.990
Cervix Uteri	0.000	1.806	0.000	0.864
Colon & Rectum	9.981	10.287	5.210	4.918
Corpus & Uterus, NOS	0.000	5.943	0.000	2.841
Esophagus	1.601	0.485	0.835	0.232
Hodgkin Lymphoma	0.584	0.533	0.305	0.255
Kidney & Renal Pelvis	3.948	2.675	2.061	1.279
Larynx	1.272	0.352	0.664	0.168
Leukemia	2.803	2.284	1.463	1.092
Liver & Intrahepatic Bile Duct	1.945	0.837	1.015	0.400
Lung & Bronchus	14.788	13.787	7.718	6.591
Melanoma of the Skin	4.418	3.591	2.306	1.717
Mesothelioma	0.326	0.103	0.170	0.049
Myeloma	1.327	1.206	0.693	0.576
Non-Hodgkin Lymphoma	4.212	3.982	2.198	1.903
Oral Cavity & Pharynx	3.171	1.521	1.655	0.727
Ovary	0.000	3.067	0.000	1.466
Pancreas	2.438	2.675	1.272	1.279
Prostate	29.321	0.000	15.304	0.000
Stomach	1.718	1.179	0.897	0.564
Testis	1.028	0.000	0.537	0.000
Thyroid	1.138	3.945	0.594	1.886
Urinary Bladder	6.585	2.367	3.437	1.131
Other	5.793	6.908	3.024	3.302

●●●● Methods – NAACCR CSI

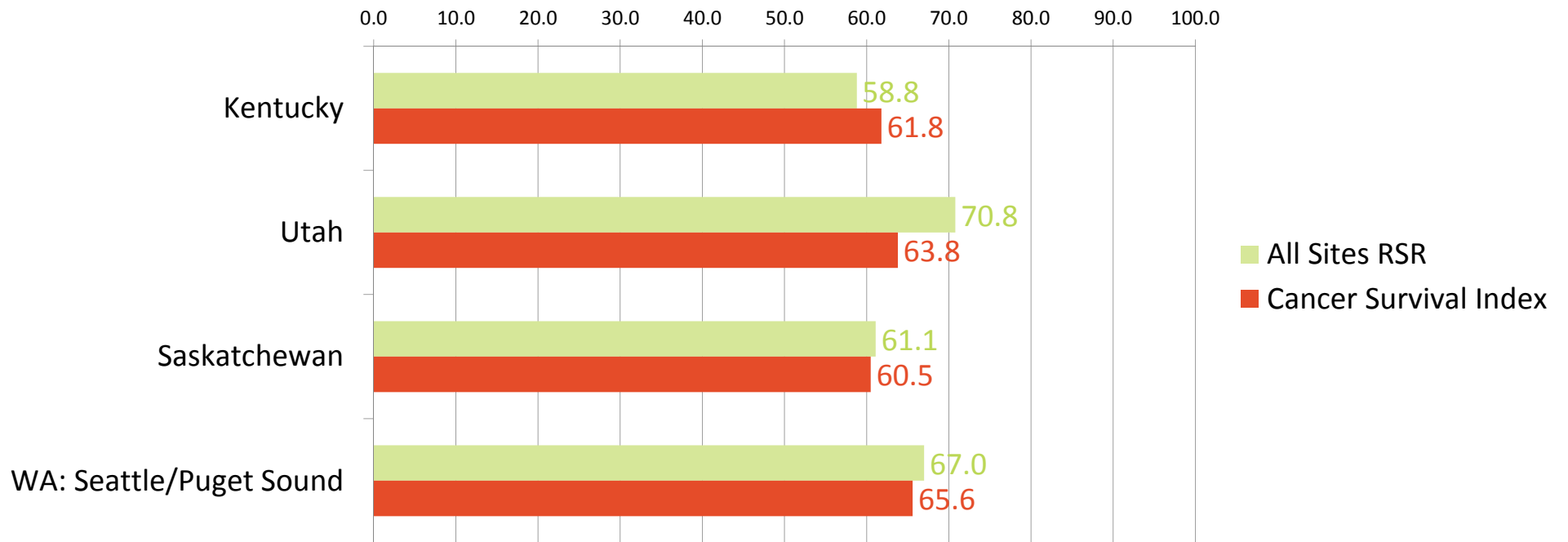
Cancer Survival Index Suppression Rules

- If a site-specific age-standardized RSR was not available for a jurisdiction, the estimate was replaced with that of the country.
 - This replacement was conducted by race for the United States (total, white, and black tables).
- If more than 30% of the site-specific age-standardized RSR estimates were not available for a jurisdiction, and were replaced with that of the country, the CSI estimate was suppressed.
 - Due to the suppression rules, CSI values could be calculated for 4 of 8 Canadian jurisdictions and 9 of 33 U.S. registry areas for blacks.

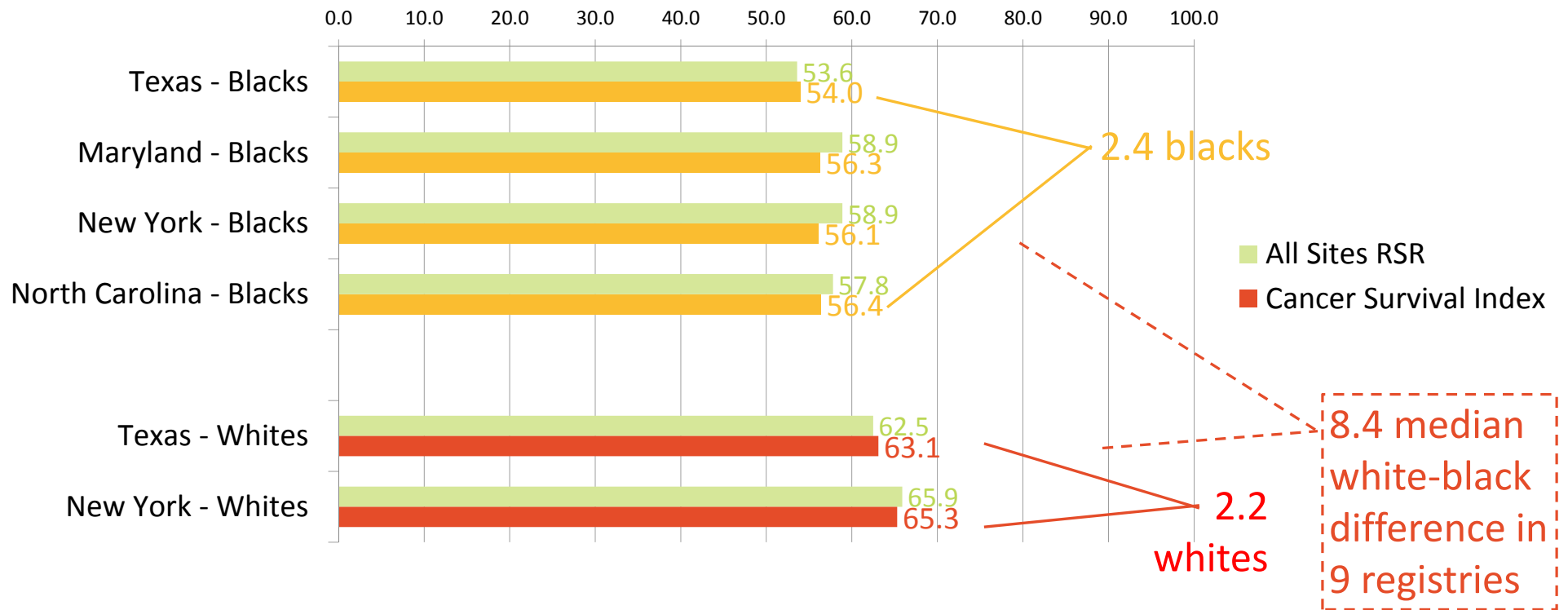
Results



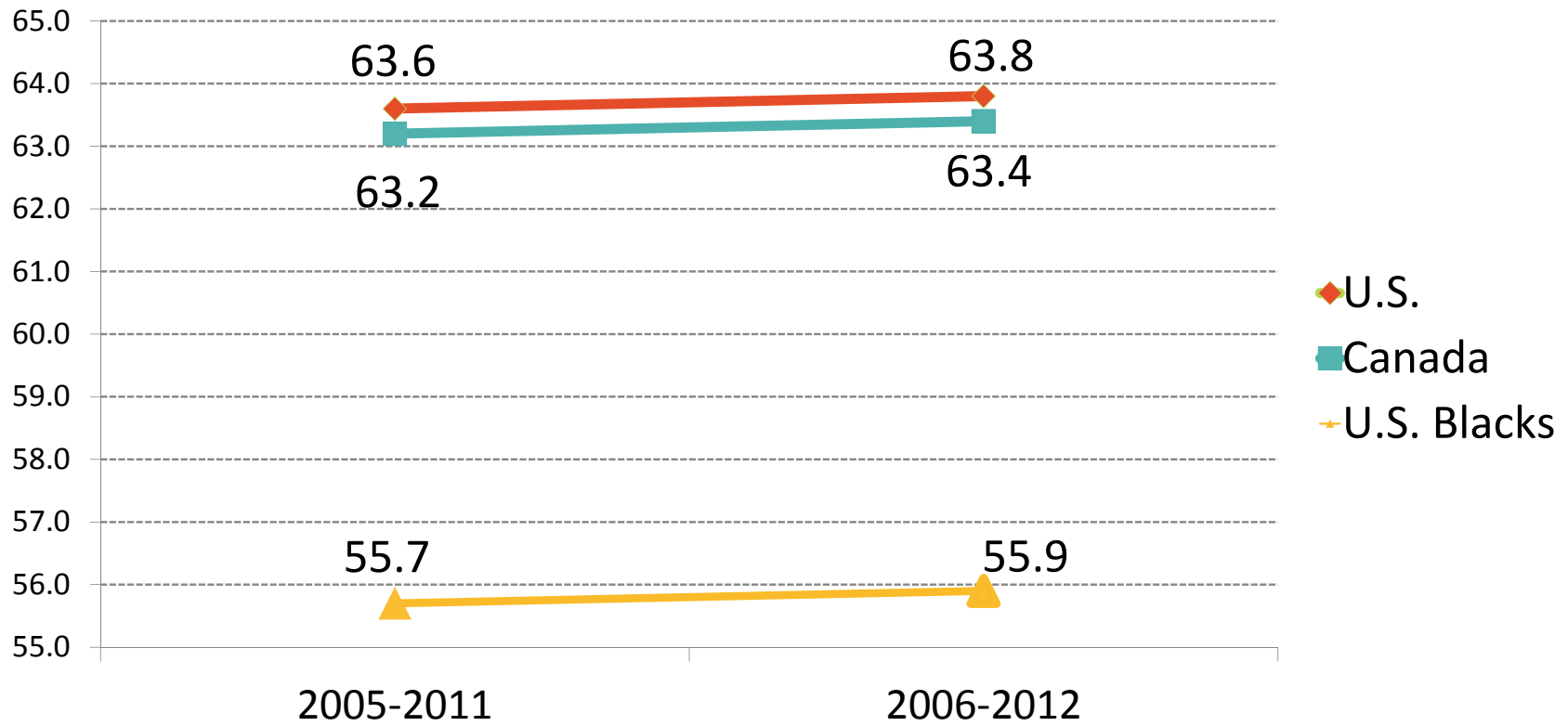
Results by Jurisdiction (extremes of ranges)



Results by Race (of 9 registries; extremes of ranges)



CSI Trends: 60-Month Relative Survival Ratios





Discussion

- The CSI is a one-number summary for overall patterns of cancer survival
- The CSI is intended to quantify and communicate disparities in cancer survival across jurisdictions and to monitor progress in cancer survival over time
- State and provincial specific CSIs are directly comparable because they are standardized by age, sex, and primary site



Discussion

- Variation in survival by registry catchment area can be due to several factors:
 - differences in demographic characteristics related to race, ethnicity, and socioeconomic status
 - cancer screening rates, which affect stage distributions
 - cancer registration practices that impact case ascertainment, dates of diagnosis and follow-up
 - access to and quality of care
 - *Notably, among whites, four of the five highest CSI values were in SEER registries, which may be related to the quality of cancer care in these areas*

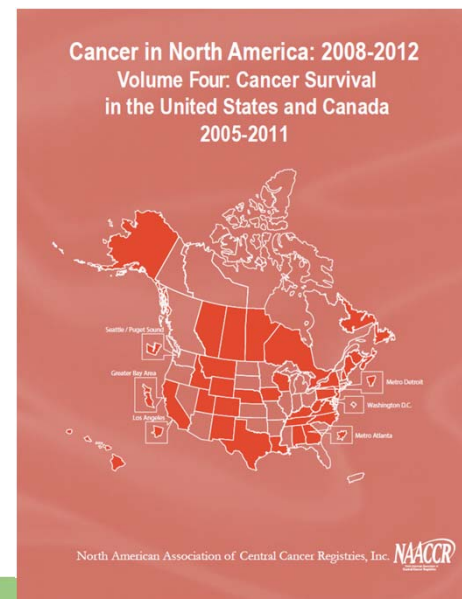


Limitations

- CSI values could be calculated for only 4 of 8 Canadian jurisdictions and 9 of 33 U.S. registry areas for blacks
- The U.S. combined and Canadian combined survival statistics may not be representative of the total national populations because not all jurisdictions were included
- While age and site-mix adjusted relative survival measures may be informative of a jurisdiction's performance in cancer control, the indicator values may not be easily clinically interpretable

●●●● Take-Home Messages

1. Substantially less variation in CSI than All Sites RSR
2. Racial disparities remain
3. NAACCR CSI is a good choice for monitoring progress in cancer control over time, between jurisdictions, and towards eliminating disparities by race in the U.S.
4. Already included in *CINA Survival*



Thanks

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