Assessing the Implementation of the NCCN Distress Thermometer: Missing Screening and Distress Scores in a Rural Population

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BACKGROUND

- Distress is an important factor impacting how well patients follow the recommended care, quality of life, and mortality.
- The American College of Surgeons Commission on Cancer (CoC) has recommended cancer distress monitoring as a standard for all accredited programs since 2012, and was enforced in 2015.
- Many barriers or limitations were encountered in implementation of distress screening, including lack of staff, competing demands and staff turnover.[1] However, research in this area is not well studied.
- This study is part of the L.A.U.N.C.H (Linking & Amplifying User-Centered Networks through Connected Health), which aims to address cancer distress for rural cancer patients through a broadband enabled intervention approach for patients, caregivers and healthcare providers.

OBJECTIVES

- Investigate factors associated with the 45 day NCCN distress thermometer screening status.
- Examine the longitudinal distress scores for female breast cancer patients.

METHODS

- Study Population: Adult KY cancer patients treated at Markey Cancer Center (MCC) University of Kentucky since 2016 to 2019 were included. For the screening status analysis, the unit of analysis was a visit. For the distress score analysis, only female breast cancer patients with at least two visits were included. The unit of analysis was visit occurred within the first year of cancer diagnosis.
- The National Comprehensive Cancer Network (NCCN) distress thermometer was used to capture distress symptoms at the MCC.[2]
- For each visit, a screening status is assigned. Any visit occurred with 45 days of the previous screening was considered meeting the screening requirement (Yes); otherwise, the screening status is missing (No).
- The distress scores ranged from 0-10. The analysis was done by the 1st scores after cancer diagnosis and the highest score within the first year of diagnosis.
- A multilevel logistic regression was fitted to examine factors associated with the 45-day screening status. A longitudinal mixed model was utilized to identify factors associated with the distress scores within the first year of cancer diagnosis.

References:

1. Knies AK, Jutagir DR, Ercolano E, Pasacreta N, Lazenby M, McCorkle R. Barriers and facilitators to implementing the commission on cancer's distress screening program standard. Palliat Support Care. 2019;17(3):253-261.
2. https://www.nccn.org/patients/guidelines/content/PDF/distress-patient.pdf

RESULTS FOR SCREENING (SELECTED VARIABLES)

Table 1. Descriptive Analysis of the 45-day Distress Thermometer Screening Status

		Meeting 45-Day Screening Status				
Factors	Number of Visits	No	%	Yes	%	P-value
Total	110619	13770	12.4%	96849	87.6%	
Department						
Chemo Infusion	26914	4895	18.2%	22019	81.8%	
Comprehensive Breast Cancer Center	13316	1286	9.7%	12030	90.3%	<0.0001
Markey Hematology Program	16657	953	5.7%	15704	94.3%	
Multidisciplinary Oncology Clinic	41656	5737	13.8%	35919	86.2%	
Ob/Gyn Oncology	12076	899	7.4%	11177	92.6%	
Year of Service						
2016	28990	6455	22.3%	22535	77.7%	
2017	38667	3210	8.3%	35457	91.7%	<0.0001
2018	39930	3766	9.4%	36164	90.6%	
2019	3032	339	11.2%	2693	88.8%	
Age group						
<=20	733	66	9.0%	667	91.0%	
21-50	28432	3409	12.0%	25023	88.0%	0.0001
51-64	46256	5779	12.5%	40477	87.5%	
65-74	26707	3368	12.6%	23339	87.4%	
75+	8491	1148	13.5%	7343	86.5%	
Insurance						
Not Insured	2532	349	13.8%	2183	86.2%	
Private Insured	50289	6170	12.3%	44119	87.7%	
Medicare	39828	4996	12.5%	34832	87.5%	0.0057
Medicaid	15396	1972	12.8%	13424	87.2%	
Other Public	933	118	12.6%	815	87.4%	
Unknown	1641	165	10.1%	1476	89.9%	
Appalachia Status						
Non-AP	55069	7185	13.0%	47884	87.0%	<0.0001
AP	55550	6585	11.9%	48965	88.1%	
Metro Status						
Non-Metro	65338	7795	11.9%	57543	88.1%	<0.0001
Metro	45281	5975	13.2%	39306	86.8%	
Distance to Markey						
<20 Miles	36012	4877	13.5%	31135	86.5%	
20-50 Miles	30706	3872	12.6%	26834	87.4%	<0.0001
50-100	34416	3952	11.5%	30464	88.5%	
100+ Miles	9485	1069	11.3%	8416	88.7%	

Table 2. Factors Associated with the 45-day Screening Status from Multilevel Logistic Regression Model

Factors	OR	95% CI		P-value
Department				
Comprehensive Breast Cancer Center	1.09	0.95	1.25	
Markey Hematology Program	2.21	2.00	2.44	<0.0001
Ob/Gyn Oncology	1.33	1.17	1.51	
Chemo Infusion	0.58	0.55	0.62	
Multidisciplinary Oncology Clinic	Reference			
Stage				
In situ	1.32	1.09	1.60	
Stage I	1.19	1.08	1.32	
Stage II	1.16	1.04	1.30	0.0030
Stage III	1.14	1.03	1.27	
Unknown	1.19	1.08	1.32	
Stage IV	Reference			
Distance to Markey				
20-50 Miles	1.10	1.01	1.19	
50-100 Miles	1.10	1.01	1.19	0.0046
100 Miles+	1.14	1.02	1.28	
<20 Miles	Reference			
Service Year				
2017	2.98	2.83	3.15	
2018	2.75	2.58	2.91	<0.0001
2019	2.25	1.97	2.58	
2016	Reference			

RESULTS FOR DISTRESS SCORE (SELECTED VARIABLES)

Table 3. Distress scores for 1st score after cancer diagnosis

Factors	First Distress Score After Diagnosis						
	Low (0-4)		Moderate (5-8)		Severe (9-10)		P-value
	N	%	N	%	N	%	
Total # of Patients	414	51.7%	273	34.1%	114	14.2%	
Age Group							
21-50	114	48.7%	83	35.5%	37	15.8%	
51-64	145	48.3%	108	36.0%	47	15.7%	0.0529
65-74	98	53.6%	60	32.8%	25	13.7%	
75+	57	67.9%	22	26.2%	5	6.0%	
Appalachia Status							
Non-Appalachia	214	54.3%	129	32.7%	51	12.9%	0.3088
Appalachia	200	49.1%	144	35.4%	63	15.5%	
Insurance Type							
Not Insured	5	50.0%	5	50.0%	0	0.0%	
Private Insured	203	51.0%	137	34.4%	58	14.6%	
Medicare	144	54.3%	86	32.5%	35	13.2%	0.3497
Medicaid	52	46.8%	39	35.1%	20	18.0%	
Other Public	10	71.4%	4	28.6%	0	0.0%	
Unknown	0	0.0%	2	66.7%	1	33.3%	
Stage							
In-situ	63	58.3%	34	31.5%	11	10.2%	
Localized	218	49.9%	155	35.5%	64	14.6%	0.2665
Regional	99	49.5%	66	33.0%	35	17.5%	
Distant	34	60.7%	18	32.1%	4	7.1%	

Table 4. Factors associated with distress screening scores based on a longitudinal mixed model

Factors	Categories	Estimate	95% CI		P-value
Age Groups	21-50	1.23	0.55	1.92	0.0028
	51-64	1.20	0.55	1.85	
	65-74	0.67	0.08	1.27	
	75+	Reference			
Appalachia Status	Non-Appalachia	-0.20	-0.51	0.11	0.1961
	Appalachia	Reference			
Insurance	Medicaid	0.84	-0.61	2.29	<0.0001
	Medicare	0.54	-0.90	1.97	
	Other Public	-0.50	-2.30	1.30	
	Private Insured	-0.22	-1.62	1.18	
	Unknown	-0.29	-3.20	2.61	
	Not Insured	Reference			
Months After Cancer Diagnosis	<1 Month	2.63	2.37	2.89	<0.0001
	2-3 Month	1.32	1.07	1.56	
	4-6 Month	0.59	0.36	0.82	
	7-12 Month	Reference			
Stage	In-situ	-0.78	-1.31	-0.25	0.0291
	Distant	-0.52	-1.16	0.12	
	Localized	-0.29	-0.66	0.09	
	Regional	Reference			

DISCUSSION

- There are significantly variations of screening status among departments with the Hematology Program having the highest screening rates. Rural and Appalachia status were significant in the bivariate analysis but not in the multivariate analysis. Patients who traveled longer distance were more likely getting screening. Those with late stage diagnosis were least likely getting screened.
- No significantly difference as found for the first distress score across various factors. Significant factors were found when examining the highest score in the first year (data not shown). The longitudinal model showed the distress scores had the highest value in the first month, and then decreased over time. Medicaid or young patients had significant higher distress scores. Neither rural nor Appalachian status impacted the score.
- The variation of missing screening by department is likely due to varying practices and available resources. Utilization of readily available electronic health assessment tools for distress has the potential to improve collection of important patient data. Understanding factors associated with distress scores could reduce barriers and improve practices in cancer patient care.

A COMMUNITY/CANCER REGISTRY, COLLABORATIVE EFFORT TO EVALUATE CANCER BURDEN IN A SOUTHEAST TENNESSEE, RURAL COMMUNITY

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INTRODUCTION

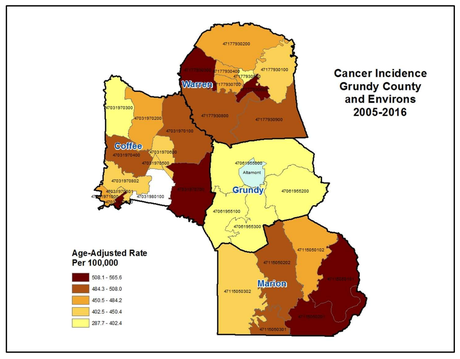
Cancer is a group of more than 100 diseases characterized by the uncontrolled growth and proliferation of abnormal cells, and is the second leading cause of death in the US population. The lifetime risk of being diagnosed with invasive or *in situ* cancer in the U.S. during the period 2016-18 was 43%; therefore, almost half of Americans can expect to be diagnosed with cancer sometime during their lifetime.[1] Given this commonality of cancer, cancer cluster concerns are frequent. A cancer cluster is defined as follows by the Centers for Disease Control & Prevention (CDC): "a greater-than-expected number of cancer cases that occurs within a group of people in a geographic area over a period of time.[2]" The Tennessee (TN) Dept. of Health's TN Cancer Registry (TCR) staff recently responded to a cancer cluster concern located in Altamont city in Grundy County. Local citizens organized the Grundy County Community Cancer Organization (GCCCO), a 501(c)3 organization, to tackle the cancer problem in collaboration with TCR staff.

METHODS

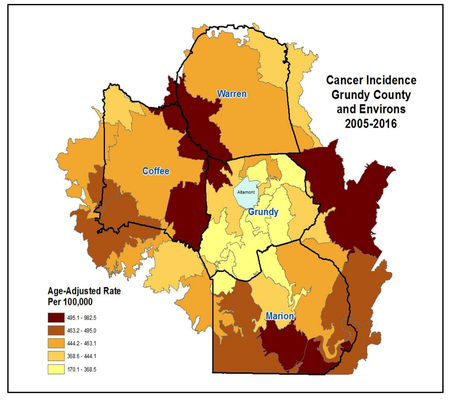
The GCCCO administers a Facebook page that allows local residents to volunteer cancer information about themselves, a family member, or acquaintance due to the concerns regarding the high number of cancers in the community. There were a total of 137 entries on the GCCCO list from the Facebook page that included the individual's name, birth date, address information, and cancer type. TCR staff analyzed reported cancer data by census tract for the time period 2005-2016 for four counties located in southcentral TN: Grundy, Marion, Warren, and Coffee. The census tract under study was #47061955000 (#9550), which includes Altamont city in Grundy County. We initially searched for cancer cases that fit the definition for 47 different forms of cancer and examined the distribution of these cancers by census tract in all study counties. Of the 47 different forms of cancer examined, TCR staff only included in the analysis those forms which had at least 3 incident cases during the study period. This analysis yielded the following results: 22 cancers had a zero count for the 12-year period; 10 cancers displayed a count of one; 5 cancers had a count of two; and, finally, 10 cancers had a count of 3 or more. After examining these cases, TCR staff selected the following six cancers for further analysis: lung, female breast, Non-Hodgkin Lymphoma, pancreas and liver. Age-adjusted incidence rates were calculated for the six forms of cancer under study and then these rates were subjected to "hotspot analysis" using Arc-GIS software (Environmental Systems Research Institute (ESRI)). By definition, hotspot analysis is a complex mapping and spatial statistical analysis technique used to identify clustering of events, such as cancer occurrence. For this study, hot spot analysis was performed using the Global Moran's I statistic. Due to the large number of non-standard addresses—Highway Contract Routes (HCR), PO Boxes, and Rural Routes (RR)—an analysis using zip code-level data was performed to avoid potential study bias introduced during census tract-level analysis. Almost 40% of Grundy County addresses could not be geocoded due to presence of non-standard addresses.

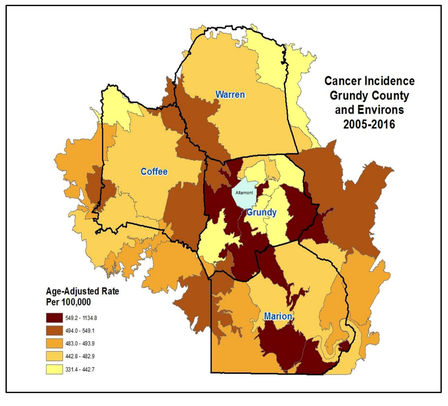
RESULTS

There was a total of 126 cancers diagnosed in #9550 during the 12-year period under study, or on average about 10-11 cases per year out of a population of 2770 as measured during the 2010 Census. Age-adjusted rates were calculated for all census tracts in the counties under investigation, but due to the small numbers involved, the age-adjusted rates cannot be presented other than in map form (see below). One can imagine that the 95% confidence intervals attached to those rates were quite wide and, in some cases, included a negative number. The age-adjusted rates were imported into Arc-GIS software to perform spatial autocorrelation followed by hot spot analysis. TCR staff originally attempted to map observed age-adjusted rates for all cancers combined for all census tracts in the four counties under study (see Figure 1 on page 3), but nearly 40% of all cases for Grundy County could not be mapped due to the large number of residences that do not have exact addresses because they are reported as post office boxes, rural routes, highway contract routes, etc. The substantial amount of missing street address data for Grundy County does not allow for the assignment of census tract for these 40% of cases and, therefore, greatly reduces the accuracy of this analysis. Note in the figure below, the low age-adjusted rates in the census tracts compared to what would be expected for Grundy County as a whole. It should be noted that Grundy County experienced during the 2014-2018 period the 16th highest overall cancer incidence rate, 498.5 cases/100,000 population, in TN among the 95 counties that make up TN. Identical maps were generated for each individual cancer and demonstrated similar results.



For this reason, the experimental protocol was modified such that analyses were also performed at the zip code-level, both not including (left figure below) and including (right figure below) non-standard address data.





RESULTS CONT.

Spatial autocorrelation of zip code-level data with non-standard address data indicated that rates among the four counties were highly correlated; therefore, there were no statistically significant differences between age-adjusted rates from a spatial statistical sense for all cancers combined, nor individual cancers examined. As such, there were no hot or cold spots detected.

DISCUSSION

The purpose of this study was to analyze experiential cancer differences between a census tract (#9550) located within Grundy County and all other census tracts located in Grundy, Marion, Warren, and Coffee Counties. No spatial statistically significant differences were noted during the study using spatial autocorrelation followed by hot spot analysis using the Global Moran's I statistic. A novel issue that had to be addressed was the rurality of Grundy County that led to the evaluation of a number of non-standard addresses—including highway contract routes, rural route addresses, and post office boxes—that made geocoding data impossible. Nearly 40% of all Grundy County addresses included a non-standard address. **For this reason, a collaborative effort between the TCR and the GCCCO was essential to the success of this cluster investigation**. Using the GCCCO list of cases successfully served as a cross-reference to a number of cases in the TCR database that were reported to the TCR with non-standard addresses. Results demonstrated that analysis not using the non-standard address information would have significantly underestimated the age-adjusted rates for Grundy County, but was there evidence to support the validity of the use of the non-standard addresses during the analysis? The GCCCO list of cancer cases (137 total) was cross-referenced to data from the TCR database containing non-standard address information. A total of 80 GCCCO entries (58.4% of all entries) were successfully matched to a case in the TCR's database. There was a total of 38 matched cases amongst the matched cases on the GCCCO list that included a physical street address but were reported to the TCR as a non-standard address. Importantly, 35 of the TCR non-standard address cases (92.1%) could be matched to a GCCCO list case by the zip code. This suggests our assumption for this study may be valid that those individuals with non-standard addresses in the TCR's cancer database lived within the zip code provided; therefore, including individuals with non-standard addresses in the zip code analysis may have produced minimal bias in this study, allowing for a successful, collaborative investigation.

References available upon request.

HLA-Global

Clinical Natural Language Processing Leaders

A Comparison of Deep Understanding and Deep Learning for Pathology Coding

Advantages and Disadvantages of two alternative Machine Learning methods for identifying and coding cancer pathology reports

It all starts with the CTR

A CTR's role is to code pathology reports by following a standard procedure

1. Scan a report quickly to determine if it appears to be a reportable case.
2. If Reportable read the final diagnosis section and identify specimens
3. Select the specimen(s) with the most appropriate cancer details
4. Code the details in the specimen(s) to ICD-O-3 codes
5. Search other sections of the report for any missing data items
6. Merge combinations of specimens to arrive at substitute codes if necessary
7. Commit the codings to the database record

How can HLA-Global's CNLP aid the CTR's work?

3 key steps:

1. Identify Reportables
2. Identify the Specimens and key target content
3. Code to the NAACCR requirements

An automated service must also perform other tasks to be useful

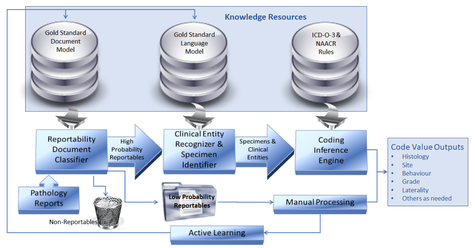
- Identify borderlines for manual validation
- Identify sections in the document
- Find missing information elsewhere
- Apply NAACCR coding rules

Deep Understanding

A Multi-Process Methodology for Pathology Coding

Achieving Deep Understanding (DU) Using a Four-stage Pipeline

More Detailed Breakdown



Putting the Pieces Together

1. Curate the DU components and Create a Gold Standard (GS) of coded documents

Craft a Gold Standard corpus of coded documents by:

- Manually coding, or correcting the coding, of a representative selection of reports
- Annotating these reports
- Building a Language Model
- Building a coding inference engine

2. Identify the attributes of the objects to be classified (All Machine Learning requires this)

- These attributes are called features
- The objects are either words or documents.
- Deep Understanding identifies one set of features for documents
- Deep Understanding identifies a different set of features for words.
- Classically, computational linguistics uses six parameters to compute word features using open-source libraries.

3. Build and validate a Language Model(LM)

- With features and GS classes assigned, the LM is computed
- The LM is used to assign the semantic classes for new reports
- Apply the LM to the GS to identify errors.
- Discrepancies between the GS and LM are errors
- Correcting the inconsistency between a GS and LM computation improves the accuracy.

4. Assemble the pipeline

- Assemble a single processing system
- Further software engineering is needed to manage:
  - Inflow of documents
  - Storage of the source documents
  - Output of the different stages
  - Results
- Forward results to the client's repository
- The Active Learning feedback cycle of train, test, implement, evaluate, and improve.

5. Create a Learning Feedback mechanism

- In production, new reports represent new knowledge
- Active Learning automatically selects the new reports for:
  - new information, or,
  - fine distinctions.
- A CTR codes them for Gold Standard values and annotates for Clinical Entities.
- These reports are used in generating a new language model.

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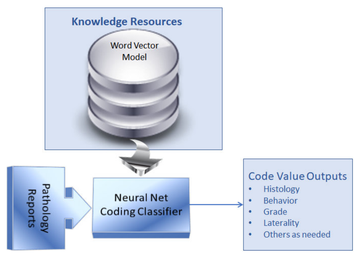
Deep Learning

A Monolithic Process Methodology for Pathology Coding

Single Process Deep Learning

- DL is a technique that has grown in significant popularity for NLP since 2010 because of some of the advantages it offers and its spectacular success in certain application settings (speech recognition, image analysis)
- DL uses a very large collection of reports already coded by registries as a Gold Standard (Historical Records) in a single step process.
- The Language Model is developed using Neural Net machine learners of different types.
- DL is an "uncurated training corpus" methodology, it uses all available data regardless of quality. It uses the whole apple without cutting out the rotten and wormy bits.

More Detailed Breakdown



Putting the Pieces Together

Using Deep Learning for optimising pathology coding

Looking through DL eyes the pathology coding task appears simple

- There are millions of coded reports across the USA
- Hence the words are a classical Neural NLP wellspring of context features.
- Extracting these contexts means word features are created immediately.
- These words features and the code values are used to build a DOCUMENT classifier to compute the five data items.
- A single process bypasses any need to create
  - Two curated Gold Standards, for Reportability and Clinical Entities,
  - An inference engine to manage the coding process.

How Deep Learning Identifies features for a Language Model

1. Obtain a large corpus
2. Generate all the word contexts of each word
3. Use Neural Net technology to reduce the set of contexts for each word to a feature vector of 200 or 300 elements.
4. Words that occur in similar context have similar vector values.
5. Words that occur in different contexts have different vector values.
6. This output is called word embeddings

Deep Learning Document Language Model Creation

- The Language Model is created by using a machine learner (often a Neural Net) to learn the correlations between the feature vectors of the words (aka Word Embeddings) in a document and the 5 classical data item values.
- As a simplification classifying a new document requires:
  - Assigning the feature vectors previously created for each word in the new document
  - Statistically combine the feature vectors for all words in the document
  - Find the document(s) in the training set which have the best statistical match for feature vectors and assign it their data item values
  - In this case the Language Model is a Document Model NOT a Clinical Entities Model

Comparision of Processing Results

The comparision of processing results for Deep Understanding and Deep Lnderstanding is limited as the two methods have not been tested on the same corpus. Deep Understanding results are computed from California CR materials while the Deep Learning results come from a series of published papers but are predominantly sourced from Alawad et al 2019*

*2019 M. Alawad, S. Gao, J. X Qiu, H. J. Yoon, J B. Christian, L. Penberthy, B. Mumphrey, X-C. Wu, L. Coyle, G. Tourassi. Automatic extraction of cancer registry reportable information from free-text pathology reports using multitask convolutional neural networks. Journal of the American Medical Informatics Association, Volume 27, Issue 1, January 2020, Pages 89–98, https://doi.org/10.1093/jamia/ocz153

2021 NAACCR Summer Forum

Comparative Results Analysis between DU and DL

Limitations of Deep Learning Approach

With the efficiencies attributed to DL what might be its limitations?

- DL cannot compute a value for any code that is not in its training set
- DL can't react to prospective changes in the coding values or rules until sufficient training examples are in the coding community, may take years.
- DL uses an "uncurated training corpus" methodology which has several consequences:
  - DL has trouble being accurate for low frequency codes
  - DL has trouble getting coverage for low frequency codes
  - DL can only react to errors by tweaking global parameters of limited scope, so it lacks specificity for targeting local errors
  - New models are computationally expensive and so revisions are expensive and therefore done infrequently.
  - DL can do error correction by removing problematic reports but that then brings it into a curation task somewhat similar to DU curation and therefore loses one of its touted advantages.
  - DL builds in all the characteristics of the training corpus regardless of those elements that are contrary to the ultimate processing objectives, that is it also trains-in contradictions.

Limitations of Deep Understanding Approach

- Uses a curated training corpus so there is significant effort in creating a GS for document types and semantic annotations.
- Separate code development of the coding inference engine

Technology Differences between DU and DL for Pathology Coding

Deep Understanding

- Builds models of the 3 core stages used by the CTR
- Can target specific coding values for improvements for accuracy and coverage
- Can achieve higher accuracies and coverage of the code sets
- Can pre-build models based on prospective standards and coding rules
- Can incorporate an Active Learning feedback cycle for Continuous Process Improvement

Deep Learning

- Sidesteps curated modelling and uses the context vectors of the words to directly model the code values as attributes of a document in a single process
- Uses the initially coded values supplied by the registries as the Gold Standard
- Has no need to create an annotation of the specimen or the key semantic words in the report.
- Has no need to explicitly represent the NAACCR rule books

Is there a point of common contact between Deep Understanding and Deep Learning?

- The commonality of the two methods is that they both require features for words but derive them in different ways.
- Then they use them in different ways:
  - DU computes Clinical Entities
  - DL classifies documents directly to codes.
- The open question is: " Can the the two approaches co-operate by using the Word Vectors computed by DL to then be used by DU as Features for computing Clinical Entities both with and without its own engineered features?"
- That's a question for the future!

Numerical Analysis

DU Results at California CR 2018-19

- Total reports sent to NLP: 935,290
- Total reports completed manual checking: 657,662
- Reports marked reportable or manual by NLP and marked not reportable by the user: 91,324 (13.9%)- about 14% are Manual
- Reports marked non-reportable by NLP and marked reportable by the user: 487
- Reportable: Recall 99.84%

DU at California CR 2020 data processed to date

- Total processed by CTRs 68,999
- Reportable FPs = 5,660 (8.20%)
- Manual Non-Reportables = 31 (0.04%)
- Reportable FNs = 186 (0.27%)
- Reportable TPs = 63,122 (91.48%)

Deep Understanding - 3-digit Site code confusion matrix

- Deep Understanding Compared to Deep Learning has:
  - Less than half the number of 3-digit Site codes under 70% accuracy
  - All misclassifications except one are with topographically contiguous sites
  - No cross-gender sex organ misclassifications occur.

Deep Understanding - 4-Digit Site codes confusion matrix

- ***No*** DL results published
- DU Results
  - Overall classes
    - 28 classes leak reports to 47 other classes
    - 70% of leaks are to a contiguous organ or to Uncertain
  - Classes without Manual processing
    - Of 19 classes – 53% leakage to contiguous classes and 42% to Uncertain
    - No leakage between male and female sex organ cases.
  - o

Deep Understanding vs Deep Learning – Histology Comparisons

- 62 classes - DU have an average higher accuracy by 23%
- 2 classes – DL has higher accuracy
- 3 DL classes not present in the DU sample
- 137 DU classes not present in the DL sample
- For classes with accuracy <70% there are at least twice as many classes to which leakage is made by DL compared to DU.

DL - Summary of Alawad et al. Supp. Materials – 3-digit Site Misclassifications

- 20 smallest Site classes show poor accuracies
  - Not important as make up only 3.2% of total cases
- 3-digit Site coding
  - Overall accuracy 93.7%
  - 50% of classes have an accuracy below 70%
  - 21% have an accuracy of 0.0%
  - 19% of classes have an accuracy above 95%

Bewildering misclassification error examples:

- C08 Salivary Other classified as C50 Breast and C53 Cervix Uteri
- C38 Heart classified as C62 testis
- C52 Vagina classified as C09 Tonsil and C60 Penis
- C60 Penis classified as C51 Vulva

Classification of errors into 4 types are presented in Appendix 3

DL - Summary of Alawad et al. Supplementary Materials – Histology Misclassifications

Histology coding

- Overall accuracy 82.7%
- 40% of classes have an accuracy below 70%
- ?% have an accuracy of 0.0%
- 9% of classes have an accuracy above 95%

Making Corrections to classifier

- The DL is not amenable to any local engineering to rectify specific faults. The best option is to remove erroneously classified reports but that is the same as burying your head in the sand.

NAACCR 2020 Conference - DOE Presentation – Summary and Analysis

- Limitations of use in Registries
- Out-of-date training set
- Unable to compute codes missing from the training set
- Reported accuracies for current models not available and no description for separating more accurate analyses and less accurate analyses
- Accent on processing speed is fairly irrelevant to workflow operations of a cancer registry

HLA-Global

A Comparison of Selected Non-CNS Solid Invasive Malignant Tumors Between Children/Adolescents and Adults in Massachusetts, 2008-2017

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OBJECTIVE: To examine differences in stage, histology, and sex among selected non-CNS solid invasive malignant tumors that occur in both adults and children/adolescents diagnosed from 2008-2017.

BACKGROUND:

- Cancers in children/adolescents differ from those in adults with the former's emphasis on morphology and site and the latter's emphasis on site.[1] This study compared eight non-CNS solid invasive malignant tumors (renal, liver, bone, soft tissue, testes, ovary, thyroid, and melanoma) for differences in stage at diagnosis, sex, and histology between children/adolescents and adults.

METHODS:

- A database was created for the eight non-CNS invasive solid tumors diagnosed in Massachusetts residents from 2008-2017 and separated into two groups: children/adolescent aged birth (0) to 19 and adults aged 20 and older.
- Using the SEER Summary Stage variable, those cases diagnosed at either a local or a regional stage (code=1 to 5) were classified as loco-regional and those diagnosed at a distant stage (code=7) were classified as distant. Cases with an unknown stage were excluded from stage analysis.
- Male and female cases were compared to determine which cancer sites had a higher percentage of the children/adolescents versus adult cases.
- The most common histologies of the different cancer sites were compared between the two groups.
- SAS version 9.4 was used to create the data and to do the chi-square analyses using $p < .05$ as the significant cutoff.

RESULTS:

- From 2008-2017, there were 60,803 cases of the above listed cancers, 911 (1.5%) among those 0-19 and 59,892 (98.5%) among 20+.
- Blastomas comprised nearly 75% of renal and liver cancers among children/adolescents and almost 0% of adult cancers. Renal and liver carcinomas were significantly more prevalent among adults.
- Osteosarcomas and Ewing sarcomas represented a significantly higher percentage of bone cancers among children/adolescent cancers compared to adults.
- Rhabdomyosarcomas represented a significantly higher percentage of soft tissue cancers among children/adolescents as do non-seminomas and germ cell tumors for testicular and ovarian cancers.
- There were no significant differences for thyroid cancer and melanoma histologies.
- There was a significantly larger percentage of female children/adolescents compared to female adults for both renal cancers and melanoma.

Selected Histology Percentages by Cancer Site, Cancers in Children/Adolescents vs. Adult

	0-19	20+
Renal:	(N=119)	(N=10,699)
Nephroblastoma+	80.2%	<0.05%
Clear Cell Carcinoma+	1.0%	54.3%
Unclassified Renal Cell Carcinoma*	8.3%	18.8%
Liver:	(N=49)	(N=6084)
Hepatoblastoma+	73.5%	<0.05%
Hepatocellular Carcinoma*	20.3%	69.2%
Bone:	(N=151)	(N=398)
Osteosarcoma*	56.6%	20.8%
Ewing Sarcoma*	24.3%	4.7%
Soft Tissue:	(N=207)	(N=3,501)
Rhabdomyosarcoma*	32.9%	2.0%
Fibrosarcoma*	16.2%	18.1%
Testicular:	(N=100)	(N=1,851)
Seminoma*	17.0%	61.6%
Non-seminoma*	68.0%	36.6%
Ovarian	(N=31)	(N=4,457)
Germ Cell*	56.3%	1.2%
Adenocarcinoma*	21.9%	80.9%
Thyroid	(N=179)	(N=13,656)
Papillary	67.2%	56.9%
Follicular	6.1%	5.8%
Melanoma	(N=66)	(N=16,330)
NOS	40.3%	41.0%
Lentigo Maligna+	0.0%	6.9%+
Superficial Spreading	49.3%	47.8%

+-not done due to small numbers; *-significant at p<.05.

Sex and Age Group Percentages by Cancer Site, Childhood/Adolescent vs. Adult Cancers, 2008-2017

Cancer Site/Type:	Male		Female	
	0-19	20+	0-19	20+
Renal *	55.4%	64.3%	44.6%	35.7%
Liver	65.3%	72.9%	34.7%	27.1%
Bone	54.6%	51.3%	45.4%	48.7%
Osteosarcoma	52.3%	51.1%	47.7%	48.9%
Ewing Sarcoma	64.7%	75.7%	35.3%	24.3%
Soft Tissue	57.1%	52.6%	42.9%	47.4%
Rhabdomyosarcoma	51.4%	46.1%	48.6%	54.0%
Fibrosarcoma	56.5%	53.1%	43.5%	46.9%
Thyroid	22.2%	25.5%	77.8%	74.5%
Melanoma*	29.9%	55.1%	70.1%	44.9%

*-significant at p<.05.

- A significantly larger percentage of children/adolescents were diagnosed at a distant stage for renal and thyroid cancers.
- While children/adolescents were more likely to be diagnosed at a distant stage for all bone and soft tissue cancers, this was not true for either of the most common subtypes.
- Children/adolescents were significantly more likely to be diagnosed at a distant stage of ovarian cancer compared to the adults.

Stage at Diagnosis Percentages by Cancer Site, Childhood/Adolescent vs. Adult Cancers, 2008-2017

Cancer Site/Type:	Loco-regional		Distant	
	0-19	20+	0-19	20+
Renal*	74.8%	88.4%	25.2%	11.6%
Liver	67.4%	78.6%	32.7%	21.4%
Bone*	74.8%	85.7%	25.2%	14.3%
Osteosarcoma	79.1%	73.0%	20.9%	27.0%
Ewing Sarcoma	64.0%	69.4%	36.0%	30.6%
Soft Tissue*	79.2%	84.9%	20.8%	15.1%
Rhabdomyosarcoma	66.2%	62.9%	33.8%	37.1%
Fibrosarcoma	95.5%	90.9%	4.5%	9.1%
Testicles	91.0%	93.0%	9.0%	7.0%
Ovary*	90.3%	41.4%	9.7%	58.6%
Thyroid*	93.9%	97.0%	6.2%	3.0%
Melanoma	93.9%	95.2%	6.1%	4.8%

*-significant at p<.05.

CONCLUSIONS:

- Although various cancers exist in both the children/adolescent and adult populations, there were significant differences in the stage of diagnosis for five of the cancers.
- For both renal cancer and melanoma, the ratio of females to males in children/adolescents was significantly higher compared to adult females
- There were several significant differences in histology types between children/adolescents and adults which reflect known differences such as blastomas occurring in the very young and germ cell cancers in older children and adolescents..
- Further analyses comparing survival and distant stage diagnosis between children/adolescents and adults will provide more data on this association.

1. NCI SEER Program. International Classification of Childhood Cancer (ICCC).

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Assessing the Pattern of Use of Biological and Genetic Markers for Chronic Lymphocytic Leukemia and Acute Myeloid Leukemia in Puerto Rico Using the Puerto Rico CLL/AML Population-Based Registry

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BACKGROUND

- Worldwide, leukemia remains one of the leading causes of cancer morbidities and mortality. In Puerto Rico, leukemia is the 9th most common cancer with an incidence rate of 10.2 per 100,000 population and the 8th leading cause of cancer related death with a mortality rate of 4.1 per 100,000 population.
- Chronic lymphocytic leukemia (CLL) and acute myeloid leukemia (AML) are the most frequent types of leukemia among the elderly population.
- During the past decades, novel biomarkers have changed the way physicians treat leukemia patients and assign targeted therapies.
- Cytogenetic analysis of AML and CLL has become essential for disease diagnosis, classification, prognostic stratification, and treatment guidance.
- For CLL, the most reliable molecular prognostic markers offered in routing diagnostic tests are the immunoglobulin heavy chain variable (IgHV) gene mutational status and those detected by the fluorescence in situ hybridization (FISH) technique.
- For AML, the polymerase chain reaction (PCR) is one of the most sensitive techniques to screen for many common translocations and to detect leukemic cells during and after treatment.
- Today, no study has evaluated the use and impact on these prognostic factors for CLL or AML in Puerto Rico, a Hispanic aging population.

PURPOSE

- To assess the use of CLL and AML biological and genetic markers and estimates their prevalence in Puerto Rico.

METHODS

- The Puerto Rico Central Cancer Registry (PRCCR) developed the Puerto Rico CLL/AML Population-Based Registry software and database in order to add data that is not collected systematically by the PRCCR.
- The study population consisted of cases reported to the PRCCR between January 1, 2011 and December 31, 2015 with a diagnosis of CLL and AML.
- Data were stratified by sex, age-groups, Health Region, history of previous cancer, health insurance type, and the modified Charlson's comorbidity index.
- Logistic regression models were used to examine factors associated with the receipt of the most relevant testing. For CLL, we examine the factors associated with the performance of FISH to identify genetic abnormalities and IgHV testing. For AML, we examined the factors associated with the performance of PCR.

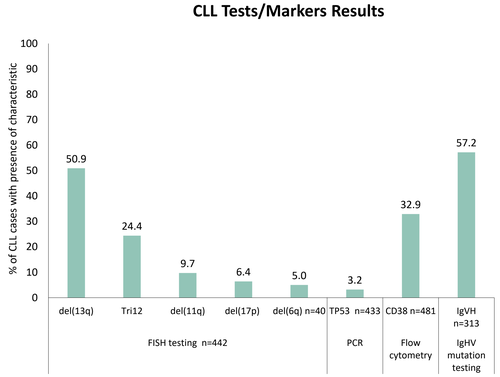
RESULTS

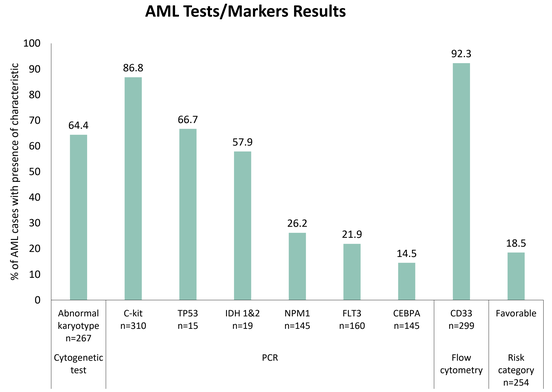
Description of cohort by leukemia subtype: Puerto Rico, 2011-2015

Characteristics	CLL (N = 518)	AML (N = 408)
	%	%
Sex		
Male	59.1	51.0
Female	40.9	49.0
Age Group		
<50	5.8	21.8
50-64	26.1	22.6
65-79	49.6	41.4
80+	18.5	14.2
Previous Cancer History		
No	86.7	77.7
Yes	13.3	22.3

Characteristics	CLL (N = 518)	AML (N = 408)
	%	%
Charlson Comorbidity Index		
0	45.0	46.6
1	16.0	13.0
≥ 2	17.6	16.4
Unknown	21.4	24.0
Insurance type		
Private	23.0	22.8
Medicaid	14.9	23.5
Medicare/Medicaid	22.6	24.3
Medicare	29.3	20.6
Unknown/Other	10.2	8.8

Biological markers distribution in CLL and AML





Adjusted odd ratios (AOR)

Factors associated with performing FISH Tests in CLL Patients

Characteristic	AOR	95% CI
Sex		
Male	1.00	
Female	1.30	(0.77-2.20)
Age at dx, years		
<75	1.00	
≥75	**0.39**	**(0.23-0.67)**
Insurance at Diagnosis		
Private	1.00	
Medicaid	0.54	(0.22-1.32)
Medicare	1.38	(0.57-3.32)
Medicare/Medicaid	0.74	(0.32-1.72)
Others/Unknown	0.38	(0.11-1.33)
Comorbidity Index		
0	1.00	
1	**0.34**	**(0.17-0.69)**
≥2	0.48	(0.23-1.01)
Unknown	1.24	(0.47-3.27)

Factors associated with performing PCR in patients with AML

Characteristic	AOR	95% CI
Sex		
Male	1.00	
Female	1.05	(0.65-1.71)
Age at dx, years		
<75	1.00	
≥75	1.81	(0.97-3.38)
Insurance at Diagnosis		
Private	1.00	
Medicaid	0.84	(0.42-1.69)
Medicare	0.96	(0.43-2.16)
Medicare/Medicaid	1.36	(0.61-3.03)
Others/Unknown	0.51	(0.19-1.39)
Comorbidity Index		
0	1.00	
1	0.82	(0.38-1.78)
≥2	1.25	(0.54-2.90)
Unknown	0.71	(0.37-1.39)

DISCUSSION

- Medical care treatment for patients with CLL and AML has been improved due to better understanding of the biological and genetic markers, particularly in improvements in diagnosis, prognosis, and monitoring of these patients.
- Our findings show that despite the importance of genetic testing as a key tool to evaluate and guide treatment decisions in patients with CLL and AML, testing was not performed consistently among patients diagnosed in Puerto Rico.
- This analysis shows the potential of the Puerto Rico CLL/AML Population-Based Registry database to estimate and monitor the pattern and trends of use of these biological markers to guide treatment decisions and monitor outcomes among patients with CLL and AML in Puerto Rico.
- Our findings highlight the importance of testing for prognostic genetic markers for all patients with CLL and AML and suggests the need for increasing awareness and knowledge regarding the value of this genetic information at time of diagnosis.
- FISH testing to identify genetic abnormalities has proved to be relevant in the assessment of prognosis of patients with CLL. However, our findings show that older patients with CLL are less likely to undergo FISH testing, which is important to determine treatment modalities.
- For patients with AML, no statistical association was found between the predictors and undergo PCR testing (p>0.05).
- The databased developed for this project proved to be an invaluable resource to characterize and monitor the pattern of use of biological and genetic markers for CLL and AML in Puerto Rico.

ACKNOWLEDGEMENT

- This work was supported by a federal grant from the National Program of Central Cancer Registries (NPCR Award Number NU58DP006318) to the Puerto Rico Central Cancer Registry at the UPR-Comprehensive Cancer Center.

Central Nervous System (CNS) tumour incidence rates in Canada over five years between 2013 and 2017

Farzana Yasmin[1], Emily Walker[1], Yan Yuan[1], Faith Davis[1],
The BTRC Surveillance Research Collaboration Group and PHAC Analytical Support Team
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Introduction

The Brain Tumour Registry of Canada was established in 2016 to address the lack of data on Central Nervous System (CNS) tumours in Canada. We present one of the most comprehensive reports on all primary CNS tumours diagnosed among Canadians (excluding Quebec) from 2013-2017.

Methods

- Data on all primary CNS tumours were obtained from the Canadian Cancer Registry.
- International Classification of Diseases for Oncology (3rd edition) site/histology codes were grouped into histological categories according to the schema developed by the Central Brain Tumor Registry of the United States (CBTRUS).
- Age-standardized incidence rates (ASIR) were calculated per 100,000 person-years,
- Direct standardization method was used with with the 2011 Canadian and 2000 U.S standard population.
- ASIR and 95%CI are presented by histology, behaviour, age, sex ,and geographic region.

Results

The primary CNS tumour incidence estimates are based on approximately 29,705 CNS tumours diagnosed in 28,490 Canadians (excluding Quebec) between 2013 and 2017.

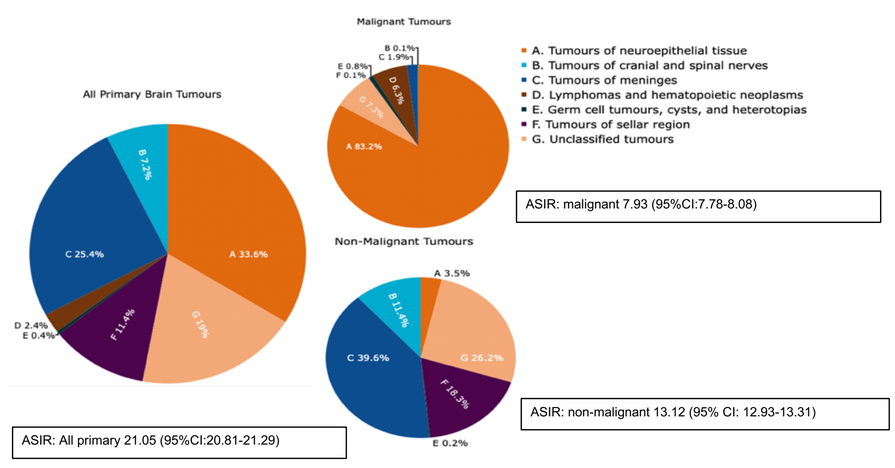

Figure 1: Distribution of major histology groups for all primary central nervous system tumours by behaviour, Canada (excluding Quebec), 2013-2017

- The ASIR for all primary CNS tumours was similar across sex (male: 20.73, 95%CI:20.38-21.07 and female: 21.40, 95%CI:21.07-21.74).
- However, they differed by histology and males had higher rates of neuroepithelial tumours.
- Females had higher rates of tumours of the meninges.

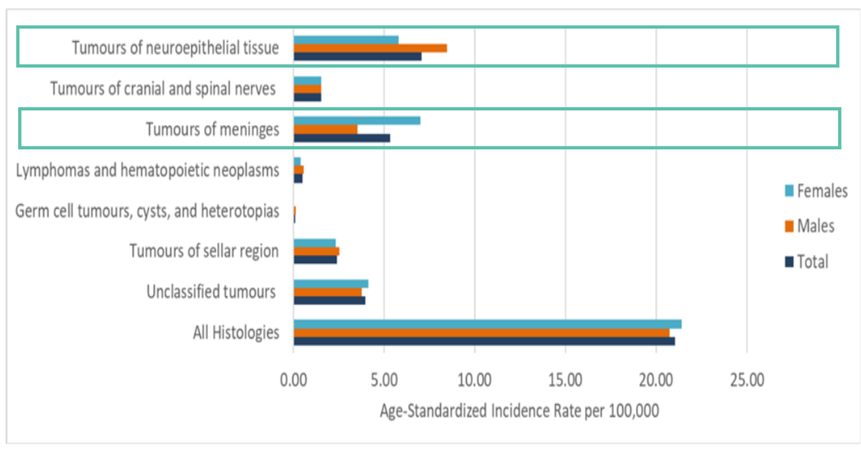

Figure 2: Average annual age-standardized incidence rates (per 100,000) for all primary central nervous system tumours by sex and major histology group, Canada (excluding Quebec), 2013-2017

The ASIR for all CNS tumours increased with age.

- Age 0-14 (children) years, ASIR: 4.99 (95%CI:4.70-5.29)
- Age 15-39 (AYA) years, ASIR: 8.71 (95%CI:8.44-8.98)
- Age 40+ (Adults) years, ASIR: 34.63 (95%CI:34.20-35.07).

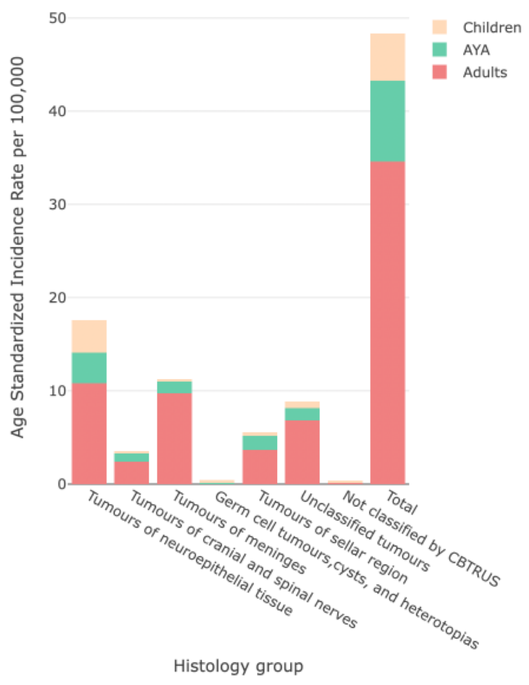

Figure 3: Average number of cases per year and average annual age-standardized incidence rates (per 100,000) for all primary brain tumours by life course stage at diagnosis, Canada (excluding Quebec), 2013-2017

- ASIR for all primary CNS tumours is lowest in Newfoundland and Labrador (13.14; 95%CI:11.86-14.53) and highest in Ontario (24.72; 95%CI: 24.36-25.09).
- ASIR for malignant tumours is lowest in Manitoba (7.43; 95%CI: 6.77-8.13) and highest in Ontario (8.16; 95%CI: 7.95-8.37).
- ASIR for non-malignant tumours is lowest in Newfoundland and Labrador (5.26; 95%CI:4.46-6.18) and highest in Ontario (16.56; 95%CI:16.27-16.87).

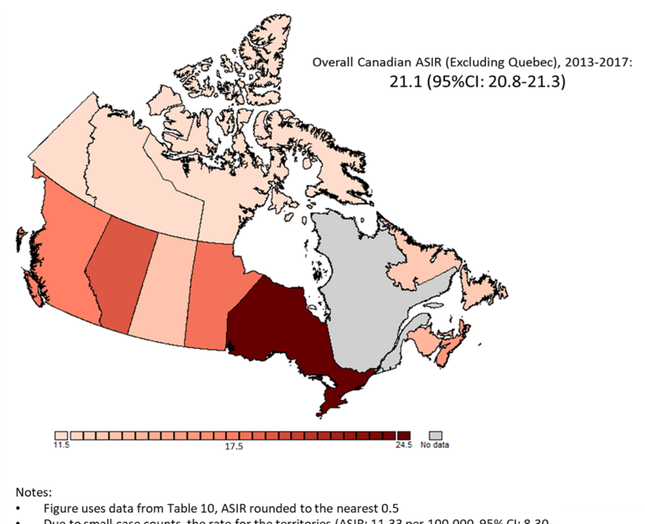

Figure 4: Average annual age-standardized incidence rates (per 100,000) for all primary central nervous system tumours by province/territory (excluding Quebec), 2013-2017

Conclusion

- We present one of the most comprehensive data on CNS tumours available among Canadians.
- ASIR rates for malignant tumours are similar across provinces
- ASIR rates for non-malignant CNS tumours indicate an underestimation of non-malignant CNS tumours.
- These data suggest Canadian key stakeholders need to continue to improve methods for capturing of non-malignant brain tumours in population registries.

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Challenges of Medical Record Abstraction in a Retrospective Long-Term Follow up Study

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Introduction

Medical Records are an extremely rich source of information and have tremendous value in cancer research. Nevertheless, the process of obtaining and abstracting medical records for a long-term follow-up study is complicated, time-consuming, and resource-intensive. Our three-member team abstracted approximately 25,000 pages of medical records for 93 patients, as a part of a retrospective 5-year follow-up study involving lung cancer survivors in New Jersey. We obtained these charts from 150 facilities and 111 physicians following HIPAA compliant procedures, and then meticulously reviewed this unstructured data. This presentation describes the observations and challenges during this process, which we hope will provide helpful guidance for any future studies with a similar design.

Data Collection Process

The Diversity Study

The medical records were obtained as a part of data collection for the study "Identifying Racial Disparities in Follow-up Care in a Diverse Population of Lung Cancer Survivors," also called the "Diversity Study." The purpose of this study was to measure any racial differences in receipt of post-treatment follow-up care in lung cancer survivors. The other sources of information for the study data included SEER DMS, and patient-administered surveys (Table 1).

Data	*Source*
Basic Demographic Characteristics	SEER DMS
Tumor Characteristics	SEER DMS
Health and Social Behaviors	Self-reported questionnaire
Comorbidities	Self-reported questionnaire
Treatment Procedures and sequence	Medical Records and SEER DMS
Testing Procedures	Medical Records

Table 1: Sources of Information for Diversity Study

Challenges

- ***Complexity of Electronic Medical Record (EMR) systems - Ensuring complete medical records is challenging***

  EMR landscape in healthcare is complex and is subject to continuous and rapid changes. The providers use a myriad of EMR systems with diverse configurations. This widely varied system of medical record repositories makes it difficult for researchers to determine if all required medical charts from all years of follow-up for a particular patient have been received.

- ***Reporting Bias - Patients often fail to report one or more healthcare providers (HCPs)***

  We found that the lists of HCPs provided by the patients were often different from that in the SEER DMS database. Since SEER DMS is a more authentic source of this information by virtue of its verification procedures, we suspected a reporting bias in the participants' provided lists. This might affect the data collection process.

- ***Medical Record Release Authorization - rigorous documentation requirements can frustrate patients***

  Providers have varied and rigorous requirements for medical record release of their patients, which might require multiple patient contacts. This can frustrate sick patients and can discourage them from participating in current or any future research studies.

- ***Abstraction challenges in case of large records***

  We estimated that it takes approximately 1 hour to abstract 100 pages of free text. Therefore, large medical records (500+ pages) posed a substantial challenge to the abstractors. Due to the tedious and monotonous nature of the abstraction work, human factors like fatigue are natural to affect the process. The legibility of some records is also compromised during photocopying and faxing, which might further complicate abstraction procedures.

- ***Obtaining Medical Records specific to the study objectives needs careful determination***

  Medical records contain different sets of information depending on their source, such as general hospitals, specialty centers, primary care providers or subspecialty clinics. Determination of the sources that are best for the study objectives might require early abstraction and careful analysis of the first few records that are received.

- ***Inconsistent medical terminologies and extensive use of free text by MDs***

  The use of inconsistent medical terminologies by different providers complicates the conversion of unstructured text into categorical data for analysis. Furthermore, the MDs extensively use free text, which then requires a manual line-by-line search for relevant information. This may result in missing some data due to human error.

Recommendations

- ***Source of research data:***

  Different sources of research data such as medical records from various providers, registry data, and survey questionnaires, will provide different sets of information. The source that is best suited for the study objectives should be determined early on in the study.

- ***Abstractors training***

  To have consistency in the abstraction procedures, all staff should receive sufficient training from an experienced abstractor before starting the process.

- ***Tailoring the abstraction to research objectives***

  Medical records contain a tremendous amount of information. The abstractors should focus on the relevant data only.

- ***Data abstraction audit***

  A good tracking system for the abstracted elements might be required to ensure data integrity.

- ***Data quality control measures***

  More than one abstractor should separately review some or all charts depending on the available research resources.

- ***Pilot study***

  A smaller pilot study, with 50 to 100 patients, is strongly recommended to evaluate the required resources before any large-scale study is conducted.

Conclusion

Despite being a rich source of information, several factors can affect the data collection process from medical records, and thus can bias the research results. These include receiving incomplete charts, inaccurate coding, and missing important information during abstraction. It is recommended that the staff is appropriately trained to obtain and abstract data, firm data auditing procedures are employed, and sufficient time and human resources are allocated in order to collect quality data to achieve the research objectives.

Acknowledgements: *Principal Investigator - Diversity Study: Jyoti Malhotra, MD* *Funding source: Rutgers Cancer Institute of New Jersey and the American Cancer Society*

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Childhood Cancer Records in an Agrobusiness Region of South Brazil

Authors: Jane Kelly Oliveira Friestino[1,2]; Marcelo Moreno[1]; Vander Monteiro da Conceição[1]; Patricia Carla Lima[3];Gilnei Fitler Soares[1]; Priscila Maria Stolses Bergamo Francisco[2]

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BACKGROUND

Between 2020 and 2022, it is estimated that there will be 8,460 new cases of childhood cancer in Brazil. By 2020, it was expected that South Brazil will present the highest incidence of childhood cancer, with a gross rate of 165.27 cases per million.

Chapecó - health reference city – state of Santa Catarina/South Brazil.

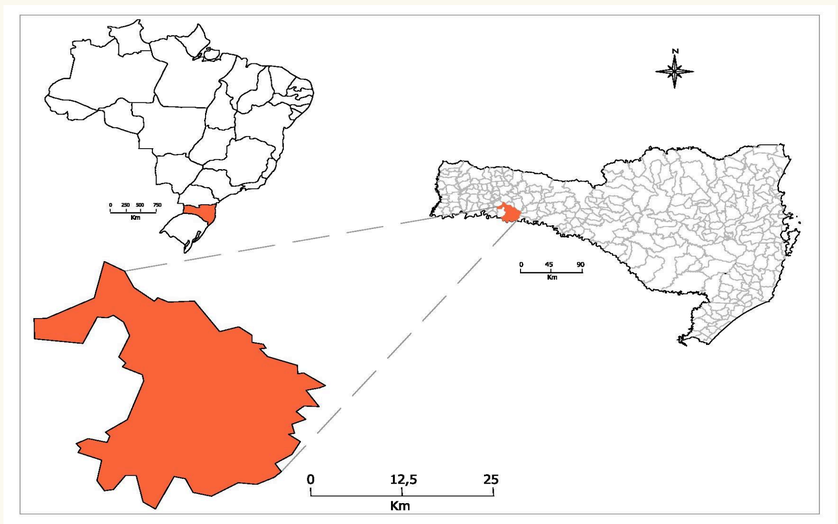

Figure 1 – Chapecó's location in Santa Catarina and in Brazil.
Source: https://doi.org/10.4000/confins.9646.

Agribusiness economy is based on family farming. It is known that more than 82% of these properties make use of pesticides, a rate significantly higher than the national average of 33%.

OBJECTIVE

The objective was to study the profile of childhood cancers registered in Children's Hospital of Augusta Müller Bohner during the first year of pediatric oncology care.

METHODS

Used to collect data was made by medical records from the patients attended during 2016. All pediatric cancers were further classified according to the ICCC (International Classification for Childhood Cancer third Edition. The ethical committee approved this Project.

RESULTS

At the end of 2015, the pediatric oncology ward was inaugurated at the Children's Hospital of Augusta Müller Bohner, with services of clinical oncology, surgical oncology, chemotherapy, hematology and radiotherapy, for the age group from 0 to 18 years. The hospital is a reference for approximately 1.5 million inhabitants. The hospital does not have a Hospital Cancer RegFederal University of Fronteira Sul, the systematization of registry data has started, including the possibility of producing population-based information for the region.

During the 2016, 22 cancer cases which were registered. Among all these subtypes, all cancers showed female predominance, 59.1% were female cases and 40.9% were male. The predominance age group of the start of treatment was 10-14 years old, (31.8%).

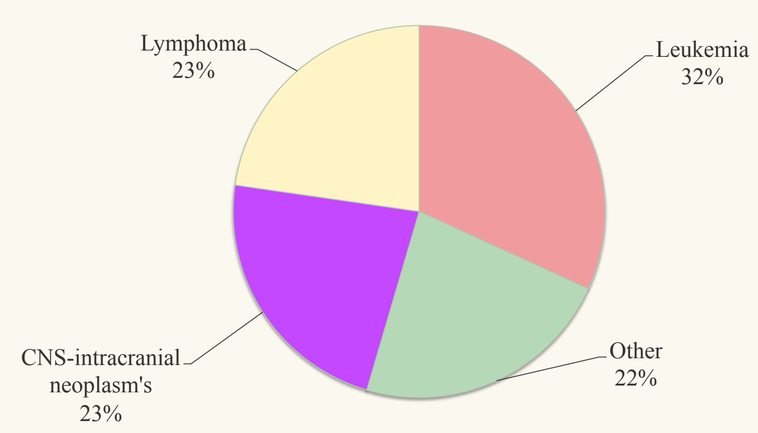

Figure 2 – Cancer data registred using the ICCC. Children's Hospital of Augusta Müller Bohner. 2016

CONCLUSION

The most common cancers among the pediatric group were leukemias/lymphomas followed by CNS-intracranial neoplasms. The cancer registry was very important to consider the future plans for oncological health, specific for this region.

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COLORECTAL CANCER IN SCREENING AGE NEW JERSEY ADULTS

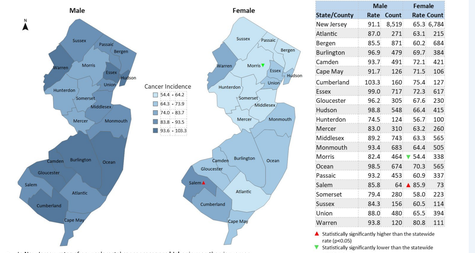
Pamela Agovino[1], Susan German[2], Muhammad Ahmed[2,3], Jie Li[1], Anupama Shah [2,3], Lisa E. Paddock[2,3], Antoinette Stroup[2,3]

[1]New Jersey Department of Health, Trenton, NJ; [2]Rutgers Cancer Institute of New Jersey, New Brunswick, NJ; [3]Rutgers School of Public Health, Piscataway, NJ

BACKGROUND

- Colorectal cancer (CRC) is the third most commonly diagnosed cancer in both men and women in the United States (U.S.) and in New Jersey.[1,2] Compared to the U.S. average, New Jersey has a slightly higher incidence of CRC (40.8 vs. 38.4 per 100,000; 2013 -2017).[3,4] CRC mortality rates in New Jersey are the same as the U.S. average (13.7 per 100,000; 2014-2018).[3,4]
- The links between diet, weight, and exercise and CRC are among the strongest for any type of cancer.[5] Based on a meta-analysis, in the U.S., individuals with a high body mass index (BMI) were 46% more likely to develop CRC compared to those with normal BMI values (pooled RR of 1.465 (95% CI, 1.325–1.619)), and those with the highest vs lowest category of waist circumference had a 61% higher risk of CRC (pooled RR of 1.612 (95% CI, 1.379–1.885)).[6]
- Smoking is also a modifiable risk factor for CRC.[5] A large prospective cohort study found that long term cigarette smoking was associated with an increased risk of CRC.[7] The greatest risk was among current smokers with at least 50 years of smoking, who have a 38% increase in CRC risk compared to never-smokers (hazard ratio: 1.38 (95% CI, 1.04-1.84)).[7]
- Over the past two decades, a subtle yet steadily significant increase in CRC incidence can be seen for younger adult (20-49) men (+1.16% per year; 1995-2014) and women (+1.46% per year; 1995-2014) in New Jersey.[2]
- Due to this trend, the American Cancer Society has lowered the recommended screening age for CRC from 50 to 45.[9]

Newly Diagnosed Colorectal Cancer in Screening Age Adults



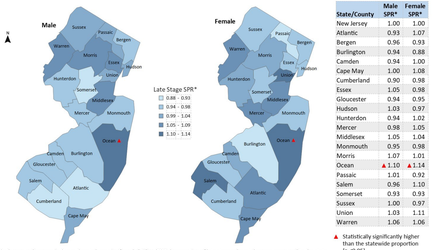
State/County	Male Rate	Male Count	Female Rate	Female Count
New Jersey	91.1	8,519	65.3	6,784
Atlantic	87.0	271	63.1	215
Bergen	85.5	871	60.2	684
Burlington	96.9	479	69.7	384
Camden	93.7	491	72.1	421
Cape May	91.7	126	71.5	106
Cumberland	103.3	160	75.4	127
Essex	99.0	717	72.3	617
Gloucester	96.2	305	67.6	230
Hudson	98.8	548	66.4	415
Hunterdon	74.5	124	56.7	100
Mercer	83.0	310	63.2	260
Middlesex	89.2	743	63.3	565
Monmouth	93.4	683	64.4	505
Morris	82.4	464	▼ 54.4	338
Ocean	98.5	674	70.3	565
Passaic	93.2	453	60.9	337
Salem	85.8	64	▲ 85.9	73
Somerset	79.4	280	58.0	223
Sussex	84.3	156	60.5	114
Union	88.0	480	65.5	394
Warren	93.8	120	80.8	111

- In New Jersey, rates of new colorectal cancer cases are **higher** in men than in women.
- Rates of new cases are **higher** in southern counties among men and women compared to northern counties.
- Among women with newly diagnosed colorectal cancer, Morris County had significantly **lower** rate and Salem County had significantly **higher** compared to New Jersey women overall.

▲ Statistically significantly higher than the statewide rate (p<0.05)
▼ Statistically significantly lower than the statewide rate (p<0.05)

* Rates are per 100,000 and age-adjusted to the 2000 US population standard. Incidence data are from the New Jersey State Cancer Registry and include invasive colorectal cancers diagnosed during 2012-2017 in adults ages 45-74 years.

Late Stage Colorectal Cancer Diagnosis in Screening Age Adults



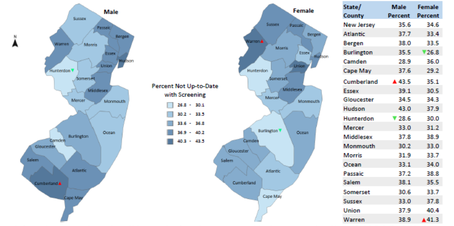
State/County	Male SPR*	Female SPR*
New Jersey	1.00	1.00
Atlantic	0.93	1.07
Bergen	0.96	0.93
Burlington	0.94	0.88
Camden	0.94	1.00
Cape May	1.00	1.08
Cumberland	0.90	0.98
Essex	1.05	0.98
Gloucester	0.94	0.95
Hudson	1.03	0.97
Hunterdon	0.94	1.02
Mercer	0.98	1.05
Middlesex	1.05	1.04
Monmouth	0.95	0.98
Morris	1.07	1.01
Ocean	▲1.10	▲1.14
Passaic	1.01	0.92
Salem	0.96	1.10
Somerset	0.93	0.93
Sussex	1.00	0.97
Union	1.03	1.11
Warren	1.06	1.06

- Both men and women in Ocean County have significantly **higher** (10%+) proportion of late stage colorectal cancer compared to the state.
- For men, the counties with a 5% or **higher** proportion of late stage colorectal cancers compared to the state include Ocean, Warren, Union, Mercer, Salem, Atlantic and Cape May.
- For women, the counties with a 5% or **higher** proportion of late stage colorectal cancers compared to the state include Ocean, Warren, Union, Mercer, Salem, Atlantic and Cape May.

▲ Statistically significantly higher than the statewide proportion (p <0.05)

* Standardized Proportion Ratio (SPR) of late stage colorectal cancer cases in each county compared to New Jersey. SPRs can be interpreted as the percentage above or below the reference population's (NJ) SPR of 1.00 or 100%. A SPR of 1.08 represents 8% higher than the New Jersey SPR, while a 0.90 SPR represents 10% lower than the New Jersey SPR. Late stage includes regional and distant stages. The denominator includes all cases (in situ, local, regional, distant). Incidence data are from the New Jersey State Cancer Registry and include colorectal cancers diagnosed during 2012-2017 in adults ages 45-74 years.

Percentage of Screening Age Adults Who are Not Up-to-Date with Colorectal Cancer Screening



State/ County	Male Percent	Female Percent
New Jersey	35.6	34.6
Atlantic	37.7	33.4
Bergen	38.0	33.5
Burlington	35.5	▼26.8
Camden	28.9	36.0
Cape May	37.6	29.2
Cumberland	▲ 43.5	35.1
Essex	39.1	30.5
Gloucester	34.5	34.3
Hudson	43.0	37.9
Hunterdon	▼ 28.6	30.0
Mercer	33.0	31.2
Middlesex	37.8	38.9
Monmouth	30.2	33.0
Morris	31.9	33.7
Ocean	33.1	34.0
Passaic	37.2	38.8
Salem	38.1	35.5
Somerset	30.6	33.7
Sussex	33.0	37.8
Union	37.9	40.4
Warren	38.9	▲41.3

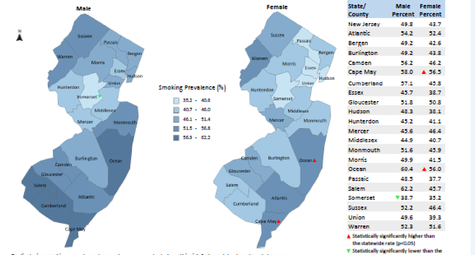
- In the four southern-most counties, men have a higher proportion of screening age New Jersey adults who are not up-to-date with their colorectal cancer screening compared to women.
- Compared to all NJ screening age women, there is a significantly higher proportion of screening age women in Warren County who are not up-to-date with their colorectal cancer screening, while there is a significantly lower proportion of screening age women in Burlington County who are not up-to-date with their colorectal cancer screening.
- Screening age men have a significantly higher proportion of not up-to-date colorectal cancer screening in Cumberland County and a significantly lower proportion of not up-to-date colorectal cancer screening in Hunterdon County compared to New Jersey screening age men overall.
- Screening age men in Atlantic, Bergen, Cape May, Cumberland, Essex, Hudson, Middlesex, Passaic, Salem, Union and Warren counties have a high proportion (37% or above) of not up-to-date with colorectal cancer screening.
- Although not significantly higher than the state average, screening age women in Hudson, Middlesex, Passaic, Sussex and Union counties have a high proportion (37% or above) of not up-to-date with colorectal cancer screening.

▲ Statistically significantly higher than the statewide percentage (p<0.05)
▼ Statistically significantly lower than the statewide percentage (p<0.05)

Screening data are from the 2012, 2014-2017 New Jersey New Jersey Behavioral Risk Factor Survey presented as percentages (not age-adjusted) of adults aged 50-75 who reported not being up-to-date with either a colonoscopy, sigmoidoscopy, or fecal occult blood test per screening guidelines.

5

Smoking Prevalence in Screening Age Adults



State/ County	Male Percent	Female Percent
New Jersey	49.8	43.7
Atlantic	54.2	52.4
Bergen	49.2	42.6
Burlington	49.2	43.8
Camden	56.2	46.2
Cape May	58.0	▲ 56.5
Cumberland	57.1	45.8
Essex	45.7	38.7
Gloucester	51.8	50.8
Hudson	48.3	36.1
Hunterdon	45.2	41.1
Mercer	43.6	46.4
Middlesex	44.9	40.7
Monmouth	51.6	45.9
Morris	49.9	41.5
Ocean	60.4	▲ 56.0
Passaic	48.5	37.7
Salem	62.2	45.7
Somerset	▼ 38.7	39.3
Sussex	52.2	46.4
Union	49.6	39.3
Warren	52.3	51.6

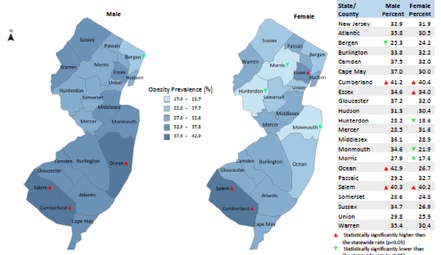
- By displaying smoking prevalence by county we can evaluate how this risk factor relates to colorectal cancer.
- Overall, men have a **higher** smoking prevalence than women.
- Men in Cape May, Cumberland, Ocean, and Salem counties have the **highest** smoking prevalence in New Jersey.
- Compared to the statewide average, women in Cape May and Ocean counties have significantly **higher** smoking prevalence and men in Somerset County have significantly lower smoking prevalence.
- Smoking prevalence is **lowest** [below 46%] in Essex, Hunterdon, Middlesex and Somerset counties for both men and women.

▲ Statistically significantly higher than the statewide rate (p<0.05)
▼ Statistically significantly lower than the statewide rate (p<0.05)

Smoking prevalence data are from 2012-2017 New Jersey Behavioral Risk Factor Survey presented as percentages (not age-adjusted) of adults aged 45-75 and include current and former smokers. Current smoker is defined as someone who now smokes "every day" or "some days". Former smoker is defined as someone who does not smoke "at all" now, but had smoked at least 100 cigarettes in their entire life.

6

Obesity Prevalence in Screening Age Adults



State/ County	Male Percent	Female Percent
New Jersey	32.9	31.9
Atlantic	35.8	30.5
Bergen	▼ 25.3	24.2
Burlington	33.8	32.2
Camden	37.5	32.0
Cape May	37.0	30.0
Cumberland	▲ 41.2	▲ 40.4
Essex	34.6	▲ 34.0
Gloucester	37.2	32.0
Hudson	31.3	30.4
Hunterdon	28.2	▼ 18.6
Mercer	28.5	31.6
Middlesex	36.1	28.9
Monmouth	34.6	▼ 21.9
Morris	27.9	▼ 17.6
Ocean	▲ 42.9	26.7
Passaic	29.2	32.7
Salem	▲ 40.3	▲ 40.2
Somerset	28.6	24.3
Sussex	34.7	26.9
Union	29.8	25.9
Warren	35.4	30.4

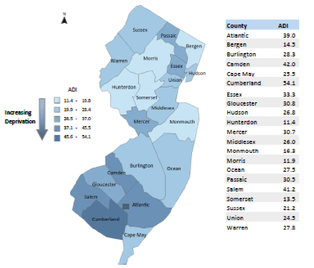
- By displaying obesity prevalence by county we can evaluate how this risk factor relates to colorectal cancer.
- Overall, men have a **higher** obesity prevalence than women in New Jersey.
- There is a significantly **higher** obesity prevalence in Ocean, Salem and Cumberland counties for men and in Essex, Salem and Cumberland counties for women compared to New Jersey.
- There is a significantly **lower** obesity prevalence in Bergen County for men, and Hunterdon, Morris, and Monmouth counties for women compared to New Jersey.

▲ Statistically significantly higher than the statewide rate (p<0.05)
▼ Statistically significantly lower than the statewide rate (p<0.05)

Obesity prevalence data are from 2012-2017 New Jersey Behavioral Risk Factor Survey presented as percentages (not age-adjusted) of adults aged 45-75.

7

Area Deprivation Index (ADI) by County



County	ADI
Atlantic	39.0
Bergen	14.5
Burlington	28.3
Camden	42.0
Cape May	23.5
Cumberland	54.1
Essex	33.3
Gloucester	30.8
Hudson	26.8
Hunterdon	11.4
Mercer	30.7
Middlesex	26.0
Monmouth	16.3
Morris	11.9
Ocean	27.5
Passaic	30.5
Salem	41.2
Somerset	13.5
Sussex	21.2
Union	24.5
Warren	27.8

- By reviewing the variation in ADI rankings by county we can evaluate how socioeconomic status relates to colorectal cancer.
- Cumberland, Atlantic, Camden, and Salem counties have the **highest** level of area deprivation in New Jersey (above the 37th percentile).
- Individuals living in Cumberland County have the **highest** level of deprivation; Cumberland County also has the **highest** rates of newly-diagnosed CRC cases among men, and is one of the counties with both the **highest** smoking prevalence for men, and the **highest** obesity prevalence for men and women.
- Hunterdon, Sheet2.Cty Rate counties have the lowest area deprivation in New Jersey and are among the counties with the lowest rates of new CRC cases.

The ADIs are national percentile rankings (from 1 to 100) of socioeconomic deprivation at the census block group level. The percentiles are constructed by ranking the ADI from low to high for the U.S. We calculated the county rankings from the census block group rankings. The census block group ADI data for N.J. were downloaded from the Neighborhood Atlas website, https://www.neighborhoodatlas.medicine.wisc.edu/.

8

CONCLUSIONS

- Despite the declining trends in colorectal cancer (CRC) statewide, there are at least a third (35%) of New Jerseyans who are not up-to-date with CRC screening. CRC incidence, and the prevalence of obesity and smoking is higher in men compared to women in New Jersey. Area deprivation and CRC incidence are higher in South Jersey compared to North Jersey.
- Substantial geographic variation in CRC incidence and key risk factors in New Jersey are evident. Although South Jersey has the highest incidence rates of CRC, several northern counties are at increased risk including Warren County which is among the northern counties with the highest proportion of late stage CRC, highest smoking prevalence, and is among the counties that have high proportions who are not up-to-date with screening, particularly women. In the south, Salem is one of the counties with a high ADI, high obesity prevalence, highest smoking prevalence among men, higher proportion of late stage CRC compared to the state among women, and is among the counties with the highest proportion of men who are not up-to-date with their CRC screening. Cumberland County, which has the greatest socioeconomic deprivation and the highest incidence among men (and one of the highest among women), also has the highest percentage of men who are not up-to-date with CRC screening.
- Counties with the lowest area deprivation (or high socioeconomic status) are the same counties with some of the lowest incidence rates (Morris women), prevalence of smoking (Somerset men), obesity (Bergen men and Hunterdon, Morris, and Monmouth women), and proportion of individuals who are not up-to-date with CRC screening (Hunterdon men).
- These findings are consistent with previous research. These data provide evidence to inform cancer control programs that focus on cancer screenings, tobacco cessation, and healthy lifestyle promotion.

Acknowledgements

Data were collected by the New Jersey State Cancer Registry under contract HHSN 75N91021D00009 and control No. 75N91021F00001 from the Surveillance, Epidemiology, and End Results Program of the National Cancer Institute, and under cooperative agreement 5NU58DP006279-04-00 from the National Program of Cancer Registries, Centers for Disease Control and Prevention, in addition to funding from the State of New Jersey, and the Rutgers Cancer Institute.

Data collection for the New Jersey Behavioral Risk Factor Survey (NJBRFS) was funded under Cooperative Agreement 6NU58DP006070 by the Behavioral Risk Factor Surveillance System, Centers for Disease Control and Prevention, and by the State of New Jersey.

To view the entire report including technical notes and references, please visit https://www.nj.gov/health/ces/reports.shtml.

Presented at the NAACCR Annual Conference, June 15-17, 2021

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BACKGROUND

- Colorectal cancer (CRC) is the third most commonly diagnosed cancer in both men and women in the United States (U.S.) and in New Jersey.[1,2] Compared to the U.S. average, New Jersey has a slightly higher incidence of CRC (40.8 vs. 38.4 per 100,000; 2013 -2017).[3,4] CRC mortality rates in New Jersey are the same as the U.S. average (13.7 per 100,000; 2014-2018).[3,4]
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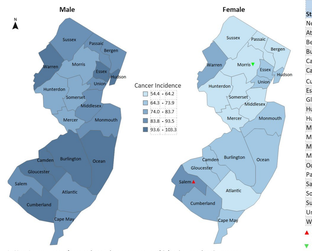

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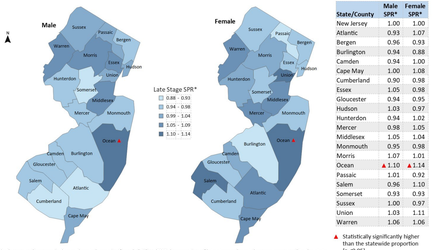

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Cape May	1.00	1.08
Cumberland	0.90	0.98
Essex	1.05	0.98
Gloucester	0.94	0.95
Hudson	1.03	0.97
Hunterdon	0.94	1.02
Mercer	0.98	1.05
Middlesex	1.05	1.04
Monmouth	0.95	0.98
Morris	1.07	1.01
Ocean	▲ 1.10	▲ 1.14
Passaic	1.01	0.92
Salem	0.96	1.10
Somerset	0.93	0.93
Sussex	1.00	0.97
Union	1.03	1.11
Warren	1.06	1.06

▲ Statistically significantly higher than the statewide proportion (p <0.05)

- Both men and women in Ocean County have significantly **higher** (10%+) proportion of late stage colorectal cancer compared to the state.
- For men, the counties with a 5% or **higher** proportion of late stage colorectal cancers compared to the state include Ocean, Warren, Morris, Essex and Middlesex.
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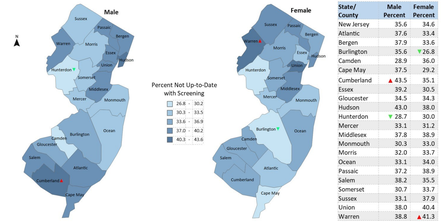
Percentage of Screening Age Adults Who are Not Up-to-Date with Colorectal Cancer Screening



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Hudson	43.0	38.0
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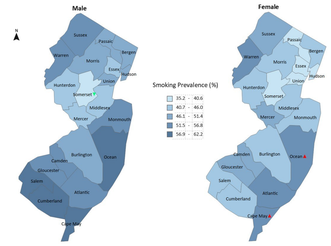
Monmouth	30.3	33.0
Morris	32.0	33.7
Ocean	33.1	34.0
Passaic	37.2	38.9
Salem	38.2	35.5
Somerset	30.7	33.7
Sussex	33.1	37.9
Union	38.0	40.4
Warren	38.8	▲ 41.3

- In the four southern-most counties, men have a **higher** proportion of screening age New Jersey adults who are not up-to-date with their colorectal cancer screening compared to women.
- Compared to all NJ screening age women, there is a significantly **higher** proportion of screening age women in Warren County who are not up-to-date with their colorectal cancer screening, while there is a significantly **lower** proportion of screening age women in Burlington County who are not up-to-date with their colorectal cancer screening.
- Screening age men have a significantly **higher** proportion of not up-to-date colorectal cancer screening in Cumberland County and a significantly **lower** proportion of not up-to-date colorectal cancer screening in Hunterdon County compared to New Jersey screening age men overall.
- Screening age men in Atlantic, Bergen, Cape May, Cumberland, Essex, Hudson, Middlesex, Passaic, Salem, Union and Warren counties have a **high** proportion (37% or above) of not up-to-date with colorectal cancer screening.
- Although not significantly higher than the state average, screening age women in Hudson, Middlesex, Passaic, Sussex and Union counties have a **high** proportion (37% or above) of not up-to-date with colorectal cancer screening.

▲ Statistically significantly higher than the statewide percentage (p<0.05)
▼ Statistically significantly lower than the statewide percentage (p<0.05)

Screening data are from the 2017 New Jersey Behavioral Risk Factor Survey presented as percentages of adults aged 45-75 who reported not being up-to-date with either a colonoscopy, sigmoidoscopy, or fecal occult blood test per screening guidelines.

Smoking Prevalence in Screening Age Adults



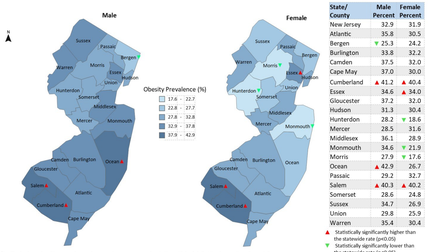
State/County	Male Percent	Female Percent
New Jersey	49.8	43.7
Atlantic	54.2	52.4
Bergen	49.2	42.6
Burlington	49.2	43.8
Camden	56.2	46.2
Cape May	58.0	▲ 56.5
Cumberland	57.1	45.8
Essex	45.7	38.7
Gloucester	51.8	50.8
Hudson	48.3	38.1
Hunterdon	45.2	41.1
Mercer	45.6	46.4
Middlesex	44.9	40.7
Monmouth	51.6	45.9
Morris	49.9	41.5
Ocean	60.4	▲ 56.0
Passaic	48.5	37.7
Salem	62.2	45.7
Somerset	▼ 38.7	35.2
Sussex	52.2	46.4
Union	49.6	39.3
Warren	52.3	51.6

▲ Statistically significantly higher than the statewide rate (p<0.05)
▼ Statistically significantly lower than the statewide rate (p<0.05)

- By displaying smoking prevalence by county we can evaluate how this risk factor impacts colorectal cancer.
- Overall, men have a **higher** smoking prevalence than women.
- Men in Cape May, Cumberland, Ocean, and Salem counties have the **highest** smoking prevalence in New Jersey.
- Compared to the statewide average, women in Cape May and Ocean counties have significantly **higher** smoking prevalence and men in Somerset County have significantly **lower** smoking prevalence.
- Smoking prevalence is **lowest** (below 46%) in Essex, Hunterdon, Middlesex and Somerset counties for both men and women.

Smoking prevalence data are from 2011-2016 New Jersey Behavioral Risk Factor Survey presented as percentages not age-adjusted and include current and former smokers. Current smoker is defined as someone who now smokes "every day" or "some days". Former smoker is defined as someone who does not smoke "at all" now, but had smoked at least 100 cigarettes in their entire life.

Obesity Prevalence in Screening Age Adults



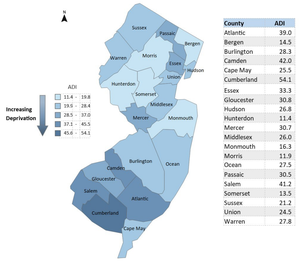
State/County	Male Percent	Female Percent
New Jersey	32.9	31.9
Atlantic	35.8	30.5
Bergen	▼ 25.3	24.2
Burlington	33.8	32.2
Camden	37.5	32.0
Cape May	37.0	30.0
Cumberland	▲ 41.2	▲ 40.4
Essex	34.6	▲ 34.0
Gloucester	37.2	32.0
Hudson	31.3	30.4
Hunterdon	28.2	▼ 18.6
Mercer	28.5	31.6
Middlesex	36.1	28.9
Monmouth	34.6	▼ 21.9
Morris	27.9	▼ 17.6
Ocean	▲ 42.9	26.7
Passaic	29.2	32.7
Salem	▲ 40.3	▲ 40.2
Somerset	28.6	24.8
Sussex	34.7	26.9
Union	29.8	25.9
Warren	35.4	30.4

▲ Statistically significantly higher than the statewide rate (p<0.05)
▼ Statistically significantly lower than the statewide rate (p<0.05)

- By displaying obesity prevalence by county we can evaluate how this risk factor impacts colorectal cancer.
- Overall, men have a **higher** obesity prevalence than women in New Jersey.
- There is a significantly **higher** obesity prevalence in Ocean, Salem and Cumberland counties for men and in Essex, Salem and Cumberland counties for women compared to New Jersey.
- There is a significantly **lower** obesity prevalence in Bergen County for men, and Hunterdon, Morris, and Monmouth counties for women compared to New Jersey.

Obesity prevalence data are from the 2011-2016 New Jersey Behavioral Risk Factor Survey presented as percentages not age-adjusted.

Area Deprivation Index (ADI) by County



County	ADI
Atlantic	39.0
Bergen	14.5
Burlington	28.3
Camden	42.0
Cape May	25.5
Cumberland	54.1
Essex	33.3
Gloucester	30.8
Hudson	26.8
Hunterdon	11.4
Mercer	30.7
Middlesex	26.0
Monmouth	16.3
Morris	11.9
Ocean	27.5
Passaic	30.5
Salem	41.2
Somerset	13.5
Sussex	21.2
Union	24.5
Warren	27.8

- By reviewing the variation in ADI rankings by county we can evaluate how socioeconomic status impacts colorectal cancer.
- Cumberland, Atlantic, Camden, and Salem counties have the **highest** level of area deprivation in New Jersey (above the 37th percentile).
- Individuals living in Cumberland County have the **highest** level of deprivation; Cumberland County also has the **highest** rates of newly-diagnosed CRC cases among men, and is one of the counties with both the **highest** smoking prevalence for men, and the **highest** obesity prevalence for men and women.
- Hunterdon, Morris, and Somerset counties have the **lowest** area deprivation in New Jersey and are among the counties with the **lowest** rates of new CRC cases.

The ADIs are national percentile rankings (from 1 to 100) of socioeconomic deprivation at the census block group level. The percentiles are constructed by ranking the ADI from low to high for the U.S. We calculated the county rankings from the census block group rankings.

Acknowledgements

Data were collected by the New Jersey State Cancer Registry under contract HHSN 75N91021D00009 and control No. 75N91021F00001 from the Surveillance, Epidemiology, and End Results Program of the National Cancer Institute, and under cooperative agreement 5NU58DP006279-04-00 from the National Program of Cancer Registries, Centers for Disease Control and Prevention, in addition to funding from the State of New Jersey, and the Rutgers Cancer Institute.

To view the entire report including technical notes and references, please visit https://www.nj.gov/health/ces/reports.shtml.

CONCLUSIONS

- Despite the declining trends in colorectal cancer (CRC) statewide, there are at least a third (35%) of New Jerseyans who are not up-to-date with CRC screening. CRC incidence, and the prevalence of obesity and smoking is higher in men compared to women in New Jersey. Area deprivation and CRC incidence are higher in South Jersey compared to North Jersey.
- Substantial geographic variation in CRC incidence and key risk factors in New Jersey are evident. Although South Jersey has the highest incidence rates of CRC, several northern counties are at increased risk including Warren County which is among the northern counties with the highest proportion of late stage CRC, highest smoking prevalence, and is among the counties that have high proportions who are not up-to-date with screening, particularly women. In the south, Salem is one of the counties with a high ADI, high obesity prevalence, highest smoking prevalence among men, higher proportion of late stage CRC compared to the state among women, and is among the counties with the highest proportion of men who are not up-to-date with their CRC screening. Cumberland County, which has the greatest socioeconomic deprivation and the highest incidence among men (and one of the highest among women), also has the highest percentage of men who are not up-to-date with CRC screening.
- Counties with the lowest area deprivation (or high socioeconomic status) are the same counties with some of the lowest incidence rates (Morris women), prevalence of smoking (Somerset men), obesity (Bergen men and Hunterdon, Morris, and Monmouth women), and proportion of individuals who are not up-to-date with CRC screening (Hunterdon men).
- These findings are consistent with previous research. These data provide evidence to inform cancer control programs that focus on cancer screenings, tobacco cessation, and healthy lifestyle promotion.

Presented at the NAACCR Annual Conference, June 15-17, 2021

Colorectal Cancer In Massachusetts, 2012-2016 – Data Report and Visualization

MacMillan A[1], Knowlton R[1], Gershman ST[1], McKenna M[2], Steeves M[3]

[1]Massachusetts Cancer Registry, [2]Behavioral Risk Factor Surveillance Survey, [3]Colorectal Cancer Control Program

BACKGROUND AND PURPOSE

Data presentation is an important consideration for cancer registries. Level of detail and visual appeal are both important factors. The purpose of this project was to produce a data report and a one-page visual flyer for the Colon Cancer Coalition that describes colorectal cancer in Massachusetts. Primary goal for the flyer was to design a visually appealing product to maximize data communication as well as to distribute at the Colon Cancer Coalition Walks.

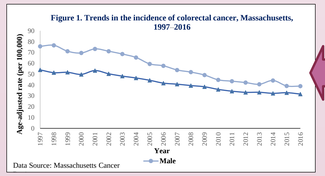
METHODS

Descriptive data on colorectal cancer in Massachusetts were summarized for 2012-2016 by the following: 1) incidence and mortality rates by race/ethnicity and age; 2) joinpoint regression for long term trends (1997-2016); 3) comparisons to national rates; 4) BRFSS colorectal cancer screening data.

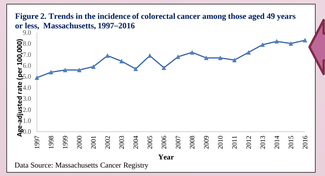
A contracted vendor was hired to produce the data report and flyer.

SELECTED GRAPHS/TABLES FROM DATA REPORT

TRENDS



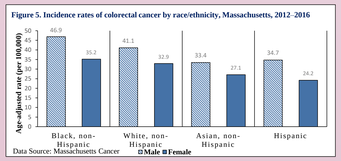
Incidence rates decreased significantly by 4.0% for men and 3.1 % for women each year.



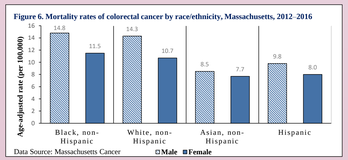
For those aged 49 years or less, incidence rates increased by an average of 2.2% each year.

Percentage of cases under age 50 for each individual group: White non-Hispanic 10.4%, Black non-Hispanic 17.0%, Asian, non-Hispanic 18.0%, Hispanic 24.0%.

RACE/ETHNICITY



The highest incidence rates were among Black, non-Hispanics, followed by White, non-Hispanics, Asian, non-Hispanics, and Hispanics



The highest mortality rates were among Black, non-Hispanic followed by White, non-Hispanics, Hispanics and then Asian, non-Hispanics.

RESULTS

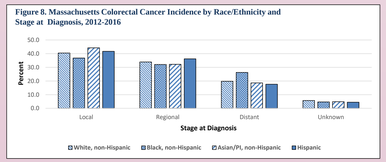
STAGE

Table 4. Percentage of new colorectal cancer cases by stage at diagnosis, Massachusetts, 2012–2016

Stage at diagnosis	All Ages	Individuals Aged 49 Years or Less	Individuals Aged 50 Years or More
Local (confined to organ where it began)	40.6%	37.3%	41.0%
Regional (spread to some nearby areas)	33.7%	35.6%	33.5%
Distant (spread into other parts of the body)	19.9%	25.2%	19.2%
Unknown (a stage is not assigned)	5.8%	1.9%	6.3%

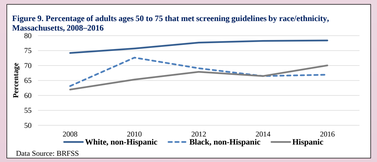
Data source: Massachusetts Cancer Registry

Individuals aged 49 years or less were more frequently diagnosed at regional or distant stage as compared to those aged 50 years or more.



*Hispanics had a higher percentage of cases diagnosed at regional stage compared to other race/ethnic groups. *Black, non-Hispanics had the highest percentage of cases diagnosed at distant stage.

SCREENING



A significant increase in the percentage that met screening guidelines each year was observed among White, non-Hispanics and Hispanic adults. The numbers among Asian non-Hispanics were insufficient to calculate a percentage

We acknowledge the Centers for Disease Control and Prevention under cooperative agreement 5 NU58DP006271-03-00 and the National Cancer Institute under contract HHSN261201800008I awarded to the Massachusetts Cancer Registry at the Massachusetts Department of Public Health. The contents of this poster are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention nor the National Cancer Institute.

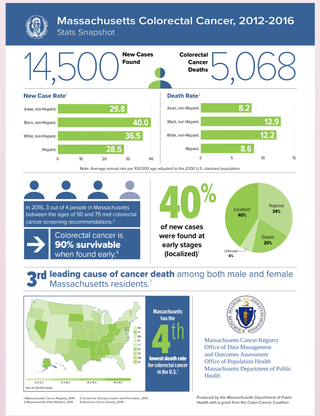
Advantages of In-Depth Report

- Allows for more granular data
- Allows for greater content including explanations and interpretations of data presented.

Disadvantages of In-Depth Report

- Message gets lost in detail
- Harder to absorb and remember key points
- More labor intensive

FLYER



Advantages of One-Page Flyer

- Visually appealing
- Provides easily understandable chunks of data
- Message more easily received

Disadvantages of One-Page Flyer

- Loss of detail and data granularity
- Limit on number of items to present

IMPLICATIONS/CONCLUSIONS

Producing an in-depth report with an accompanying visualization gives the best of both worlds - detail when needed and a simpler presentation of data. Data that are better received and comprehensible might provide greater motivation for action.

Special thanks given to the Louisiana State Cancer Registry for the inspiration and the model of the Massachusetts one-page flyer.
Funding for data report and flyer provided by Colon Cancer Coalition.

Developing the Puerto Rico Multiple Myeloma and Myelodysplastic Syndromes Population-Based Registry

Tonatiuh Suárez Ramos, Karen J. Ortiz-Ortiz, Carlos R. Torres-Cintrón,
Mariela Alvarado Ortiz, Maira A. Castañeda Ávila, Guillermo Tortolero-Luna

Background

- Multiple myeloma (MM) and myelodysplastic syndromes (MDS) are hematological conditions with a wide range of clinical manifestations and outcomes.
- In Puerto Rico (PR), there is scarce information concerning the clinical characteristics, treatment patterns, and outcomes related to both conditions
- With a multidisciplinary team, we proposed a new population-based project of MM and MDS leveraging clinical data, gathered by pathological reports with health insurance claims data and *Electronic Medical Record* (EMR) .

Objective

- To develop the MM and MDS Population-Based Registry in PR in order to:
  - Describe the epidemiologic characteristics
  - Estimate the prevalence of mutations and translocations
  - Examine the patterns of care among MM and MDS patients.

Methods

- Development of a database to store the information of MM and MDS cases with all the capabilities of the main database from the PR Central Cancer Registry (PRCCR).
- These capabilities include data entry, editing, quality control, and linkage, among others.
- PathPlus, a PRCCR in-house software was used; this program manages pathology reports and uses exhaustive case-finding protocols to identify incident cases.
- MM and MDS cases in the PRCCR database for the period 2012-2017 will be included.

Methods

- The date of last contact of patients will be updated using follow-up pathology reports while patients' vital status will be updated with information from the mortality files provided by the Demographic Registry of Puerto Rico.
- A match with PRCCR-Health Insurance Linkage Database (PRCCR-HILD) will be performed to obtain the pattern of care of MM and MDS patients.
- We propose to conduct active follow-up, as needed, for those cases through physicians, hospitals, images centers, and other reporting facilities.
- Additional information can be obtained through *EMR* for those physician who have it.

MM/MDS Project

Research
Project Team | Pathology reports' evaluation

Design
Data dictionary & database design | System design

Development
Programming | Module testing

Testing
User test | User acceptance

Implementation
Analyze pathology reports | Create MM/MDS cases

Visualization
Model creation | Design MM/MDS profile dashboard

Results

- Using the PRCCR's cancer database, *EMR*, Pathology Reports database, and PRCCR-HILD, we created a solution in *Visual Studio* to manage MM and MDS-related variables
- A tumor registrar was kept in charge of capturing the complete diagnosis and treatment information of patients with MM and MDS, including the necessary tumor markers.
- A manual review is performed periodically to evaluate the potential true matches between these databases.
- We summarized demographic characteristics, clinical data, treatment, healthcare utilization, and comorbidities.

Conclusions and Future Plans

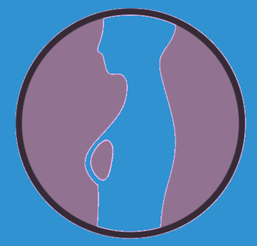
- The MM and MDS Population-Based Registry expands the quality and quantity of data regularly collected by the PRCCR by including additional clinical and genetic characteristics.
- It allows us to estimate the prevalence of the most common mutations and translocation of MM and MDS and compare it to the National Comprehensive Cancer Network (NCCN) guidelines.
- This study will provide complementary information on these conditions and related morbidities among the Hispanic populations to support future scientific publications.
- This database will be used to monitor and assess MM- and MDS-related health outcomes in PR.

This work was supported by a federal grant from the National Program of Central Cancer Registries (Grant # 6 NU58DP006318) to the Puerto Rico Central Cancer Registry at the UPR-Comprehensive Cancer Center

Distant recurrence in women with early breast cancer and the prevalence of metastatic disease:
A systematic review and meta-analysis

Eileen Morgan[1], Colette O'Neill[2], Aude Bardot[1], Paul Walsh[2], Isabelle Soerjomataram[1], Melina Arnold[1]

[1]Section of Cancer Surveillance, International Agency for Research on Cancer, Lyon, France, [2]National Cancer Registry Ireland, Cork, Ireland.



Background

- To-date, there are **no population-based data on the prevalence of metastatic breast cancer (MBC).**
- According to previous evidence, about 20-30% of all women initially diagnosed with early breast cancer develop MBC later during a disease relapse or recurrence.
- **Distant recurrence rates** and the **prevalence of distant MBC,** including women with *de novo* metastatic disease at initial diagnosis and those who developed MBC because of disease recurrence, are **largely unknown**.

Methods

- Relevant studies published since 2010 were identified from a **systematic search** of MEDLINE and Web of Science.
- Exclusion of studies that included other cancer sites/diseases, in-situ breast cancer, second primaries or randomised clinical trials
- Extraction of data on recurrence prevalence and rates of distant metastatic disease, information on follow-up time, treatment, age, stage at diagnosis, site of metastasis and breast cancer subtype is ongoing
- Data analysis and assessment of risk of bias of all included studies is ongoing and meta-analyses will be conducted where feasible

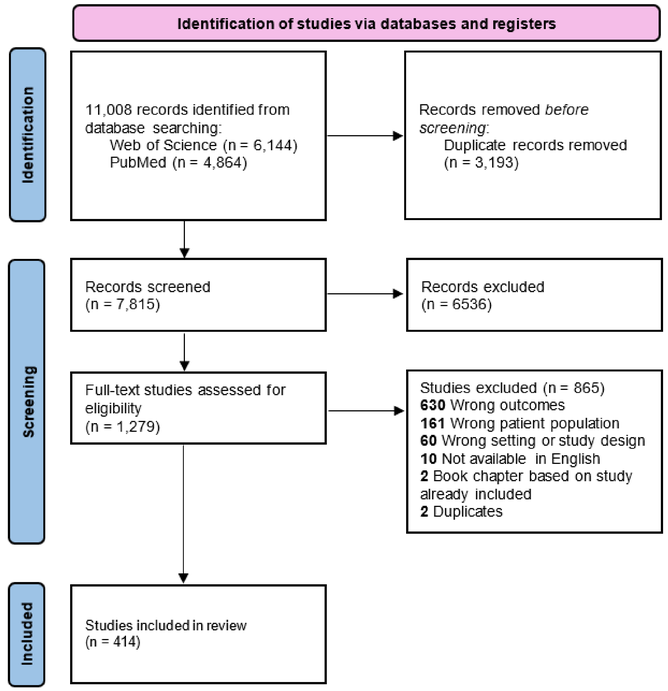
Aims

- The aim of this study was to conduct a **systematic literature review** and **meta-analysis** to determine **distant recurrence rates in women initially diagnosed with early (M0) breast cancer**

.

Results

- In total, 7,815 publications were identified and screened for eligibility by three independent reviewers; 1,279 studies underwent full text screening and data from a total of 414 studies are being extracted.
- Initial results show that proportions of **distant recurrence were higher in hospital-based studies** compared to studies that identified patients through population-based cancer registries.
- Differences in recurrence rates and time to recurrence were also observed by **disease subtype**.



Conclusion & Next Steps

- Upon completion of the data extraction phase, results will be **stratified** by disease subtype, stage at diagnosis and data source to compare between hospital/ institution and population-based cancer registry data.
- Insights from this study will increase our understanding of **MBC prevalence on the population level**
- The quantification of recurrence and disease progression is important to assess the **effectiveness of treatment**, evaluate **prognosis** and **allocate resources**.

International Agency for Research on Cancer

World Health Organization

For more information or questions, please contact:
Melina Arnold, PhD
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Susan G. Komen Foundation

susan G. komen

NAACCR Summer Forum 2021

Do Modifiable Risk Factors Impact Pancreatic Cancer Survival in a Population-based Study after Adjusting for Clinical Factors?

Mei-Chin Hsieh, PhD, CTR;[1] Lu Zhang, PhD;[3] Cruz Velasco-Gonzalez, PhD;[3] Yong Yi, PhD;[1] Lisa A. Pareti, BS, CTR;[1] Edward J. Trapido, ScD, FACE;[1] Vivien W. Chen, PhD;[1] Xiao-Cheng Wu, MD, MPH, CTR[1]

KEY MESSAGES

- The impact of diabetes and smoking on cancer-specific (CS) survival was greater among patients with stage I-II than those with stage III-IV.
- Only a BMI ≥35 was observed to increase risk of CS death among stage III-IV patients.
- As expected, diabetic current smoker had the worse survival after 20 months of follow-up, particularly between 24 months and 36 months.
- By eliminating these modifiable risk factors an estimated ~16% of the CS deaths could be avoided.

AFFILIATIONS

[1]Louisiana Tumor Registry/Epidemiology Program, School of Public Health, Louisiana State University Health Sciences Center
[2]Department of Public Health Sciences, College of Behavioral, Social and Health Sciences Clemson University
[3]Center for Outcomes and Health Services Research, Ochsner Health System

LSU Health NEW ORLEANS Louisiana Tumor Registry

June 15-17, 2021

INTRODUCTION

Several modifiable risk factors (MRFs) including diabetes, smoking, and BMI are related to emerging pancreatic cancer. Epidemiological studies show that these MRFs also escalate mortality. Population-based studies assessing the impact of these MRFs on pancreatic cancer survival were limited. Studies which assessing these associations mainly controlled for sociodemographic factors only and showed inconsistent findings.

OBJECTIVES

1) To examine the impact of diabetes, smoking status, and BMI on pancreatic CS survival
2) To compare estimated survival rates among adult pancreatic cancer patients stratified by MRFs
3) To measure the population attributable risk (PAR) of these MRFs on survival outcome of pancreatic cancer patients

METHODS AND MATERIALS

Data Source and Study Population

Data on pancreatic cancer patients diagnosed from 2011 to 2017 were queried from the Louisiana Tumor Registry (LTR). The eligibility criteria included pancreatic cancer patients aged 20 years and older with stage I-IV disease.

Modifiable Risk Factors

Diabetes mellitus data was retrieved from the patient's comorbid condition(s) and supplemented with statewide Hospital Inpatient Discharge Data (HIDD) 2010-2018 to obtain the complete information. Cigarette smoking, height and weight were abstracted directly from medical charts at the time of cancer diagnosis.

Sociodemographic and Clinical Variables

Race, age, marital status, insurance, census tract poverty, stage, grade, treatment, and CCI score were included in the adjusted model.

Survival

Survival duration was defined as the time between the initial diagnosis date and the CS death date or end of follow-up, December 31, 2019 if alive. Patients died in non-CS cause were censored.

Statistical Analysis

The Cox regression model was used to examine the association between MRFs and CS survival. The stratified Cox regression model was used to estimate direct adjusted survival rates. The partial PAR was employed to measure the attributable risk of MRFs on CS survival.

Table 1. Frequency, hazard ratio (HR) and 95% confidence interval (CI) for cancer-specific death

Variables	N (%)	Crude HR (95% CI)	Adjusted HR (95% CI)
Diabetes			
No	2417 (65.2)	1.00	1.00
Yes	1289 (34.8)	1.12 (1.04-1.21)	1.14 (1.05-1.23)
Smoking status			
Non-smoker	1,422 (38.4)	1.00	1.00
Current smoker	857 (23.1)	1.24 (1.13-1.35)	1.39 (1.25-1.54)
Former smoker	1,015 (27.4)	1.14 (1.04-1.24)	1.14 (1.04-1.25)
Unknown	412 (11.1)	1.28 (1.14-1.44)	1.14 (1.00-1.31)
BMI (kg/m^2)			
BMI <18.5	172 (4.6)	1.20 (1.01-1.42)	1.00 (0.84-1.19)
BMI 18.5-<25	1,150 (31.0)	1.00	1.00
BMI 25-<30	998 (26.9)	0.84 (0.76-0.92)	0.93 (0.85-1.02)
BMI 30-<35	524 (14.1)	0.82 (0.73-0.92)	1.00 (0.90-1.13)
BMI 35-<40	211 (5.7)	0.79 (0.67-0.92)	1.02 (0.86-1.20)
BMI ≥40	136 (3.7)	1.01 (0.83-1.23)	1.46 (1.19-1.78)
Unknown BMI	515 (14.0)	1.20 (1.07-1.34)	0.97 (0.86-1.10)

Table 2. Percent population attributable risk (PAR) and 95% confidence interval (CI) of diabetes, smoking, and/or BMI on pancreatic cancer-specific survival

Modifiable risk factors[1]	Partial PAR% (95%CI)[2]
Diabetes	4.5 (1.6-7.4)
Smoking	10.7 (5.6-15.8)
BMI	1.3 (0.5-2.1)
Diabetes, smoking	14.8 (6.8-22.6)
Diabetes, BMI	5.7 (1.4-10.1)
Smoking, BMI	11.9 (6.4-17.4)
Diabetes, smoking, BMI	15.9 (7.3-24.3)
Full PAR[3]	96.0 (88.0, 98.7)

[1]Included cases with known smoking status and obesity (n=3,001)
[2]One or more risk factors are considered eliminated, while others are allowed to remain unchanged.
[3]All pancreatic cancer patients who are exposed to risk factor(s) switch to the lowest risk category of all measured risk factors.

Figure 1. Adjusted HR and 95% CI for modifiable risk factors stratified by AJCC stage

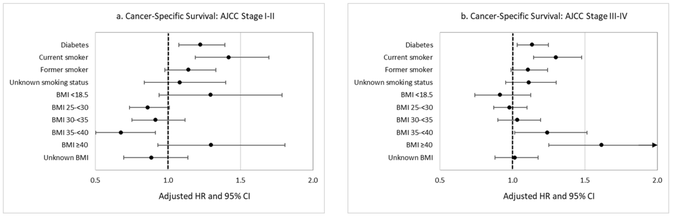
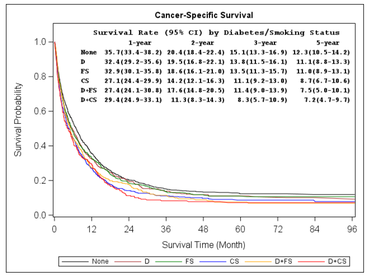


Figure 2. Adjusted survival curves for pancreatic cancer patients by diabetes and smoking status.



D, diabetes only; CS, current smokers only; FS, former smokers only

RESULTS

- Of the 3,706 eligible patients, 34.8% were diabetics, 23.1% were current smokers, and 50.4% had BMI ≥25 kg/m^2.
- After adjusting for sociodemographic and clinical factors, diabetic patients had an increased CS death risk of 14% (95% CI, 1.05-1.23), 39% (95% CI, 1.25-1.54) for current smokers, and 46% (95% CI, 1.19-1.78) for patients with a BMI ≥40 when compared to their counterparts (Table 1).
- Diabetic patients and current smokers showed a significant increase in the risk of death which persisted after adjusting for covariates for both stage I-II and stage III-IV patients (Figure 1). However, BMI ≥35 was observed to increase risk of mortality among stage III-IV patients only.
- Diabetic current smokers had significantly lower 2- and 3-year adjusted CS survival rates, 11.3% and 8.3% respectively (Figure 2).
- By eliminating MRFs an estimated 15.9% (95% CI, 7.3%–24.3%) of the CS deaths could be avoided during the study period (Table 2).
- Among the three MRFs, smoking had the highest estimated partial PAR, 10.7% (95% CI, 5.6%–15.8%).

CONCLUSIONS

This study observed that diabetes and smoking contributed substantially to the reduction of pancreatic cancer survival after adjusting for sociodemographic and clinical factors; however, only BMI ≥35 was observed to increase risk of mortality among stage III-IV patients. Advocacy and education on healthy lifestyle choices for the general population are imperative for cancer prevention and a favorable prognostic outcome.

ACKNOWLEDGMENTS

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Documenting liver cancer burden across San Francisco neighborhoods

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BACKGROUND

Liver cancer

- While overall cancer rates are declining in the U.S., liver cancer incidence has more than tripled since 1980, making it the fastest rising cancer in the U.S.
- Liver cancer is the 5th and 7th leading causes of cancer death among men and women, respectively
- Communities of color have higher liver cancer incidence and mortality
- Higher liver cancer incidence has been seen among persons living in ethnic enclaves and lower socioeconomic status (SES) neighborhoods

Objective

- Identify neighborhoods in San Francisco that are disproportionately affected by liver cancer

METHODS

Data

- Data from the California Cancer Registry, U.S. Census, American Community Survey

Inclusion criteria

- Resident of San Francisco City/County
- Age 18+ years
- Diagnosed with liver cancer as primary malignancy between 2008 – 2017

Measures

- Sociodemographic characteristics
- Cancer year of diagnosis and stage
- Neighborhood SES and census tract zones
  - Census tract aggregation zones combine adjacent census tracts based on similarity in racial/ethnic minority, % poverty, and % urban/rural

Analysis

- Sequential multivariable Cox proportional hazard regression models used to estimate risk of 5-year all-cause death

RESULTS

- 1,237 primary liver cancer cases were diagnosed between 2008 and 2017.
- We found neighborhood differences in liver cancer survival (Figure 1)
- Older individuals and those who are uninsured or publicly-insured had higher risk of death from liver cancer
- Overall survival after liver cancer diagnosis improved over time
- Zones are associated with liver cancer mortality, but this is attenuated by other sociodemographic factors

Figure 1. Liver cancer survival at 5 years by zone

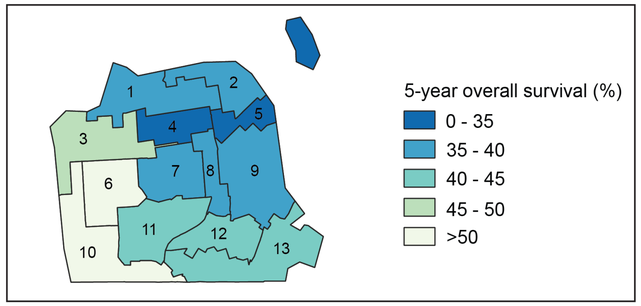

Figure 2. Adjusted hazard rate ratios (HR) for risk of 5-year all-cause death

	Minimally-adjusted[a] HR (95% CI)	Fully-adjusted HR (95% CI)
Age	**1.02 (1.02-1.03)**	**1.02 (1.02-1.03)**
Female (ref. Male)	1.00 (0.83-1.19)	0.96 (0.80-1.16)
Year of Diagnosis	**0.97 (0.94-0.99)**	**0.97 (0.94-0.99)**
Race/ethnicity (ref. NH White)		
NH Black		1.22 (0.95-1.57)
Hispanic		0.97 (0.77-1.22)
NH AAPI		0.88 (0.74-1.05)
Marital Status (ref. Married)		
Unmarried		**1.22 (1.03-1.44)**
Health insurance (ref. Private)		
Uninsured		**2.25 (1.41-3.59)**
Any public insurance		**1.19 (1.02-1.39)**
nSES (ref. 5th-highest quintile)		
1st (lowest)		0.97 (0.73-1.30)
2nd		0.89 (0.68-1.17)
3rd		0.91 (0.71-1.16)
4th		0.97 (0.77-1.22)
Zone (ref. 6 – Center West)		
1 – North	1.34 (0.90-2.00)	1.18 (0.76-1.82)
2 – Northeast	1.06 (0.75-1.49)	1.12 (0.77-1.64)
3 – Northwest	0.87 (0.60-1.26)	0.96 (0.67-1.39)
4 – Center North	1.23 (0.88-1.72)	1.12 (0.78-1.62)
5 – Downtown	1.67 (1.20-2.34)	1.48 (0.98-2.23)
7 – Center	**1.50 (1.01-2.24)**	1.33 (0.87-2.03)
8 – Center East	**1.48 (1.05-2.08)**	1.33 (0.91-1.93)
9 – East	**1.49 (1.07-2.09)**	1.37 (0.96-1.95)
10 – Southwest	1.08 (0.72-1.62)	1.12 (0.74-1.69)
11 – Center South	1.11 (0.78-1.58)	1.08 (0.74-1.58)
12 – South	1.08 (0.76-1.52)	1.20 (0.84-1.72)
13 – Southeast	1.28 (0.91-1.80)	1.28 (0.87-1.89)

Orange color denotes statistical significance; a. Minimally adjusted for age, sex, year of diagnosis, and zone as a stratification variable

DISCUSSION

- Healthcare access is an important predictor of all-cause death among liver cancer cases in San Francisco
- While neighborhood zones and SES were not significantly associated with all-cause death, it may be that intervening at the neighborhood level once liver cancer develops is too late

NEXT STEPS

- Work with community partners to focus meaningful interventions in high-risk groups, particularly the uninsured
- Future studies should explore the role of neighborhood characteristics on liver cancer risk factors and prevention

Funding

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@janetnchu

Ethnic and racial differences in gastric cancer incidence in the US

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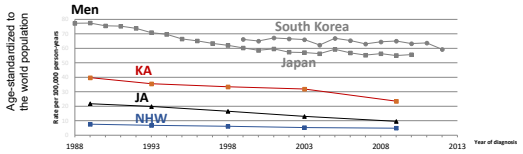
Background

- Gastric cancer incidence in the US has dramatically declined over the past few decades. However, substantial ethnic and racial differences have been observed.
- It is thought that first generation immigrants from high-risk countries are at an increased risk.
- The Los Angeles Cancer Surveillance Program (CSP) has previously reported that Korean Americans (KA) have the highest gastric cancer incidence and Japanese Americans (JA) have the second highest incidence in the US using 1988-2012 California Cancer Registry data.
- South Korea and Japan have the highest gastric cancer incidence rates worldwide.

Gastric cancer age-adjusted incidence rates. California,1988–2012

Figure reproduced from Lee et al. CEBP 2017;26:587-596 in accordance with the journal policy.



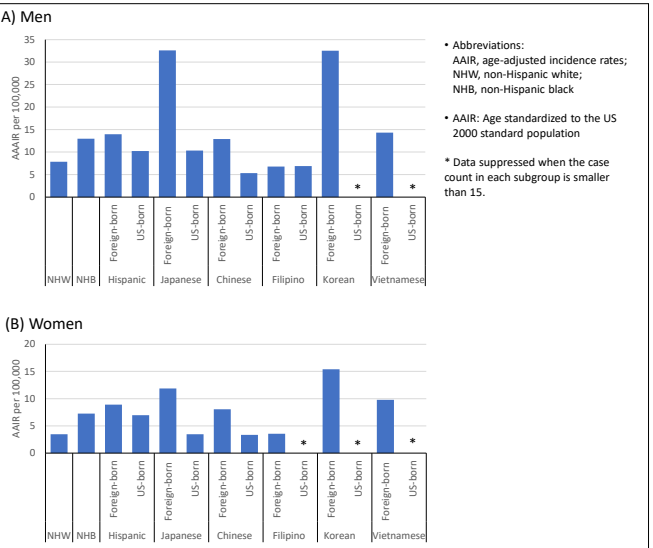
- In our earlier study, KAs had a more favorable stage distribution than other Californians but had a worse stage distribution compared to populations in Korea or Japan, where population-based screening is available.
- Stage distribution in JAs was not different from other Californians.

Objectives: To evaluate gastric cancer incidence in the US in 2011-2015 by racial/ethnic subgroup and by nativity (US-born vs. foreign-born) and examine tumor characteristics including stage at diagnosis, updating the results from our previous analysis.

Methods

- Database: California Cancer Registry data
- Foreign-born/US-born population was estimated using the American Community Survey Public Use Microdata Sample (PUMS) data.

Fig 1. Gastric cancer AAIR by race/ethnicity and nativity, California, 2011-2015.



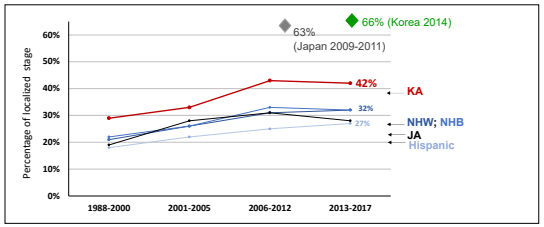
- Abbreviations: AAIR, age-adjusted incidence rates; NHW, non-Hispanic white; NHB, non-Hispanic black
- AAIR: Age standardized to the US 2000 standard population

* Data suppressed when the case count in each subgroup is smaller than 15.

Results and Discussion (1)

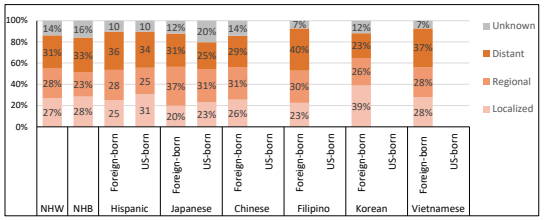
- Gastric cancer incidence rates were higher in foreign-born than in US-born populations within each Asian American subgroup and Hispanics both for men and women.
- Gastric cancer incidence rates in foreign-born KA and JA were about 4 times higher than that in NHWs both in men and women. The rates in foreign-born Vietnamese- and Chinese Americans, foreign-born Hispanics, and NHBs were about 2-3 times higher than in NHWs in men and women.
- The percentage of gastric cancer diagnosed at localized stage was highest in foreign-born KAs (39%); this figure was much lower in other populations (20-31%) including JAs (20%).

Figure 2. Percentage of localized stage gastric cancer by race/ethnicity, California, 1988-2017*



* Among patients with known stage

Figure 3. Stage distribution by race/ethnicity and nativity, California, 2011-2015



Conclusions

- Bi-annual gastric cancer screening is now recommended in South Korea for adults aged 40 or above, with an estimated bi-annual screening rate of 73%, predominantly by upper endoscopy. Japan has similar screening recommendations starting at age 50.
- The US lacks well-defined gastric cancer screening guidelines. Screening endoscopy for Asian Americans, Hispanics and African Americans should be recommended, particularly for first-generation immigrants from high-risk countries.

References: Eom et al. Trends in Gastric Cancer Incidence According to the Clinicopathological Characteristics, 1999-2014. Cancer Res Treat. 2018; 50(4): 1343; Cancer Statistics in Japan 2021; Lee et al., Stomach Cancer Disparity among Korean Americans by Tumor Characteristics: Comparison with Non-Hispanic Whites, Japanese Americans, South Koreans, and Japanese, CEBP 2017, 26(4):587

Financial support: National Cancer Institute's Surveillance, Epidemiology and End Results Program under contract HHSN261201800015I; The collection of cancer incidence data used in this study was supported by the California Department of Public Health pursuant to California Health and Safety Code Section 103885; Centers for Disease Control and Prevention's (CDC) National Program of Cancer Registries, under cooperative agreement 5NU58DP006344; the National Cancer Institute's Surveillance, Epidemiology and End Results Program under contract HHSN261201800032I awarded to the University of California, San Francisco, contract HHSN261201800015I awarded to the University of Southern California, and contract HHSN261201800009I awarded to the Public Health Institute. The ideas and opinions expressed herein are those of the author(s) and do not necessarily reflect the opinions of the State of California, Department of Public Health, the National Cancer Institute, and the Centers for Disease Control and Prevention or their Contractors and Subcontractors.

Exploring the Association Between Religious Affiliation and Cancer Survival

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Background

Studies examining the role of religion and spirituality on health have reported positive effects between religious involvement and a wide range of health outcomes

Existing research on religion and cancer has primarily focused on examining religion as a coping mechanism

Research Question

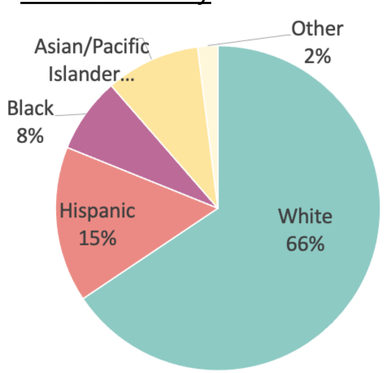
Is there an association between religious affiliation and survival time among cancer patients?

Religious Affiliation

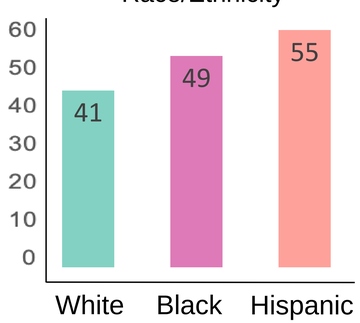
A higher proportion of women reported religious affiliation (59%) than men (47%).

More than half (53.3%) reported religious affiliation, 5.6% had no affiliation, and 41.1% of unknown religious affiliation.

Race/ Ethnicity



Percentage Reporting Religious Affiliation by Race/Ethnicity



Data: Population-based California Cancer Registry (CCR), 1988-2017

Results

Table 1. Cancer-Specific Stage Distribution by Reporting of Religion, California Cancer Registry, 1988-2017

Cancer Site	Summary Stage	Reporting of Religion: None	Religion	Unknown	Total
		82,838	787,913	608,534	1,479,285
		5.6%	53.3%	41.1%	100%
Breast					
n=546,701	Localized	63.2	60.4	62.4	61.3
	Regional	30.5	33.1	28.8	31.4
	Distant	4.8	4.9	4.8	4.8
	Unknown	1.5	1.6	4.0	2.4
	Total	100.0	100.0	100.0	100.0
CRC					
n=344,585	Localized	36.5	35.3	39.0	39.0
	Regional	38.7	40.0	34.6	34.6
	Distant	20.9	20.9	18.9	18.9
	Unknown	3.9	3.8	7.5	7.5
	Total	100.0	100.0	100.0	100.0
Cervix					
n=43,890	Localized	52.9	47.0	51.6	51.6
	Regional	32.5	36.6	29.6	29.6
	Distant	11.2	12.4	10.7	10.7
	Unknown	3.4	4.0	8.2	8.2
	Total	100.0	100.0	100.0	100.0
Prostate					
n=544,109	Localized	72.0	71.5	74.1	72.8
	Regional	16.1	15.3	9.5	12.5
	Distant	7.1	7.6	5.7	6.6
	Unknown	4.9	5.6	10.7	8.1
	Total	100.0	100.0	100.0	100.0

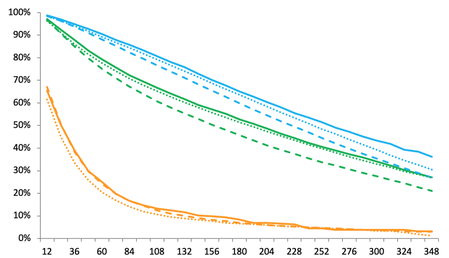
Table 2. Cancer-Specific Multivariable Analysis of Mortality Hazard Ratios (HR)⁂, CCR, 1988-2017 (***p<.001; **p=<.01; *p<.05)

	Breast HR	Colorectal HR	Cervical HR	Prostate HR
Religion				
None	1(Ref)	1(Ref)	1(Ref)	1(Ref)
Yes	1.073***	1.026**	1.076*	1.031**
Unknown	1.008	0.979*	0.969	0.99

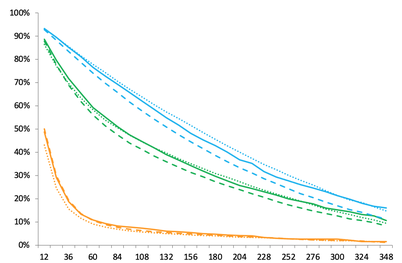
⁂ By stage and religion: Adjusted by age, race/ethnicity, insurance status, socioeconomic status (low, middle, high), cancer-specific stage, and treatment (surgery only, chemo/radiation, surgery+chemo/radiation, unknown).

Observed Survival

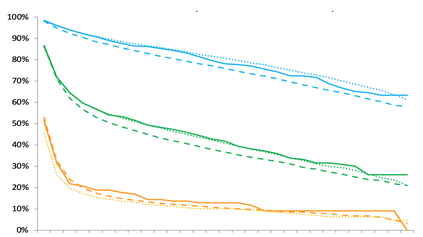
Breast Cancer



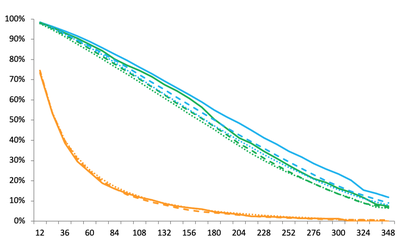
Colorectal Cancer



Cervical Cancer



Prostate Cancer



Months Since Diagnosis

None-Localized
Religion-Localized
Unknown-Localized
None-Regional
Religion-Regional
Unknown-Regional
None-Remote
Religion-Remote
Unknown-Remote

Conclusions

- Preliminary findings indicate a) slightly worse stage of disease at diagnosis and b) worse overall survival for patients reporting religious affiliation than those who did not.
- Our findings suggest that faith-based organizations may have a potential role to contribute to cancer control efforts, such as engage in promoting cancer screening and prevention.

Improvement of follow-up through linkages with State Medicaid and Statewide Hospital Discharge Data in New York

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Introduction

- Date of last contact (DOLC) is essential for computing cancer survival, a key measure of comparative effectiveness of treatment regimens and an important indicator of health inequity.
- Prior to 2020, the New York State Cancer Registry (NYSCR) had captured the DOLC from: facility reports; laboratory reports; linkages with state mortality files, the National Death Index, Social Security Administration files, and Medicare death information; and by requesting updates from facilities with large pediatric caseloads.
- Although the NYSCR has been able to meet SEER requirements for follow-up rate for patients age 20-64 (>90%) and 65+ (>95%) through the above-mentioned routine practices, we had not met the requirements for patients age < 20 (90%), nor for patients with in-situ tumors (90%). Vital records do not provide enough follow-up information for these patients due to their low mortality, and Medicare does not include any claims for most of the young patients.
- To improve the follow-up data for these two groups, the NYSCR was able to leverage our relationships with stewards of other administrative databases within the New York State Department of Health. By matching these cases with both state Medicaid and state hospital discharge data, we were able to meet SEER requirements for follow-up.

Methods

- We conducted two sets of linkages using deterministic matching methodology, one in January 2020 (2004-2016 diagnoses) and the other in October 2020 (2000-2017 diagnoses), using SAS 9.4. The initial linkages to Medicaid and discharge records were conducted for other purposes, and the improvement in follow-up was a positive unintended consequence. The subsequent linkages included more records and attained more complete follow-up.
- For the Medicaid linkages, patients were matched to enrollment files using first name, last name, birthdate, social security number, and sex. If all or a combination of any 4 of these identifier items matched, the latest date of service for the matched Medicaid enrollee was used to update the DOLC of each matched case.
- For linkage to discharge data, patients were matched using a unique personal identifier (consisting of partial last and fist names and partial social security number), date of birth, sex, treating facility, medical record number and address at diagnosis. For each matched case, the latest date of discharge of the matched records was used to update the DOLC.

Acknowledgements: *This work was supported in part by the Centers for Disease Control and Prevention's National Program of Cancer Registries through cooperative agreement 6NU58DP006309 awarded to the New York State Department of Health and by Contract 75N91018D00005 (Task Order 75N91018F00001) from the National Cancer Institute, National Institutes of Health.*

Results

- Through routine linkages, the latest follow-up dates were found for ~19% of pediatric patients.
- Before the January updates, the percentages of cases diagnosed 2000-2017 and followed through 2018 were below the SEER requirement (>90%) for both patients age < 20 (80.8%) and patients with in-situ tumors (87.4%).

Table 1. Cases Diagnosed 2000-2017 followed thru 2018 before the January 2020 updates

Age	Numerator	Denominator	Percent		Goal
Age < 20	13,060	16,173	80.75		>= 90*, >= 80**
20-64	639,041	706,613	90.44		>= 90*, >= 80**
65+	752,841	776,945	96.90		>= 95*, >= 90**
All Ages	1,404,946	1,499,802	93.68		>= 90*, >= 80**
In-situ	100,721	115,312	87.35		>= 90*, >= 80**

*SEER Contractual Standard **Minimum Acceptable

- After the January updates, the percentages of cases diagnosed 2000-2017 and followed through 2018 were increased to 85.8% for patients age < 20 and 87.5% for patients with in-situ tumors, but they were still below the 90% goal

Table 2. Cases Diagnosed 2000-2017 followed thru 2018 after the January 2020 updates

Age	Numerator	Denominator	Percent		Goal
Age < 20	13,890	16,192	85.78		>= 90*, >= 80**
20-64	642,288	709,357	90.55		>= 90*, >= 80**
65+	755,572	779,329	96.95		>= 95*, >= 90**
All Ages	1,411,754	1,504,949	93.81		>= 90*, >= 80**
In-situ	101,428	115,932	87.49		>= 90*, >= 80**

*SEER Contractual Standard **Minimum Acceptable

Results - continued

- After the October updates, the percentages of cases diagnosed 2000-2017 and followed through 2018 were 90.6% for patients age < 20 and 90.5% for patients with in-situ tumors, reaching the contractual standard for both case categories. .

Table 3. Cases diagnosed 2000-2017 followed thru 2018 after the October 2020 updates

Age	Numerator	Denominator	Percent		Goal
Age < 20	15,541	17,145	90.64		>= 90*, >= 80**
20-64	699,136	753,879	92.74		>= 90*, >= 80**
65+	807,402	828,377	97.47		>= 95*, >= 90**
All Ages	1,522,083	1,599,471	95.16		>= 90*, >= 80**
In-situ	112,760	124,592	90.50		>= 90*, >= 80**

*SEER Contractual Standard **Minimum Acceptable

Considerations

- The improvements we achieved for children are partly due to New York's generous implementation of the Medicaid program and might vary for states based on their Medicaid eligibility criteria and coverage.
- Obtaining access to the Medicaid and discharge data involved developing mutually acceptable and advantageous data use agreements that were facilitated by a shared organizational infrastructure within the state Department of Health.

Conclusions

- Linking cancer patients to Medicaid claims and to statewide hospital discharge data provided an efficient and effective way to capture the latest date of follow-up for patients age < 20 and for patients with in-situ tumors, two categories of cases for which, thankfully, death records do not provide enough information.

NATIONAL CENTER FOR CHRONIC DISEASE PREVENTION AND HEALTH PROMOTION

Improving Data Quality and Data-sharing for Cancer Surveillance through Enhanced National Interstate Data Exchange Application System (N-IDEAS)

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[2] Centers for Disease Control and Prevention, Atlanta, GA

Introduction

N-IDEAS provides and innovative information technology solution for secure and confidential interstate data exchange and assists CDC in monitoring NPCR Program Standards. N-IDEAS was developed using n-tier solution with .NET technologies and XML webservices following NIST and Advanced Encryption Standard (AES) for security and confidentiality. The first version was released in 2012 while the latest version was released in May 2020 for improved data quality.

Purpose

The purpose of this project was to update N-IDEAS to process XML files, implement mandatory data exchange edits, and improve system functionality.

Methodology

System Features

- CDC's Enterprise Architecture – System Development Life Cycle consists of five phases: Evolution, Requirement Analysis, Design, Implementation, and Testing.
- Two CCRs can use N-IDEAS to exchange data as long as they have a data exchange agreement in place.
- System now supports XML format data in addition to flat file.
- The new version of application helps to improve data quality before exchanging data by running mandatory edits and allows to track number of records they exchanged.
- Automatic email notification keeps CCR informed of the data exchange.
- Data files remain encrypted throughout the transaction, which provides security protection so that CDC or its contractor don't have access to the data.

Security Features

- The system provides double encryption in the form of encrypted files, transferred using HTTPS protocol.
- Security applied so that files on NPCR-CSS server will not be accessible to CDC or its contractor.
- Encrypted file is only accessible to receiver and file automatically deleted after expiration, never stored permanently on server.
- System uses public key infrastructure for key generation.

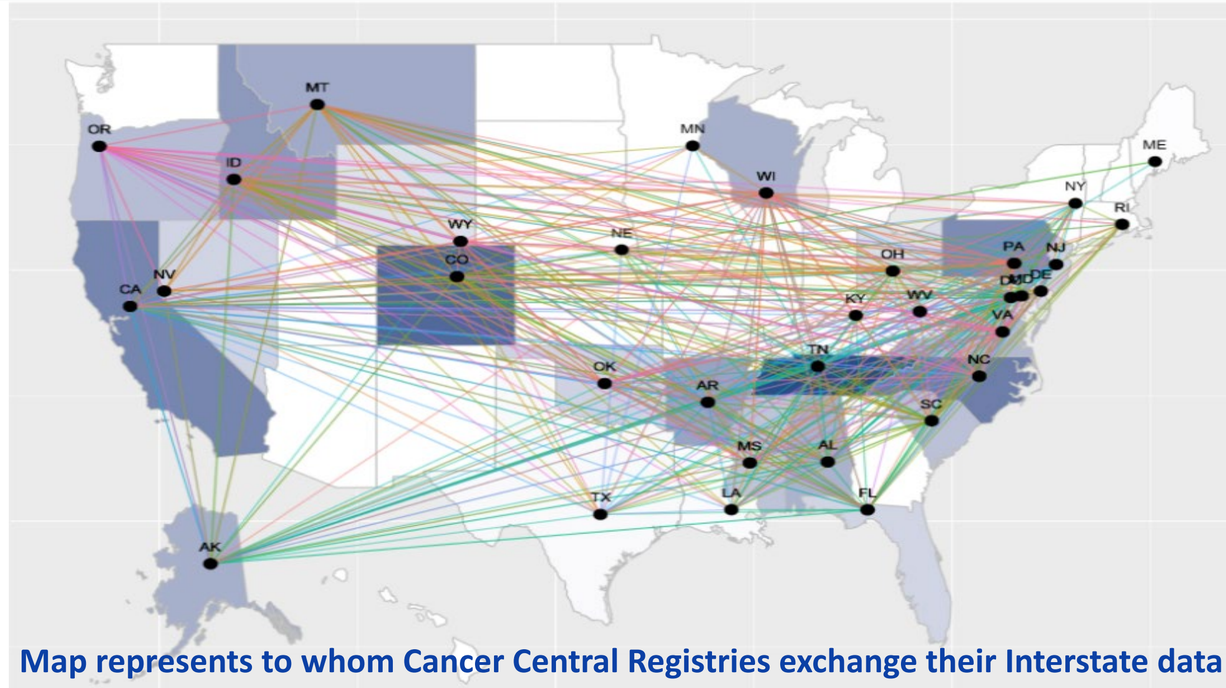
System Architecture and Design

The system is comprised of following components:

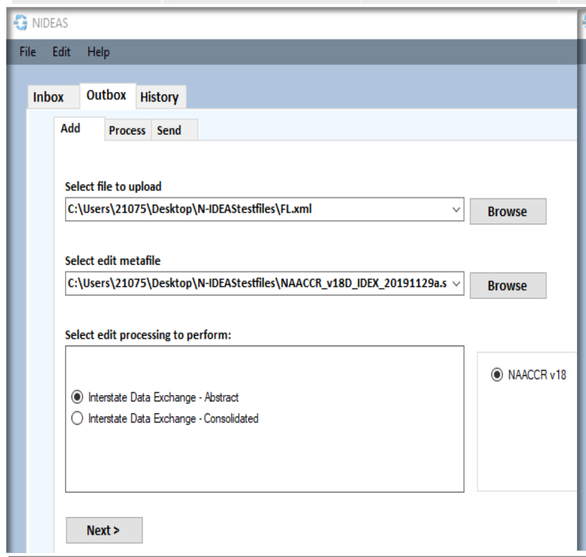
- Client Application: A desktop application on CCR users' machines to allow CCR users to exchange data with other CCRs. Performs optional edits and provides history of data exchange.
- Web services: XML web services are used to transfer data files over a secure HTTPS network as well as notification services to inform users of available exchange.
- Windows Services: Automatic deletion of expired files from the server.

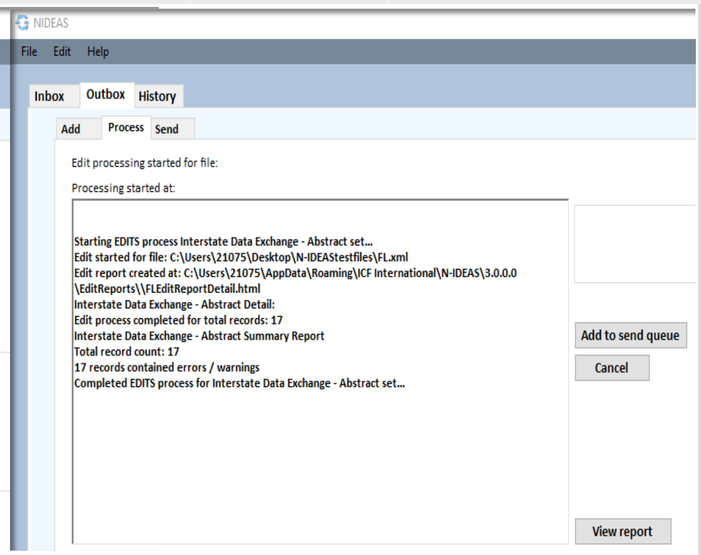
Results and Implications

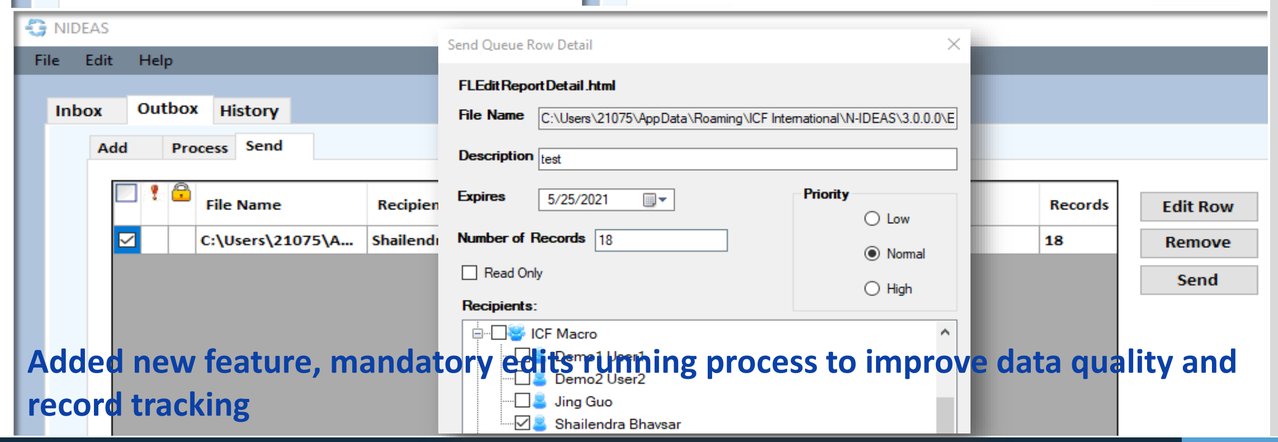
- 33 registries send and/or receive data through N-IDEAS (map).
- Mandatory edits assures high quality data received.
- Approximately 1,400 files exchanged in 2020 through N-IDEAS (figure 1)
- Most data files (62-72%) downloaded in one day (figure 2).



Map represents to whom Cancer Central Registries exchange their Interstate data







Added new feature, mandatory edits running process to improve data quality and record tracking

Figure 1. Overall N-IDEAS quarterly use by years

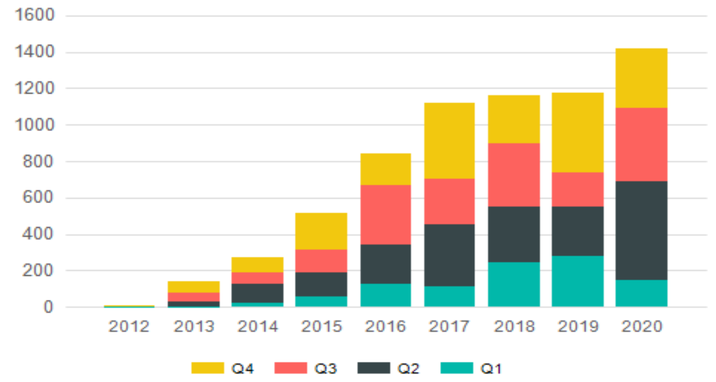
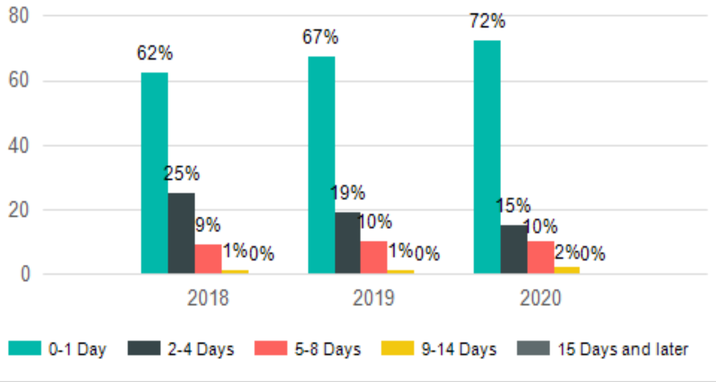


Figure 2. File downloading response



Conclusion

- The N-IDEAS tool is very innovative with its advance security and easy to use and continue to gain its popularity.
- The new features added in the latest version can help CCRs to improve their data quality without adding any extra burden to registries. The feature also allows CCRs to use XML and flat data file format and track the number of records they exchanged with each registry.
- The project highlighted CDC and ICF's joint effort in developing and implementing the product.
- The N-IDEAS is now widely used by CCRs to exchange data, compared to its early stage.

Acknowledgment

This product and service is a part of the NPCR-CSS contract funded by the Centers for Disease Control and Prevention (Contract # 200-2010-37215/0022). We also wish to thank all participating NPCR CCRs and other partners for implementation and improvement of this product.

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Incidence of Cancers Associated with Screening and Modifiable Risk Factors: Alaska 2012-2016

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Objective

To identify geographical regions of Alaska that would benefit from cancer screening programs and behavioral risk factor modification programs based on an examination of their cancer incidence rates.

Background

The Alaska Comprehensive Cancer Control Plan[1] includes many guiding principles, one of which is to identify disparities in cancer burden and address them through planning and implementation of goals and strategies. This study supports the plan by presenting cancer incidence statistics by geographic area for several cancers with the following characteristics:

- Cancers that are associated with modifiable "risk factors" (such as smoking).
- Cancers for which screening tests are available and recommended, also known as "screening-amenable cancers".

Effective comprehensive control and prevention programs focusing on reducing behavioral risk should result in fewer cancers, thus overall cancer incidence should decrease. Effective screening programs should result in more cancers being found early, thus late-stage cancer rates should decrease.

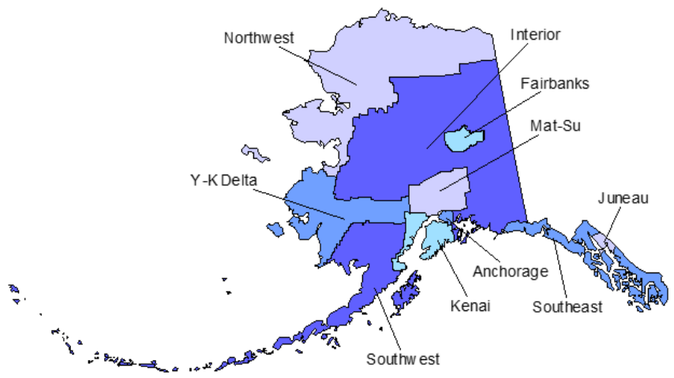
Methods

Many cancers are associated with modifiable risk factors, such as tobacco use, alcohol use, obesity, HPV infections, and excessive sun exposure. The Alaska Cancer Registry (ACR) reviewed these specific risk factors and the cancers with which they are associated. ACR selected the following 11 cancer primary sites for all age groups as indicators for cancers associated with modifiable risk factors:

- Bladder (tobacco use)
- Female breast (alcohol use)
- Cervix (tobacco use, HPV)
- Colorectal (tobacco & alcohol use, obesity)
- Endometrium (obesity)
- Esophagus (tobacco & alcohol use, obesity)
- Kidney & renal pelvis (tobacco use, obesity)
- Liver (alcohol use)
- Lung & bronchus (tobacco use)
- Melanoma of the skin (UV radiation)
- Oral cavity & pharynx (tobacco & alcohol use, HPV)

ACR examined cancer incidence rates for diagnosis years 2012-2016 for each primary site by Behavioral Health Systems Region (Figure 1) and compared them to the overall state rate. It was noted if any regions had rates that were statistically significantly higher than the state rate based on the range of upper and lower confidence limits.

FIGURE 1: ALASKA BEHAVIORAL HEALTH SYSTEMS REGIONS



Certain types of cancers can be detected through a variety of screening techniques. Some cancers are more screening-amenable than others, and only certain age groups are recommended to get screened. The Alaska Comprehensive Cancer Control Plan uses screening recommendations from the U.S. Preventive Services Task Force (USPSTF). ACR selected the following cancer primary sites for specific age groups as indicators for cancers associated with screening:

- Female breast (50-74 years)
- Cervix (21-65 years)
- Colorectal (50-75 years)
- Lung & bronchus (55-80 years)

ACR examined late-stage cancer incidence rates for diagnosis years 2012-2016 for each primary site by age group by Behavioral Health Systems Region (Figure 1) and compared them to the overall late-stage state rate. It was noted if any regions had rates that were statistically significantly higher than the state rate based on the range of upper and lower confidence limits.

Results & Discussion

Based on incidence rates for cancers associated with modifiable risk factors and for screening-amenable cancers, there do appear to be some geographic disparities:

- **The Northwest Region has statistically significantly higher rates of colorectal cancer and lung cancer for both late-stage and overall incidence** than the state rates. The high late stage rates suggest that this region could benefit from increased screening for both colorectal cancer and lung cancer. Based on risk factors for these 2 cancers, the high overall rates suggest that this region could benefit from obesity intervention programs as well as tobacco cessation programs
- **The Y-K Delta Region has statistically significantly higher rates of colorectal cancer for both late stage and overall incidence** than the state rates. The high late-stage rate suggests that this region could benefit from increased screening for colorectal cancer. Based on risk factors for this cancer, the high overall rate suggests that this region could benefit from obesity intervention programs as well as tobacco cessation programs.
- **The Mat-Su Region has a statistically significantly higher incidence rate of lung cancer** than the rest of the state. Based on risk factors for this cancer, the high overall rate suggests that this region could benefit from tobacco cessation programs.

Conclusions

This study illustrated that there were some geographic disparities for incidence of certain cancers that were either associated with modifiable risk factors or that were amenable to screening. The results of this study have been published in a report[2] that was widely distributed via GovDelivery email.

The report is posted on the ACR website (http://dhss.alaska.gov/dph/VitalStats/Pages/cancer/registry.aspx#poster) for download. The report can be used by the Alaska Comprehensive Cancer Partnership stakeholders – clinical and public health professionals as well as other health advocacy partners and the public – to support continued planning and evaluation of cancer prevention and control efforts.

References

[1] Alaska Comprehensive Cancer Partnership, 2016. Alaska Comprehensive Cancer Control Plan, 2016-2020. Anchorage, Alaska: Section of Chronic Disease Prevention and Health Promotion, Division of Public Health, Alaska Department of Health and Social Services. http://dhss.alaska.gov/dph/Chronic/Documents/Cancer/assets/AlaskaCancerPlan2016-2020.pdf

[2] O'Brien, D.K., 2020. Incidence of Cancers Associated with Screening and Modifiable Risk Factors: Alaska 2012-2016. Anchorage, Alaska: Alaska Cancer Registry, Health Analytics and Vital Records Section, Division of Public Health, Alaska Department of Health and Social Services. http://dhss.alaska.gov/dph/VitalStats/Documents/cancerregistry/ACR_Screening%20Report_2012-2016.pdf

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Is the use of a seat belt associated with screening for cancer? Results from the BRFSS 2018 survey

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Introduction

In January 2020, the American Cancer Society estimated over 1.8 million new cancer diagnoses for the year 2020 along with over 600,000 deaths, making cancer the second leading cause of death in the US. Modern innovations in cancer screening have major impacts on early cancer diagnosis, which is associated with a greater 5-year survival rate. This study seeks to examine the relationship between two health-promoting behaviors: seat belt (SB) use and use of cancer screening services.

Methods

- This cross-sectional study used data from the BRFSS 2018 study
- Eligible participants were US adults 18+.
  - Individuals who were ≥80 years of age, pregnant at the time of the survey, or had missing or incomplete responses to any of the included variables were excluded from analyses.
  - N=323,304
- Seat belt use was defined by the BRFSS 2018 and was assessed as a dichotomous variable.
- Adherence to cancer screening recommendations was also defined by the BRFSS 2018.
- The analysis was controlled for the following confounders: age, race, marital status, education, employment, income, smoking, obesity, and depression.
- Multivariable weighted logistic regression models were performed.

Sex	Cancer Screening Type	Age range (years)	Final sample	Received SC	Always or almost always wear a SB	% who always or almost always wear a SB who had an SC (95% CI)	% who sometimes, seldom or never wear a SB who had an SC (95% CI)
Female	Breast	40-65	78,549	71,406	75,974	97.00 (96.67-97.34)	3.00 (2.66-3.33)
Female	Cervical	30-65	98,019	95,317	94,548	96.61 (96.35-96.88)	3.39 (3.12-3.65)
Male	Prostate	50-70	67,696	34,871	62,722	94.83 (94.37-95.28)	5.17 (4.72-5.63)
Female	Colorectal	50-75	89,763	72,686	86,938	97.54 (97.26-97.81)	2.46 (2.19-2.74)
Male	Colorectal	50-75	80,518	62,046	74,760	94.50 (94.13-94.87)	5.50 (5.13-5.87)

Table 1. Descriptive statistics: Screening guideline-based age ranges for all screening types; N is unweighted; SB=seat belt, SC=screening for cancer, CI=confidence interval

Gender	Age Group	Cancer Screening	Screening Methodology	N	WAOR[a] (95% CI[b])	p-value
Female	40-65	Breast	Mammography	78,549	1.28 (0.96, 1.72)	0.0947
Female	30-65	Cervical	Pap and/or HPV[c]	98,019	**1.95 (1.36, 2.81)**	**0.0003**
Male	50-70	Prostate	PSA[d]	67,696	**1.34 (1.17, 1.53)**	**< 0.0001**
Female	50-75	Colorectal	Sigmoidoscopy and/or FOBT[e]	89,763	**1.82 (1.42, 2.33)**	**< 0.0001**
Male	50-75	Colorectal		80,518	**1.41 (1.24, 1.61)**	**< 0.0001**

Table 2. Multivariable weighted logistic regression results: the association between wearing a seatbelt and getting screened for cancer. Bolded text indicates statistical significance. [a]WAOR = weighted and adjusted odds ratio; [b]CI = confidence interval; [c]Pap = Papanicolaou test and HPV=human papillomavirus test; [d]PSA=prostate-specific antigen; [e]FOBT=fecal occult blood test.

Results

- The weighted and adjusted odds (WAO) of screening for cancer were significantly greater among individuals who were almost or almost always wearing a SB compared to their counterparts in the following groups (Table 2):
  - Females screened for cervical and colorectal cancer
  - Males screened for prostate and colorectal cancer
- The association between SB use and screening for breast cancer was not significant among females 40-65 YO (WAOR=1.28; 95% CI: (0.96,1.72)) but was significant among females 50-65 YO (WAOR=1.82; 95% CI: (1.21,2.72)).

Discussion & Conclusions

- Results indicate that certain individuals who wear a seat belt are more likely to participate in recommended screening for breast, cervical, prostate, and colorectal cancer.
- Suggests that those who do not wear a seat belt may be potential targets for public health interventions meant to increase adherence to cancer screening recommendations.
- Further studies are needed to determine whether seat belt use is associated with late-stage initial cancer diagnosis.

Acknowledgement

All research reported in this presentation was supported by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103442.

Late-stage cervical cancer diagnosis in young adults in California following the Affordable Care Act

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Background

- YAs (ages 21–39), a historically underinsured population, may experience various barriers to healthcare, including lack of access to the HPV vaccine and Pap smear screening, which can prevent or detect pre-malignant lesions or cervical cancer at early stage (Stage I).
- Following the Affordable Care Act (ACA), many YAs became eligible for insurance. However, YAs continue to be diagnosed with cervical cancer at later stages (II–IV).

Purpose

- To quantify changes in cervical cancer stage at diagnosis following the ACA and identify characteristics associated with later stage diagnosis.

Methods

- Using California Cancer Registry data linked to Medicaid enrollments, we identified YAs aged 21–39 diagnosed with first primary squamous cell carcinoma (SCC) or adenocarcinoma (AC) cervical cancer pre-ACA (March 2005–September 2010), early-ACA (October 2010–December 2013), and post-full ACA implementation (January 2014–December 2017).
- Multivariable logistic regression was used to assess factors associated with later stage diagnosis in YAs diagnosed with AC or SCC. Results are presented as adjusted odds ratios (OR) and 95% confidence intervals (CI).

Results

- Of the 4,244 patients, 31% had AC and 69% SCC **(Figure 1).**
- 32.7% of YAs were diagnosed at late stage. From pre-ACA to full-ACA, the percent of late-stage diagnoses increased by 6.5% **(Figure 2).**
- From pre- to full-ACA, continuous Medicaid coverage increased by 23%, whereas private insurance decreased by 11%, and Medicaid at diagnosis/uninsured decreased by 8% **(Figure 3).**
- YAs with Medicaid at diagnosis/uninsured, continuous Medicaid, and discontinuous Medicaid (vs. private/ military) were more likely to be diagnosed at a late stage for both AC and SCC histologies **(Table)**.
- In AC patients, Asian/Pacific Islanders (vs. non-Hispanic Whites) were more likely to be diagnosed at later stage **(Table)**.
- In SCC patients, older YAs, those of Black or Hispanic race/ethnicity (vs non-Hispanic White), patients with more than one comorbidity, and those diagnosed after the full ACA Expansion (vs pre-ACA) were more likely to be diagnosed at later stage **(Table)**.

Figure 1. Percent of Adenocarcinoma and Squamous Cell Carcinoma

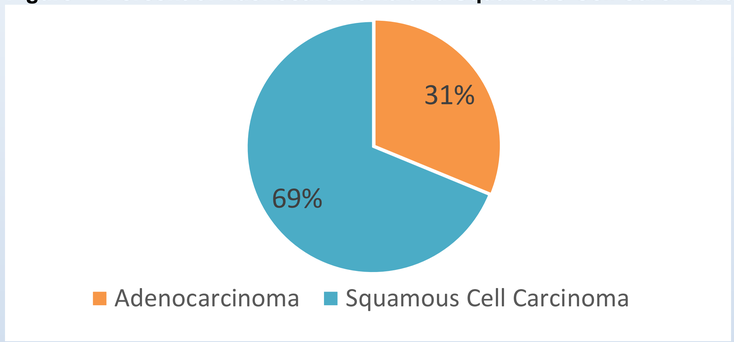

Figure 2. Percent of Late-Stage Diagnosis by Histology and ACA Implementation Period

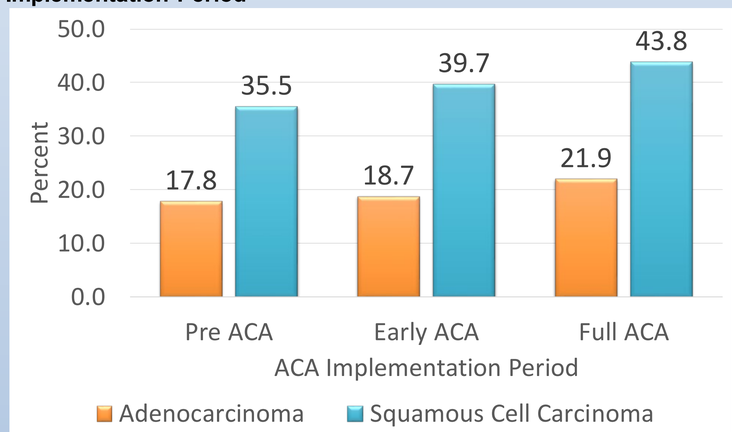

Figure 3. Percent of Health Insurance Type by ACA Implementation Period

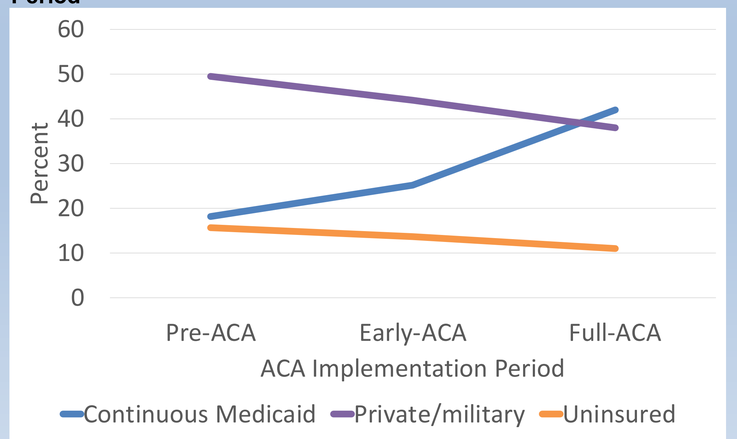

Table: Association between demographic and clinical factors with late-stage (II-IV) cervical cancer diagnosis for YA patients

Characteristic	Adenocarcinoma OR (95% CI)	Squamous Cell Carcinoma OR (95% CI)
Age Group (vs 21-25 years)		
26-39 years	1.19 (0.58, 2.44)	**1.65 (1.19, 2.30)**
ACA Implementation Period (vs.Pre-ACA)		
Early-ACA	0.83 (0.59, 1.17)	1.08 (0.89, 1.32)
Post-ACA	1.05 (0.76, 1.43)	**1.39 (1.16, 1.68)**
Health Insurance Type (vs Private/military)		
Continuous Medicaid	**2.28 (1.56, 3.33)**	**1.56 (1.27, 1.92)**
Discontinuous	**2.6 (1.64, 4.11)**	**2.26 (1.76, 2.91)**
Other Public	2.4 (0.57, 10.05)	0.95 (0.37, 2.39)
Uninsured	**2.89 (1.88, 4.44)**	**3.23 (2.49, 4.20)**
Race/Ethnicity (vs Non-Hispanic White)		
Non-Hispanic black	0.83 (0.35, 1.97)	**1.8 (1.28, 2.53)**
Hispanic	0.91 (0.66, 1.27)	**1.35 (1.11, 1.63)**
Asian/Pacific Islander	**1.63 (1.08, 2.45)**	1.16 (0.87, 1.54)
American Indian	1.3 (0.37, 4.53)	0.59 (0.25, 1.36)
Neighborhood Socioeconomic Status (vs High)		
Low	1.41 (0.96, 2.07)	1.07 (0.85, 1.35)
Medium	1.09 (0.77, 1.54)	1.05 (0.83, 1.31)
Rural Residence (vs Urban)		
Rural	**0.545 (0.34, 0.87)**	0.91 (0.72, 1.15)
Comorbidities (vs. None)		
One comorbidity	1.17 (0.75, 1.83)	1.31 (0.99, 1.74)
More than one comorbidity	1.92 (0.64, 5.82)	**3.26 (1.91, 5.57)**
Marital Status (vs Married)		
Not Married	1.21 (0.91, 1.61)	**1.21 (1.02, 1.43)**
Care facility type (vs. NCI-Designated)		
Non NCI-designated	0.91 (0.67, 1.24)	**0.72 (0.60, 0.87)**

Conclusion

- Despite fewer YAs being uninsured and more continuously insured with Medicaid, the proportion of late-stage squamous cell carcinoma increased from pre-to post-ACA implementation.
- Our findings highlight the importance of access to the HPV vaccine and increased screening among underserved YAs in California.

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NATIONAL CENTER FOR CHRONIC DISEASE PREVENTION AND HEALTH PROMOTION

Male breast cancer relative survival in the United States during 2007–2016

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2 Oak Ridge Institute for Science and Education, Oak Ridge, Tennessee

BACKGROUND

Breast cancer among males in the United States is rare with approximately 2300 new cases and 500 deaths reported in 2017, accounting for about 1% of breast cancers.

METHODS

We examined data on survival patterns of invasive breast cancer (International Classification of Diseases for Oncology, Third Edition: C50.0–C50.9) reported among males during 2007–2016

Cases with histology codes 9050-9055 (mesothelial neoplasms), 9140 (Kaposi sarcoma), and 9590-9992 (lymphomas and hematopoietic neoplasms) were excluded from analysis.

Used the National Program of Cancer Registries (NPCR) Survival Analytical Database.

Includes data from 45 population-based cancer registries that met United States Cancer Statistics (USCS) publication criteria covering 94% of the population.

RESULTS

One-year relative survival was 97.0% among Hispanics males, 96.4% among White males, 95.3% among other males, and 93.7% among Black males.

Five-year relative survival was 86.2% among other males, 86.0% among White males, 82.5% among other Hispanic males, and 77.6% among Black males.

Males classified as other in this study had the highest percentage of cases diagnosed at localized stage (50%) and Black males had the lowest percentage of cases diagnosed at localized stage (42%).

DISCUSSION

Relative survival one year after breast cancer diagnosis was lower among Black males than among White and Hispanic males.

Assuring access to appropriate treatment might reduce the observed differences in relative survival by race/ethnicity.

Male breast cancer one-year and five-year relative survival was 96.1% and 84.7% during 2007-2016

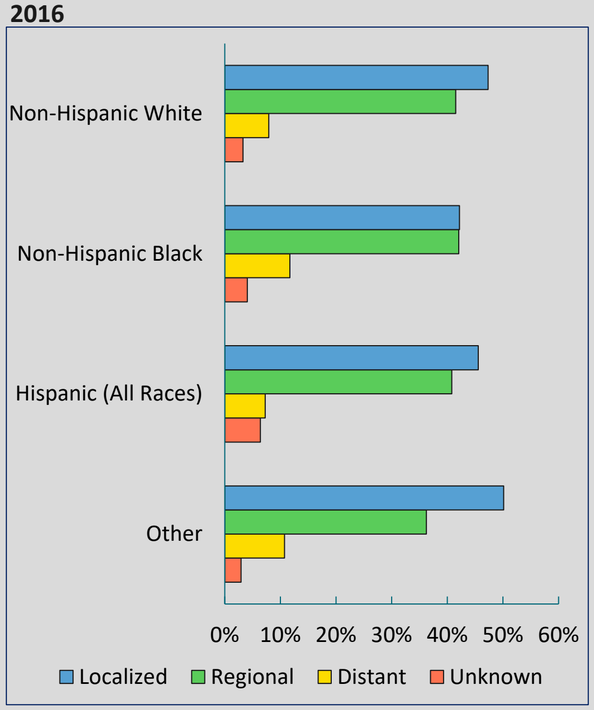
Relative survival one and five years after breast cancer diagnosis among males, by selected characteristics — United States, 2007–2016[a]

Characteristics	Number	Relative survival (95% CI) 1-year	5-year
Overall	14,805	96.1 (95.6–96.5)	84.7 (83.7–85.7)
Age (yrs)			
<50	1,626	96.9 (95.8–97.6)	83.6 (81.2–85.7)
50–59	2,990	96.5 (95.6–97.1)	83.9 (82.0–85.6)
60–69	4,583	96.1 (95.3–96.7)	85.1 (83.4–86.6)
70–79	3,471	96.3 (95.2–97.1)	85.9 (83.3–88.1)
≥80	2,135	94.8 (92.7–96.3)	84.5 (78.8–88.7)
Census Region[c]			
Northeast	3,087	95.8 (94.7–96.7)	85.9 (83.5–88.0)
Midwest	2,844	95.6 (94.4–96.5)	82.7 (80.1–85.0)
South	5,842	96.0 (95.2–96.6)	83.9 (82.2–85.5)
West	2,833	97.4 (96.3–98.1)	87.0 (84.4–89.1)
Stage at Diagnosis			
Localized	6,779	99.7 (98.9–99.9)	98.7 (96.5–99.5)
Regional	6,205	98.7 (98.1–99.2)	83.7 (82.0–85.2)
Distant	1,290	70.5 (67.8–73.1)	25.9 (22.7–29.3)
Unknown	531	80.5 (76.4–84.0)	62.1 (55.7–67.8)

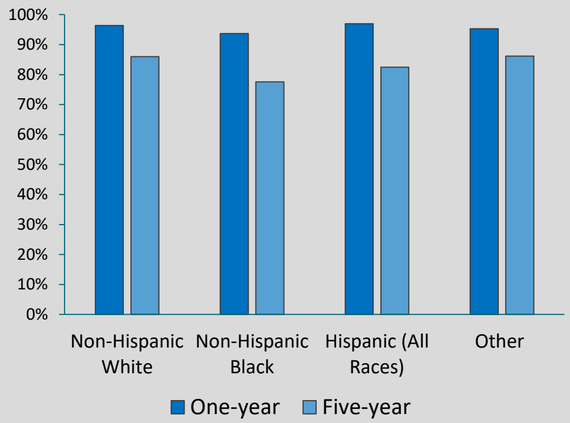
[a]Data were compiled from 45 population-based cancer registries that participate in the National Program of Cancer registries, meet the data-quality standards for inclusion in U.S. Cancer Statistics, and meet the criteria for inclusion in the survival data set, which covers approximately 96% of the U.S. population.
[b]Racial and ethnic groups are mutually exclusive. Hispanic persons can be any race. The "other" race group contains non-Hispanic Asian/Pacific Islander and non-Hispanic American Indian/Alaska Native cases.

SCAN HERE FOR MORE INFORMATION

Stage at diagnosis for males diagnosed with breast cancer by race and ethnicity, United States, 2007–2016



One-year and five-year relative survival for males diagnosed with breast cancer by race and ethnicity, United States, 2007–2016



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Obesity and Risk of Colorectal Cancer Among Adolescents and Young Adults in the US: An Ecological Study

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Background

- There is an increase in incidence of early onset colorectal cancer (CRC) that arise from distal colon and rectum.
- For adolescents and young adults (AYA, age 15-39), CRC is considered a rare disease with poor outcome, thus the recent increasing trend of early onset CRC is of great public health concern.

Hypothesis: Is early life obesity is associated with rise in AYA CRC incidence?

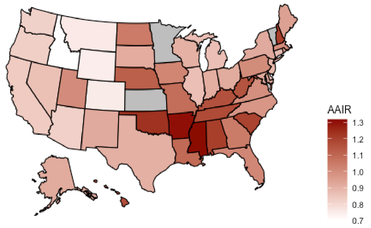
Method

- Ecological study using state level data on cancer incidence and prevalence of adolescent obesity.
- NAACCR Cancer in North America (CiNA) Research Data from 48 NPCR state registries were used to estimate state specific, age adjusted incidence rates (AAIR) of cancers in left colon, right colon and rectum among15 to 39 year-olds from 1996 to 2016.
- CDC Youth Risk Behavior Surveillance System data from 1991 to 2011 were used to estimate state specific prevalence of obesity in 39 states for 14 to 18 year-olds.

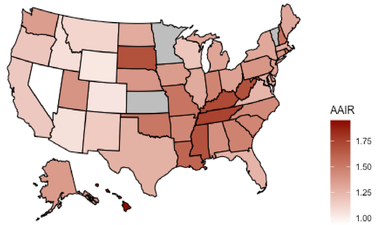
Results

State Level Age-Adjusted Incidence Rates of Colorectal Cancer Across the U.S.

AAIR of Left Colon Cancer, 1995-2016
Age 15-39

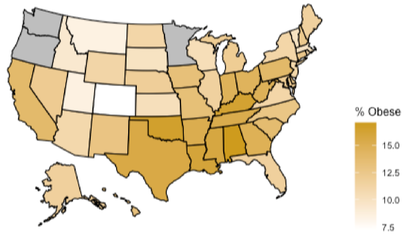


AAIR of Rectal Cancer, 1995-2016
Age 15-39



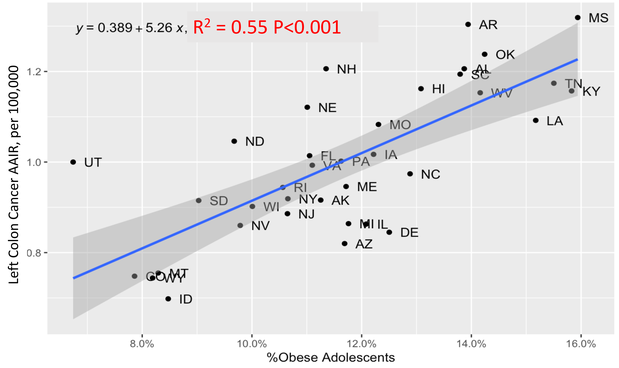
State Level Prevalence of Adolescent Obesity

YRBSS Obesity Prevalence, 1991-2011
Age 14-18

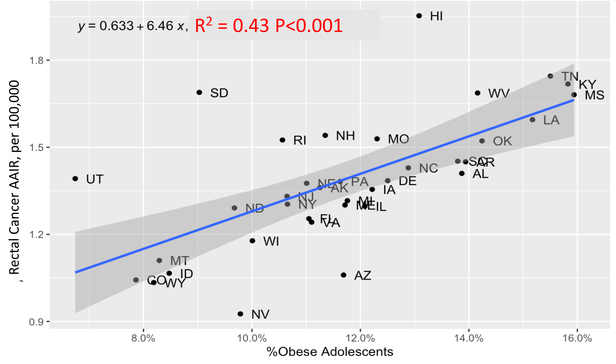


Correlation Between Colorectal Cancer Incidence and Obesity Prevalence

Left Colon Cancer 1995-2016 and % Obese Adolescents 1991-2011



Rectum Cancer 1995-2016 and % Obese Adolescents 1991-2011



Conclusion

Early life obesity may be associated with increase in incidence of left colon and rectal cancer

- States that have high incidence rates of left colon and rectal cancer in AYA also have higher prevalence of adolescent obesity
- There is a significant correlation between state level CRC incidence rate and adolescent obesity level (P<0.001)
- Significant adverse consequences of childhood and adolescent obesity should be considered for future cancer prevention efforts for AYAs.

Acknowledgement: SEER*Stat Database: NAACCR Incidence Data - CiNA Analytic File, 1995-2016, for NHIAv2 Origin, Standard File, Hwang - CRC among Young Adults in NA (which includes data from CDC's National Program of Cancer Registries (NPCR), CCCR's Provincial and Territorial Registries, and the NCI's Surveillance, Epidemiology and End Results (SEER) Registries), certified by the North American Association of Central Cancer Registries (NAACCR) as meeting high-quality incidence data standards for the specified time periods, submitted December 2018.

Pilot Study on Early Onset of Colorectal Cancer in Patients Under Age 50 How and Why are they Diagnosed?

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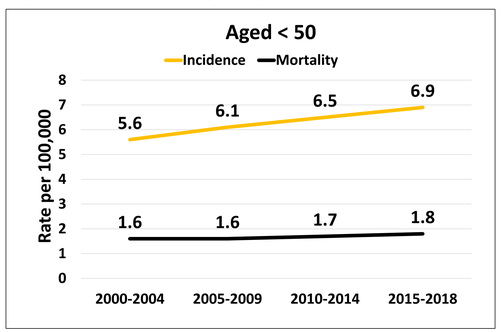
Background

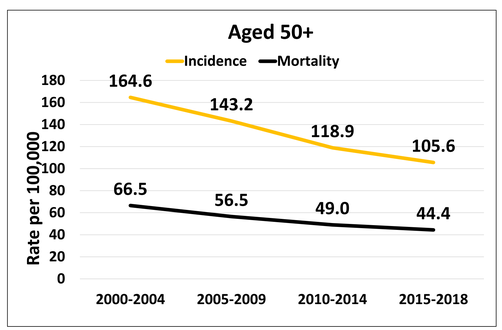
- Colorectal cancer is the 4th most commonly diagnosed cancer in the US and the 2nd leading cause of death[1]
- Iowa's colorectal cancer incidence and mortality rates have decreased in those ages 50+, while rates for <50 have been increasing since 2000
- Unclear if increase can be explained by increased high-risk screening, more diagnostic testing with colonoscopy, or changes in behavioral risk factors

Study Aims

- To examine precipitating factors of colorectal cancer diagnosis in those aged <50
- Determine the feasibility of collecting variables not routinely captured by cancer registries
- Create and pilot an abstraction form that can be used for future studies
- Determine the availability and feasibility of finding factor-specific variables in the central registry vs. hospital records

Figure 1. Colorectal Age Adjusted Incidence[2] and Mortality[3] Rates by Age at Diagnosis, SEER 18, 2000-2018





Methods

Study Population

Inclusion criteria:

- Iowa residents ages 18 to 50
- Invasive, microscopically confirmed colorectal cancer diagnosed in 2017
  - Colon (C180, C182-C187)
  - Recto-sigmoid junction (C199)
  - Rectum (C209)
- Histologic types included in Colon & Rectal Cancer Collaborative Stage Schema ID: 00200, version 0204

Exclusion criteria:

- Diagnosed at autopsy, pathology or death certificate only, and those identified only by recurrence/progression (non-analytic cases)
- Carcinoid tumors and lymphomas

Study Design/Analysis

- Retrospective cross-sectional descriptive study
- Selected a sample of cases diagnosed in 2017 among those age <50, with an oversample of those age <40
- Trained registrars collected data from abstracts submitted to the Iowa Cancer Registry and hospital EHR's where diagnostic services and/or treatment was received:
  - Reason(s) for seeking medical attention
  - Diagnostic testing
  - Risk factors
  - Staging
  - Molecular testing
- All analyses were conducted using SAS version 9.4

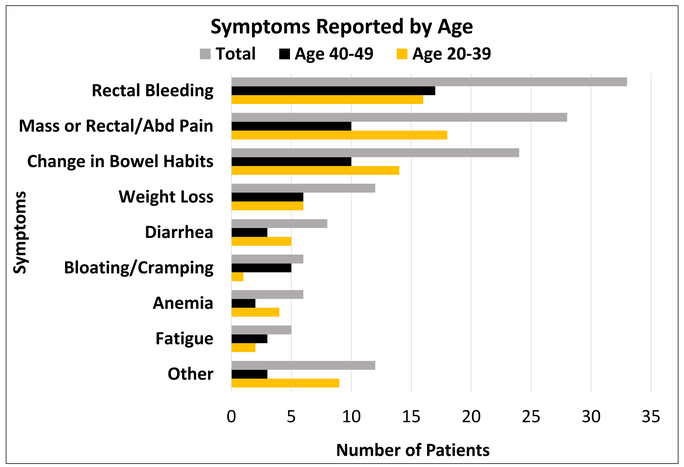
Results

Table 1. Patient and Tumor Characteristics by Age at Diagnosis

Characteristics	All (n=43) n (%)	Age 20-39 (n=22) n (%)	Age 40-49 (n=21) n (%)
Mean Age (Years)	40	35	46
Gender (Male)	25 (58)	11 (50)	14 (67)
Race (White)	42 (98)	21 (95)	21 (100)
Ethnicity (non-Hispanic)	40 (93)	20 (95)	20 (95)
Marital Status (Married/Domestic Partner)	21 (49)	8 (36)	13 (62)
Residence (Metropolitan)	28 (65)	14 (64)	14 (67)
Smoking Status (Current)	6 (14)	†	†
Alcohol Status (Current)	25 (58)	12 (55)	13 (62)
Body Mass Index (Obese)	21 (50)	10 (45)	11 (55)
Reason for Diagnosis (Symptoms)	41* (95)	21 (95)	20 (95)
Family History (Any)	24 (56)	13 (59)	11 (52)
Colorectal Polyps	6 (14)	†	†
Colorectal Cancer	10 (23)	6 (27)	†
Other Cancer	16 (42)	8 (36)	8 (38)
High Risk Comorbidities (Any)	24 (56)	11 (50)	13 (62)
Obesity	21 (49)	10 (45)	11 (52)
Diabetes	†	†	†
Inflammatory Bowel Disease	†	†	†
Primary Site			
Right (C180, C182, C183, C184)	7 (16)	†	†
Left (C185, C186, C187, C199)	18 (42)	10 (46)	8 (38)
Rectum (C209)	18 (42)	8 (36)	10 (48)
Staging (Summary Stage 2000)			
Localized	†	†	†
Regional	23 (53)	12 (54)	11 (52)
Distant	15 (35)	7 (32)	8 (38)
Genetic Counseling (Done)	14 (33)	7 (32)	7 (33)
Germline testing (Done)	16 (37)	9 (41)	7 (33)

*** 2 were also High Risk/Surveillance; † Suppressed due to small numbers**
Fisher's Exact tests were conducted for each characteristic and no statistically significant (p<.05) differences were found

Figure 2. Common Symptoms Reported by Patient by Age at Diagnosis



Key Findings

- In 95% of all cases, symptoms were the primary reason for seeking medical attention
- 33% of cases reported having a family history of colorectal polyps or a colorectal cancer
- 56% of cases reported having a high-risk comorbid condition (diabetes, IBD, and obesity)
- Comparisons between data collected from ICR and hospital medical records demonstrated that patients' weight, height, alcohol and smoking status, family history, comorbidities, and genetic counseling were best identified from hospital record review, whereas staging, treatment and diagnostic testing could be identified in the registry's abstracts

Summary & Conclusion

- Clinical symptoms were the predominant reason why those age <50 sought medical care and presented with advanced stage
- Developed and piloted the abstraction form for future studies and identified which variables could be found in the hospital records vs. the central registry's database
- This work is an important step in informing a larger study with multivariable analysis to identify the primary factors driving the increasing incidence of colorectal cancer among those age <50

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1. https://seer.cancer.gov/statfacts/html/common.html
2. Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Incidence - SEER Research Plus Data, 18 Registries, Nov 2020 Sub (2000-2018) - Linked To County Attributes - Total U.S., 1969-2019 Counties, National Cancer Institute, DCCPS, Surveillance Research Program, released April 2021, based on the November 2020 submission.
3. Surveillance, Epidemiology, and End Results (SEER) Program (www.seer.cancer.gov) SEER*Stat Database: Mortality - All COD, Aggregated With State, Total U.S. (1969-2018) <Katrina/Rita Population Adjustment>, National Cancer Institute, DCCPS, Surveillance Research Program, released May 2020. Underlying mortality data provided by NCHS (www.cdc.gov/nchs).

Acknowledgments
Thank you to Michele West and Amanda Kahl for their assistance on this project.

Population-based prevalence of bariatric surgery in cancer patients

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Background

- The California Cancer Registry (CCR) data are routinely linked with California Office of Statewide Health Planning and Development (OSHPD) data containing inpatient discharge data, emergency department data, and ambulatory surgery data. The OSHPD data have become a useful source of information on comorbidity status of cancer patients.
- Nearly 40% of adults in the United States have obesity.
- Bariatric surgeries, or weight-loss surgery (WLS), is considered as the most effective treatment of obesity, and the number of WLS has increased exponentially over the past few decades.
- Obesity is associated with all-cause mortality and mortality from breast cancer. However, the prevalence of WLS among cancer patients is not known.

Objectives:

- To utilize CCR-OSHPD data to estimate population-based prevalence of WLS among non-metastasized breast cancer patients.

Methods

- Database: CCR-OSHPD linked data (1991-2014)
  Inpatient (1991-2014, Ambulatory surgery: 2006-2014)
- Patients: First primary breast cancer diagnosed at localized or regional stage between 1991-2014
- Evaluated the frequency of WLS either prior to or after their cancer diagnosis.
- Examined characteristics of the patients according to history of WLS.

N=405,517
↓ Excluded patients diagnosed with digestive tract cancer
N=395,146
↓ Searched OSHPD data for WLS procedure codes* with obesity diagnosis
N=2,844 had a WLS record(s)

- N=202 from ambulatory surgery data
- N=2642 from inpatient data

* Used by the OSHPD team (Fong et al. 2011)

Results

- We identified WLS records between 1991-2014 for 2,844 breast cancer patients (0.7%) diagnosed in California between 1991-2014.
- WLS for 1,437 patients was performed prior to their cancer diagnosis; WLS for 1,407 patients was performed after their cancer diagnosis.
- Patients in the WLS group were younger at cancer diagnosis and more likely to have a comorbid condition(s).

References: Fong et al. Trends in Bariatric Surgery in California Hospitals, 2005 to 2009. Accessed November 1, 2019, https://data.chhs.ca.gov/dataset/number-of-weight-loss-surgeries-performed-in-california-hospitals/resource/e650ed8b-1d73-437d-b949-f7166bc9501f

Table 1. Demographic and clinical characteristics according to history/timing of WLS

	No WLS record (Total n=392,302)	WLS *before* cancer diagnosis (Total n=1,437)	WLS *after* cancer diagnosis (Total n=1,407)
Characteristics	N (%)	N (%)	N (%)
Age at cancer diagnosis	(Mean ± SD) 60 ± 14	(Mean ± SD) 55 ± 9	(Mean ± SD) 49 ± 8
<40	23964 (6%)	53 (4%)	186 (13%)
40-49	74521 (19%)	331 (23%)	535 (38%)
50-59	94245 (24%)	553 (38%)	532 (38%)
60-69	91007 (23%)	432 (30%)	154 (11%)
70+	108565 (28%)	68 (5%)	
Race/ethnicity			
NHW	264029 (67%)	1037 (72%)	1016 (72%)
NHB	23225 (6%)	136 (9%)	155 (11%)
Hispanic	59917 (15%)	224 (16%)	196 (14%)
API	41404 (11%)	40 (3%)	21 (1%)
Other/Unknown	3727 (1%)		19 (1%)
Year of cancer diagnosis*			
1991-1998	114537 (29%)	22 (1%)	407 (29%)
1999-2002	67417 (17%)	77 (5%)	306 (22%)
2003-2006	65458 (17%)	214 (15%)	364 (26%)
2007-2010	70127 (18%)	438 (30%)	270 (19%)
2011-2014	74763 (19%)	686 (48%)	60 (4%)
Stage at diagnosis			
Localized	258209 (66%)	1009 (70%)	957 (68%)
Regional	134093 (34%)	428 (30%)	450 (32%)
Charlson Comorbidity Index			
0	217413 (78%)	878 (66%)	753 (74%)
1+	62664 (22%)	460 (34%)	270 (26%)
Not determined	112225 (-)	99 (-)	384 (-)
Estrogen receptor (ER)			
Negative	68649 (20%)	263 (19%)	323 (26%)
Positive	270131 (80%)	1106 (81%)	904 (74%)
Unknown/borderline	53522 (-)	68 (-)	180 (-)
[Among age≥50]			
Negative	45050 (18%)	176 (17%)	118 (19%)
Positive	208026 (82%)	831 (82%)	499 (81%)
Unknown/borderline	40741 (-)	46 (-)	69 (-)

Abbreviations: NHW, non-Hispanic white; NHB, non-Hispanic black, API, Asian/Pacific Islander

* Maximum time interval between cancer diagnosis and 2014 (last year of the database) varies from 24 years for those diagnosed in 1991 to <1 year for those diagnosed in 2014.

Limitations: Follow up time to ascertain post-diagnosis WLS is limited for recently diagnosed cancer patients (up to 2014). Additional studies are necessary to understand prevalence of WLS among cancer patients with obesity.

Table 2. WLS characteristics according to timing of WLS

	WLS *before* cancer diagnosis (Total n=1,437)	WLS *after* cancer diagnosis (Total n=1,407)
Characteristics	N (%)	N (%)
Total number of OSHPD records of WLS (per patient)		
Only 1 record	1393 (97%)	1356 (96%)
≥2 records	44 (3%)	51 (3%)
Revision/removal procedure		
No	1385 (96%)	1343 (95%)
Yes	52 (4%)	64 (5%)
Age at WLS, first record		
Mean ± SD	**50 ± 9**	**55 ± 8**
<40	65 (5%)	15 (1%)
40-49	318 (22%)	133 (9%)
50-59	**603 (42%)**	**480 (34%)**
60-69	**384 (27%)**	**568 (40%)**
70+	**67 (5%)**	**211 (15%)**
Time interval between WLS and cancer diagnosis		
	(Mean ± SD) **5.4 ± 4.0**	
WLS ≥5 years earlier	667 (46%)	
WLS 2 - <5 years earlier	421 (29%)	
WLS 0 - <2 years earlier	349 (24%)	
		(Mean ± SD) **6.4 ± 4.5**
WLS >0 - 2 years later		207 (15%)
WLS >2 - 5 years later		474 (34%)
WLS >5 - 10 years later		425 (30%)
WLS >10 years later		301 (21%)

Results (2)

- The majority (97%) of the WLS group had only one record of WLS.
- 4-5% of WLS group had a record of revision/removal of a previous procedure or device(s).
- Most frequent procedures: Laparoscopic gastroenterostomy, high gastric bypass, other gastroenterostomy without gastrectomy, laparoscopic gastric restrictive procedure.

Conclusions

- About 2,800 patients with breast cancer diagnosed between 1991 and 2014 in California underwent WLS for obesity. More than half of these WLS were performed after their cancer diagnosis.
- CCR-OSHPD linkage database can provide useful information about surgical procedures among cancer patients.

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Risk of subsequent invasive cancers among oral cavity and pharynx cancer survivors in New Jersey, 1990-2018

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Head / Neck

Background

- Cigarette smoking is a major risk factor for oral cavity and pharynx cancer (OPC) and increases the risk for lung cancer, as well as other cancers.[1]
- Human papilloma virus (HPV) is the major cause of cervical cancer and can also cause cancers of the oral cavity, oropharynx, vulva, vagina, penis and anus.[2]
- Patients diagnosed with OPC may have increased risk of developing other smoking-associated and HPV-associated cancers.

Objectives

Evaluate risk of subsequent invasive cancer in a cohort of New Jersey (NJ) residents diagnosed with OPC
- by cancer site, sex, and race/ethnicity

Methods

- **Data Source:** New Jersey State Cancer Registry (NJSCR)
- **Cohort**: NJ residents diagnosed w/ invasive OPC as 1st primary malignancy 1990- 2018
- **Exclusions**:
  - diagnosed with cancer prior to index OPC
  - diagnosed at autopsy or by death certificate only or < 2 months of follow-up time
- N = 21,825 persons after exclusions
- **Statistical analysis**: Standardized incidence ratios (SIRs) and 95% confidence intervals (CI)

SIR = Observed / Expected

Observed: Number of subsequent invasive primary cancers
- Diagnosed > 2 months after index OPC and before December 31, 2018
- All 2nd and later (3rd, etc.) cancers were included

Person years at risk (PYR):
- Calculated for each patient starting from 2 months after diagnosis of index cancer and ending at the earliest of: date of death, last known follow-up or 12/31/2018
- Stratified by age at initial diagnosis (5 year groups), race/ethnicity, calendar year

Expected:
- NJ general population age-, race/ethnicity-, and calendar year-specific cancer incidence rates were multiplied by strata-specific PYR and then summed.

All analyses were conducted using the MP-SIR session of SEER*Stat version 8.3.8.

Results

- Risk of subsequent lung and bronchus cancer was significantly elevated in female (SIR=2.8, 95%CI 2.5-3.2) and male OPC survivors (SIR=2.9, 95%CI 2.7-3.1).
- Increased risk for lung and bronchus cancer was observed in non-Hispanic White and Black female and male OPC survivors, as well as Hispanic males.
- OPC survivors had substantially increased risk of a subsequent OPC (female: SIR=35.5, 95%CI 31.6-39.8 male: SIR=15.1, 95%CI 13.9-16.4).

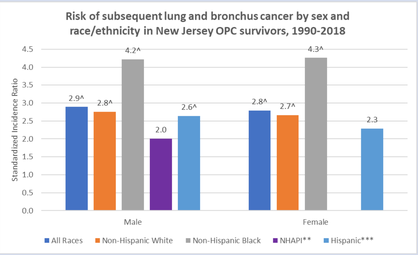
Table 1: Risk of subsequent tobacco-associated cancers* in New Jersey female oral cavity and pharynx cancer survivors by race/ethnicity, 1990-2018

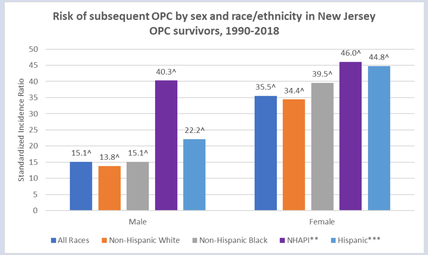
Cancer Site	All Races			Non-Hispanic White			Non-Hispanic Black			NHAPI**			Hispanic***		
	O	SIR	95% CI	O	SIR	95% CI	O	SIR	95% CI	O	SIR	95% CI	O	SIR	95% CI
Oral Cavity and Pharynx	292	35.5	31.6-39.8	240	34.4	30.2-39.1	24	39.5	25.3-58.8	9	46.0	21.0-87.4	19	44.8	27.0-69.9
Esophagus	34	10.3	7.1-14.3	25	9.3	6.0-13.8	7	17.4	7.0-35.8	*	*		*	*	
Stomach	7	0.8	0.3-1.6	5	0.8	0.3-1.8	*	*		*	*		*	*	
Colon and Rectum	76	1.1	0.9-1.4	63	1.1	0.9-1.4	7	1.2	0.5-2.4	*	*		5	1.5	0.5-3.5
Liver	6	1.5	0.5-3.2	2	0.7	0.1-2.4	*	*		*	*		*	*	
Pancreas	32	1.6	1.1-2.3	25	1.5	0.97-2.2	*	*		*	*		*	*	
Larynx	16	8.6	4.9-13.9	11	7.0	3.5-12.6	*	*		*	*		*	*	
Lung and Bronchus	241	2.8	2.5-3.2	206	2.7	2.3-3.1	27	4.3	2.8-6.2	*	*		6	2.3	0.8-5.0
Urinary Bladder	18	0.9	0.6-1.5	15	0.9	0.5-1.4	*	*		*	*		*	*	
Kidney and Renal Pelvis	11	0.8	0.4-1.4	9	0.8	0.4-1.5	*	*		*	*		*	*	
Acute Myeloid Leukemia	8	1.8	0.8-3.6	8	2.1	0.9-4.2	*	*		*	*		*	*	

Table 2: Risk of subsequent tobacco-associated cancers* in New Jersey male oral cavity and pharynx cancer survivors by race/ethnicity, 1990-2018

Cancer Site	All Races			Non-Hispanic White			Non-Hispanic Black			NHAPI**			Hispanic***		
	O	SIR	95% CI	O	SIR	95% CI	O	SIR	95% CI	O	SIR	95% CI	O	SIR	95% CI
Oral Cavity and Pharynx	590	15.1	13.9-16.4	448	13.8	12.6-15.2	52	15.1	11.3-19.8	48	40.3	29.7-53.4	42	22.2	16.0-30.0
Esophagus	109	5.0	4.1-6.0	69	3.7	2.9-4.7	28	12.8	8.5-18.5	*	*		11	11.7	5.9-21.0
Stomach	33	1.1	0.8-1.5	28	1.2	0.8-1.8	*	*		*	*		1	0.4	0.0-2.2
Colon and Rectum	148	1.0	0.9-1.2	121	1.0	0.9-1.2	14	1.1	0.6-1.9	*	*		10	1.3	0.6-2.4
Liver	61	2.5	1.9-3.2	51	2.9	2.1-3.8	*	*		*	*		5	2.3	0.8-5.4
Pancreas	42	1.0	0.7-1.4	33	1.0	0.7-1.4	6	1.7	0.6-3.8	*	*		*	*	
Larynx	81	4.7	3.7-5.8	58	4.2	3.2-5.5	16	7.6	4.4-12.4	*	*		7	6.9	2.8-14.1
Lung and Bronchus	576	2.9	2.7-3.1	470	2.8	2.5-3.0	78	4.2	3.3-5.3	7	2.0	0.8-4.1	21	2.6	1.6-4.0
Urinary Bladder	111	1.0	0.8-1.1	99	0.9	0.8-1.1	*	*		*	*		10	2.2	1.1-4.1
Kidney and Renal Pelvis	62	1.2	0.9-1.5	55	1.2	0.9-1.6	*	*		*	*		*	*	
Acute Myeloid Leukemia	21	1.8	1.1-2.8	21	2.1	1.3-3.2	*	*		*	*		*	*	

O= Observed. CI= Confidence interval. Results for cervical and ureter cancers were not presented due to small numbers.
*Results not displayed due to small numbers (n < 5 cases). **NHAPI= Non-Hispanic Asian or Pacific Islander.
***Persons of Hispanic ethnicity may be of any race or combination of races.





Results for lung cancer in NHAPI females are not displayed due to small numbers (n < 5 cases).
^Results are statistically significant (p<0.05).
**NHAPI= Non-Hispanic Asian or Pacific Islander. ***Persons of Hispanic ethnicity may be of any race or combination of races.

- For the HPV-associated cancers, the risk of vulvar cancer was significantly elevated in female OPC survivors (SIR=2.4, 95%CI 1.1-4.5).

Limitations

- Medical surveillance bias
- Possible misclassification of separate primary cancer vs. recurrence of original cancer
- Patients who move out-of-state may result in under-ascertainment of subsequent cases
- Lower power to detect risk of subsequent cancers in some racial/ethnic groups due to small numbers

Strengths

- Population-based cancer registry with high-quality data
- Diverse population of New Jersey

Conclusions

- New Jersey OPC survivors had increased risk of developing subsequent lung, esophagus, larynx and other cancers caused by smoking.
- OPC survivors also had substantially increased risk of a subsequent OPC.
- Our findings support the importance of continued surveillance of OPC patients and promotion of smoking cessation and HPV prevention programs.

Acknowledgments

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Sociodemographic associations with late-stage diagnosis among adolescents and young adults with cutaneous melanoma pre- and post- the Affordable Care Act implementation

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[2]Center for Oncology Hematology Outcomes Research and Training (COHORT) and Division of Hematology and Oncology, University of California Davis School of Medicine
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Background:

- Cutaneous melanoma, the third most frequent cancer among adolescents and young adults (AYAs, 15–39), is generally curable when diagnosed early; when diagnosed late stage (III/IV), survival is greatly diminished.
- Recent studies have found that the Affordable Care Act (ACA) increased health insurance coverage and decreased the likelihood of late-stage cancer diagnosis among AYAs.

Purpose:

- To examine associations between sociodemographic factors and late-stage melanoma in AYAs, pre- and post- ACA implementation in California.

Methods:

- Data for 8,586 AYAs diagnosed with melanoma from 2005 to 2017 were obtained from the California Cancer Registry and linked to Medicaid enrollment files.
- Period of diagnosis was grouped as pre-ACA (March/2005–September/2010), early ACA (October/2010–December/2013) and full ACA implementation (2014–2017).
- Multivariable logistic regression examined factors associated with late-stage diagnosis (III/IV vs I/II).

Results:

- The proportion of younger AYAs (ages 15-25, n=1,450) without insurance (or who acquired Medicaid at diagnosis) decreased from 5.8% to 3.3% while proportions remained unchanged for older AYAs (ages 26-39, n=7,136) (Figures 1 & 2).
- In both age groups, private insurance decreased and continuous Medicaid increased pre-ACA to post-full ACA (Figures 1 & 2).
- Among younger AYAs there were no significant changes in stage over ACA periods (Figure 3).
- Among older AYAs, there was a small but significant ($p<0.009$) decrease in stage I and increase in stage IV disease (Figure 4) and an increased likelihood of late-stage diagnoses in the early ACA and post-full ACA (vs pre-ACA; Table)
- Lack of insurance or Medicaid (vs. private insurance), non-Hispanic Black, Hispanic, or Asian/Pacific Islander race/ethnicity (vs. non-Hispanic white), and residence in low (vs high) SES neighborhoods were associated with higher likelihood of late-stage diagnosis in older AYAs (Table).

Conclusion:

- Although the implementation of the ACA impacted insurance coverage, with the proportion of AYAs continuously Medicaid insured increasing and the proportion of younger AYAs uninsured decreasing, older AYAs were more likely to be diagnosed with late-stage disease post ACA.
- Late-stage diagnosis in older AYAs was associated with factors reflecting poor access to healthcare (no insurance, low SES, non-white race/ethnicity), highlighting the need for policy interventions focused on melanoma prevention and early diagnosis, particularly in underserved population.

Figure 1. Changes in health insurance by ACA period, ages 15-25

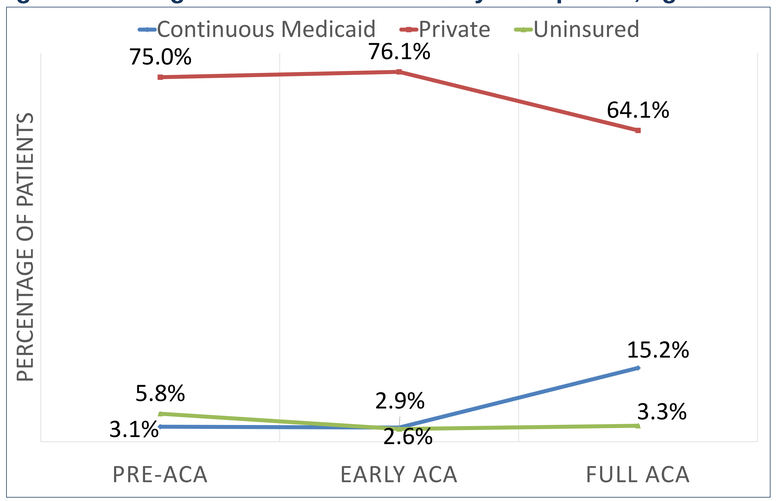

Figure 2. Changes in health insurance by ACA period ages 26-39

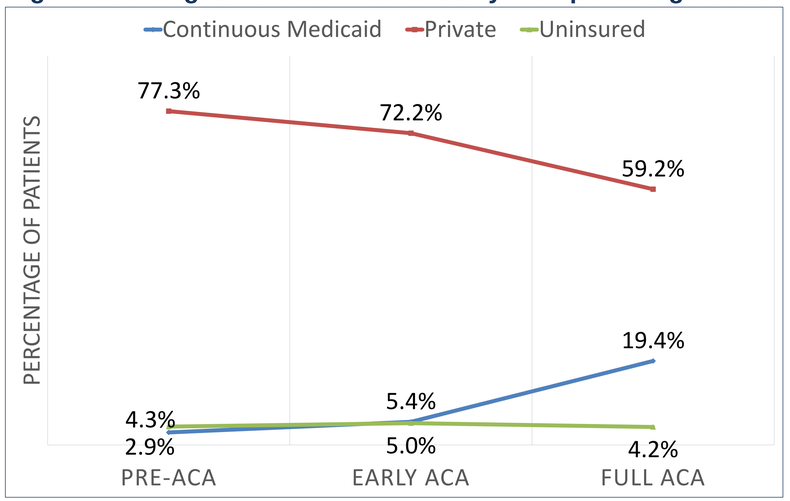

Figure 3. Stage at diagnosis by ACA period, ages 15-25

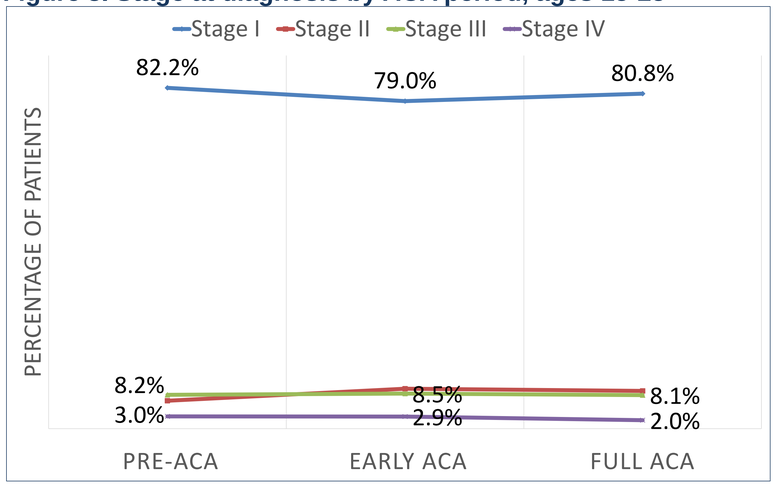

Figure 4. Stage at diagnosis by ACA period, ages 26-39

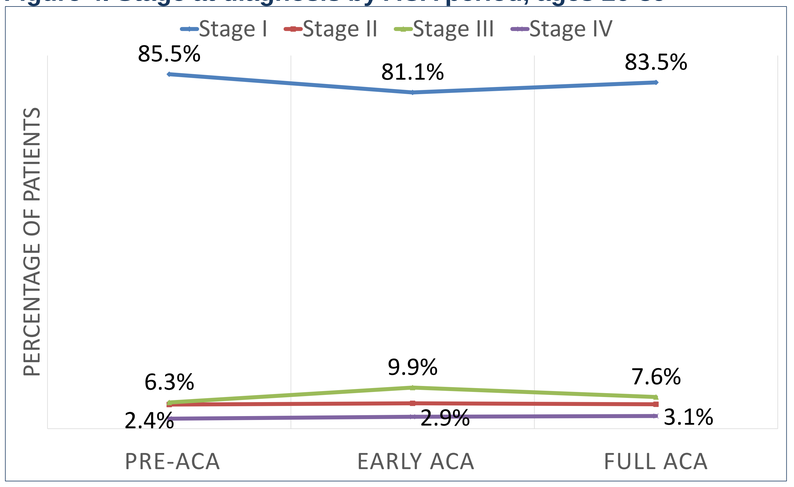

Table. Sociodemographic factors associated with late-stage (III/IV vs. I/II) melanoma at diagnosis, by AYA age group

	15-25 years		26-39 years	
	OR (95% CI)	p-value	OR (95% CI)	p-value
Continuous Medicaid vs. private	1.83 (0.95, 3.51)	0.07	**1.67 (1.26, 2.23)**	**<0.001**
No insurance vs. private	1.01 (0.43, 2.37)	0.99	**2.84 (2.06, 3.92)**	**<0.001**
Post early ACA expansion vs. pre-ACA	1.28 (0.80, 2.05)	0.30	**1.58 (1.28, 1.96)**	**<0.001**
Post full ACA expansion vs. pre-ACA	1.15 (0.72, 1.84)	0.56	**1.29 (1.04, 1.59)**	**0.02**
Male vs. female	**2.45 (1.67, 3.60)**	**<0.001**	**2.23 (1.86, 2.66)**	**<0.001**
Low SES quintile vs. high	1.13 (0.53, 2.39)	0.75	**1.94 (1.40, 2.70)**	**<0.001**
NH Black vs. NH white	5.61 (0.42, 75.09)	0.19	**3.36 (1.24, 9.14)**	**0.02**
Hispanic vs. NH white	1.70 (0.98, 2.93)	0.06	**1.69 (1.31, 2.18)**	**<0.001**
Asian/Pacific Islander vs. NH white	0.86 (0.22, 3.34)	0.83	**2.20 (1.18, 4.10)**	**0.01**

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NAACCR Summer Forum

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The effect modifying role of race and obesity on the relationship between cancer diagnosis and heavy drinking: results from the 2018 BRFSS study

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Introduction

In January 2020, the American Cancer society estimated 1.8 million new cancer diagnoses in 2020. A cancer diagnosis may cause significant physical and psychological distress to patients, which may be associated with maladaptive coping mechanisms. Heavy alcohol consumption is a known risk factor for several types of cancer. Additionally, alcohol dependence is associated with a 3-fold increase in the likelihood of smoking cigarettes, which also increases cancer risk. The relationship between alcohol consumption and cancer has been well-characterized. However, little research exists describing the potential impact of a cancer diagnosis on heavy drinking.

Methods

- This cross-sectional study used BRFSS 2018 data to examine the relationship between cancer diagnosis and heavy drinking.
- Eligible participants were US adults age 18+.
  - People ≥80 years of age, pregnant women, and individuals with missing values for any of the included variables were excluded from analysis.
  - N=299,850
- Heavy drinking and cancer diagnosis were defined by BRFSS 2018.
- The analysis was controlled for the following confounders: age, education, employment, income, insurance, and smoking
- Multivariable weighted logistic regression models were performed.
  - Race and obesity were independently identified as effect modifiers.

		Heavy drinking Yes vs. No	
Race, obesity and cancer diagnosis	**N**	**WAOR (95% CI)**	**p-value**
American Indian or Alaska Natives			
Not obese	4,211		
Cancer diagnosis - Yes		1.48 (0.79, 2.80)	0.2223
Cancer diagnosis - No		Ref	Ref
Obese	2,966		
Cancer diagnosis - Yes		**0.21 (0.11, 0.42)**	**< 0.0001**
Cancer diagnosis - No		Ref	Ref
White			
Not obese	165,832		
Cancer diagnosis - Yes		**0.85 (0.75, 0.96)**	**0.0090**
Cancer diagnosis - No		Ref	Ref
Obese	81,658		
Cancer diagnosis - Yes		0.80 (0.62, 1.02)	0.0744
Cancer diagnosis - No		Ref	Ref
Black			
Not obese	15,022		
Cancer diagnosis - Yes		1.31 (0.74, 2.33)	0.3552
Cancer diagnosis - No		Ref	Ref
Obese	11,732		
Cancer diagnosis - Yes		0.58 (0.31, 1.10)	0.0950
Cancer diagnosis - No		Ref	Ref
Other			
Not obese	13,315		
Cancer diagnosis - Yes		0.97 (0.42, 2.24)	0.9423
Cancer diagnosis - No		Ref	Ref
Obese	5,112		
Cancer diagnosis - Yes		**4.81 (2.06, 11.24)**	**0.0003**
Cancer diagnosis - No		Ref	Ref

Table 1. Results from the multivariable weighted logistic regression model. WAOR=weighted and adjusted odds ratio; CI=confidence interval; Bolded are significant results

Results

- The weighted and adjusted odds (WAO) of current heavy drinking in American Indian/Alaska Native obese individuals and White non-obese individuals who have been diagnosed with cancer were significantly lower than the WAO of current heavy drinking among their counterparts who have not been diagnosed with cancer (Table 1).
- Marginally significant decreases in heavy drinking were seen among White obese and Black obese individuals who have been diagnosed with cancer (Table 1).

Discussion & Conclusions

- The study indicates race and obesity modify the association between cancer diagnosis and heavy drinking.
- There may be a difference in perceived health risks after cancer diagnosis in these race and BMI groups.
- There may also be a difference in coping mechanisms between racial and BMI groups.
  - Higher levels of social support may lead to more adaptive coping mechanisms for cancer-related stress.
- This study should be followed by a longitudinal study that examines the relationship between cancer diagnosis and subsequent heavy drinking and additional studies that examine the relationship between social support and cancer diagnosis.

Acknowledgement

All research reported in this presentation was supported by an Institutional Development Award (IDeA) from the National Institute of General Medical Sciences of the National Institutes of Health under grant number P20GM103442.

Trends in Cancer Incidence in Younger Adults in New Jersey by Sex, Age and Race/Ethnicity, 1990-2018

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Background

- Recent research indicates that the burden of cancer is growing in younger adults, including increasing incidence of colorectal, uterine corpus and other cancers[1].
- While colorectal cancer incidence has declined in older adults and in the population overall, increases were reported in younger adults in New Jersey[2] and other areas.

Objectives

Characterize time trends in incidence of common cancers in younger adults in New Jersey

- by sex, age at diagnosis group, race/ethnicity and primary site

Methods

- **Data Source:** New Jersey State Cancer Registry (NJSCR)
  - Population-based registry that collects data on all cancers diagnosed in New Jersey residents since 1979
- **Analytic Cohort**: NJ residents diagnosed at age 20-49 years from 1990-2018 with the most common cancers in that age group
- **Statistical methods**:
  - Calculated annual age-adjusted cancer incidence rates for NJ residents by sex, race/ethnicity, age at diagnosis group, and primary site.
  - Rates & counts generated using SEER*Stat software version 8.3.8.
  - **Joinpoint regression analysis:**[3] Calculated annual percent changes (APCs) in cancer incidence rates and identified points in time when incidence rate trends change significantly (joinpoints) using Joinpoint Regression Program, Version 4.8.0.1, April 2020, National Cancer Institute.

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Acknowledgements: The New Jersey State Cancer Registry is supported by the National Program of Cancer Registries of the Centers for Disease Control and Prevention under cooperative agreement NU5U58DP006279-02-00 awarded to the New Jersey Department of Health, the Surveillance, Epidemiology, and End Results program of the National Cancer Institute under contract 75N91021D00009 awarded to the Rutgers Cancer Institute of New Jersey, and the State of New Jersey.

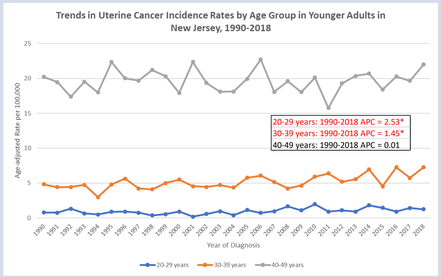
Results

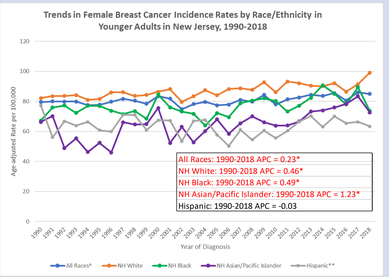
Trends in Incidence Rates by Sex and Cancer Site in Younger Adults in New Jersey, 1990-2018

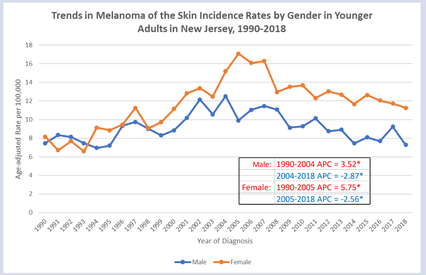
Sex	Site	No. Cases	Years	APC** (95% CI)
Females	Breast	43,165	1990-2018	+0.2^ (0.1, 0.4)
	Thyroid	12,610	1990-1993	+0.1 (-14.4, 17.1)
			1993-2009	+9.0^ (8.0, 10.1)
			2009-2018	-0.2 (-1.6, 1.3)
	Colorectal	5,471	1990-2018	+1.3^ (0.9, 1.6)
	Melanoma of the skin	6,257	1990-2005	+5.7^ (4.6, 6.9)
			2005-2018	-2.6^ (-3.7, -1.4)
	Corpus uterus and NOS	4,823	1990-2018	+0.4^ (0.0, 0.8)
	Cervix uteri	6,426	1990-2013	-2.7^ (-3.1, -2.3)
			2013-2018	+3.3 (-1.6, 8.3)
Males	Colorectal	6,048	1990-2018	+1.1^ (0.8, 1.5)
	Testis	5,651	1990-2018	+0.6^ (0.2, 0.9)
	Thyroid	3,234	1990-2012	+6.9^ (6.1, 7.8)
			2012-2018	-1.2 (-5.2, 3.0)
	Non-Hodgkin Lymphoma	5,761	1990-1994	+3.7 (-3.5, 11.4)
			1994-2018	-1.4^ (-1.8, -0.9)
	Prostate	4,746	1990-2001	+14.1^ (10.2, 18.2)
			2001-2009	+2.9 (-0.8, 6.7)
			2010-2018	-6.2^ (-8.8, -3.4)

Rates are per 100,000 and age-adjusted to the 2000 US standard population. 2018 data are preliminary.
**APC = annual percent change, 95% CI= 95% confidence interval.
^The APC based on incidence rates is significantly different from zero at p < 0.05. **APCs in red font are statistically significant increases**; **APCs in blue font are statistically significant decreases.**

- In younger women, breast (APC=0.2), colorectal (APC=1.3), and uterine cancer (APC=0.4) incidence increased significantly (p<0.05), and thyroid cancer (APC=9.0) increased from 1993-2009.
- Cervical cancer decreased (APC= -2.7) from 1990-2013.
- Melanoma decreased from 2005-2018 (APC= -2.6) in younger women after increasing from 1990-2005 (APC=5.7).
- Uterine cancer increased significantly in women aged 20-29 and 30-39.
- Breast cancer increased in younger non-Hispanic White (APC=0.5), Black (APC=0.5) and Asian or Pacific Islander (APC=1.2) but not Hispanic women.







- In younger men, colorectal (APC=1.1) and testis (APC=0.6) cancer incidence increased significantly, and thyroid cancer (APC=6.9) increased from 1990-2012.
- Non-Hodgkin lymphoma decreased (APC= -1.4) from 1994-2018.

*Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05 level. Rates are age-adjusted to the 2000 US Standard Population. ^All races includes persons of other and unknown race. **Persons of Hispanic ethnicity may be of any race or combination of races. The categories of race and ethnicity are not mutually exclusive. NH: Non-Hispanic

Limitations

- Delayed reporting of cancer cases by out-of-state facilities may impact incidence rates in 2018 and trends in recent diagnosis years.
- Delayed reporting of race or ethnicity in recent diagnosis years may impact race/ethnicity-specific rates and trends in recent diagnosis years.

Strengths

- Population-based cancer registry with high-quality data.
- Diverse population of New Jersey.
- Long term follow-up to evaluate incidence trend data (29 years).

Conclusions

- Monitoring cancer trends in younger adults can help to evaluate whether changes in screening guidelines are needed and understand the future cancer burden as this cohort ages.
- Further research is needed to identify risk factors for cancers that are increasing in this population, including the role of obesity.

Trends in obesity-associated cancer in Maine: exploring risk-based cancers in routine surveillance

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2. University of Southern Maine, Portland, United States

INTRODUCTION

Cancer remains the leading cause of death in Maine, and the state's cancer incidence and mortality are higher than the US national average. The Maine Cancer Registry (MCR) currently reports on risk-factor associated cancers in its annual cancer report including tobacco, obesity, and HPV-associated cancers. Obesity-associated cancer indicators are used by partners throughout the Maine Center for Disease Control as part of program planning and performance monitoring for cancer prevention and control activities.

OBJECTIVES

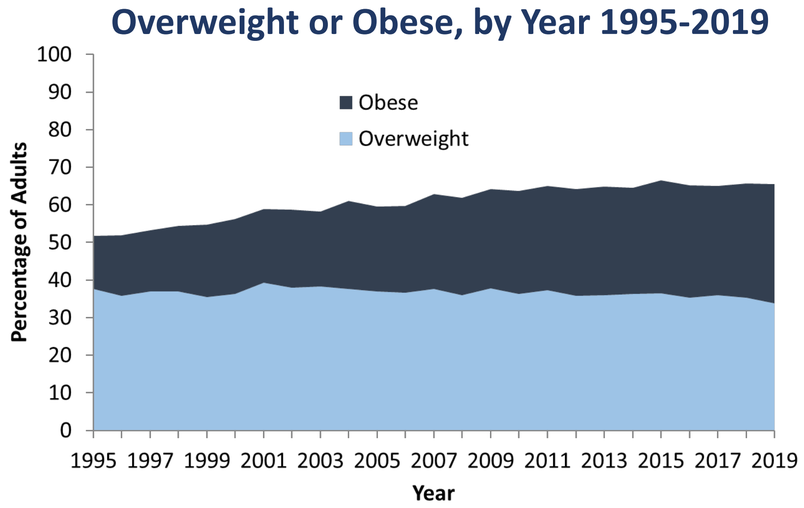
* To replicate national analysis about obesity-associated cancers[1]
* To assess trends in obesity-associated cancers in Maine

METHODS

MCR epidemiologists assessed trends in obesity-associated cancer incidence using registry data and the predefined SEER*Stat variables for calculating the number of associated cancers for selected risk factors.[2] We assessed trends in adult overweight and obesity using Maine's Behavioral Risk Factor Surveillance System (BRFSS).

Furthermore, we explored differences in obesity-associated cancer trends when including and excluding colorectal cancers and analyzed how obesity-associated cancer differs by sex, age, and county of residence.

Figure 1. Percentage of Maine Adults who are Overweight or Obese, by Year 1995-2019



Data Source: BRFSS. Data Prevalence & Trends Data [online]. [accessed Sep 18, 2020].

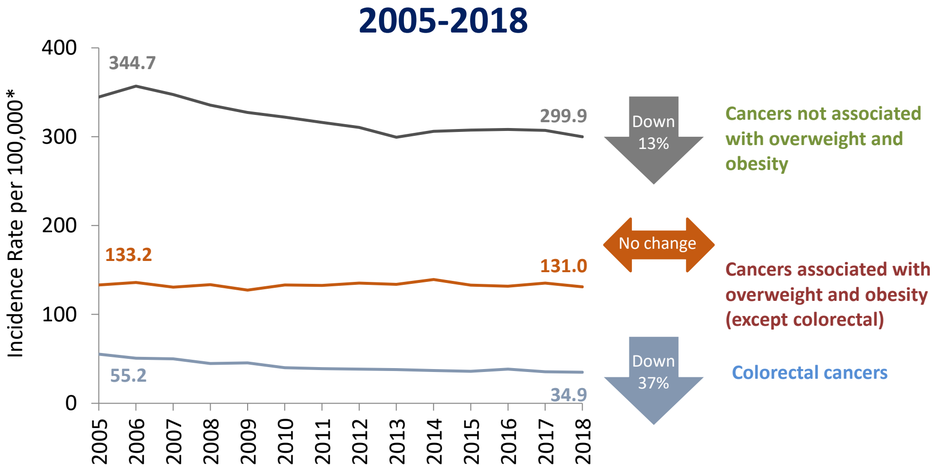
RESULTS

Nearly two-thirds of Maine adults are overweight or obese, and the prevalence of obesity among adults in Maine over the past two decades more than doubled from 14% in 1995 to 32% in 2019, which aligns with national trends (Figure 1). Overall, the percent of Maine adults who were either overweight or obese increased from 52% in 2017 to 65% in 2019.[3]

Over one-third of Maine's new cancer cases are overweight or obesity-associated cancers. From 2005-2018, the incidence of cancers not associated with overweight and obesity and the incidence of colorectal cancers both declined significantly (by 13% and 37%, respectively), while the incidence of obesity-associated cancers (not including colorectal) did not improve (Figure 2).[4] Obesity-associated cancers are a larger proportion of all new cancer cases among females when compared with males, likely because many obesity-associated cancers are female cancers. Over half of all newly diagnosed cancers among females in Maine and the US are obesity-associated (Figure 3).

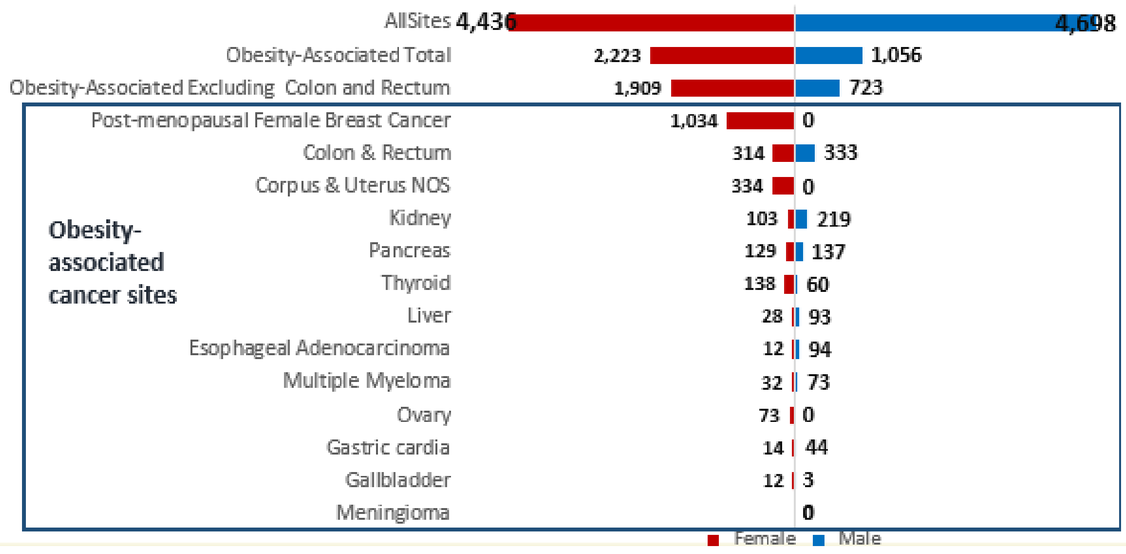
When exploring differences by age, the incidence of obesity-associated cancers (excluding colorectal cancer) increases with age. These incidence rates declined among Mainers ages 75 and older over the past 14 years but increased among Mainers ages 20-64 and have not improved among Mainers ages 65-74 (Figure 4).

Figure 2. Trends in Obesity-associated Cancers, Maine, 2005-2018



Data source: Maine: Maine Cancer Registry, November 2020 submission.
*Rates are age-adjusted to the US 2000 standard population. Only malignant cases included
Overall Trend Calculation: Percentage Change = [(Current Year Amount – Base Year Amount) / Base Year Amount]

Figure 3. Counts of New Cancer Cases in Maine, 2018, Obesity-Associated Sites

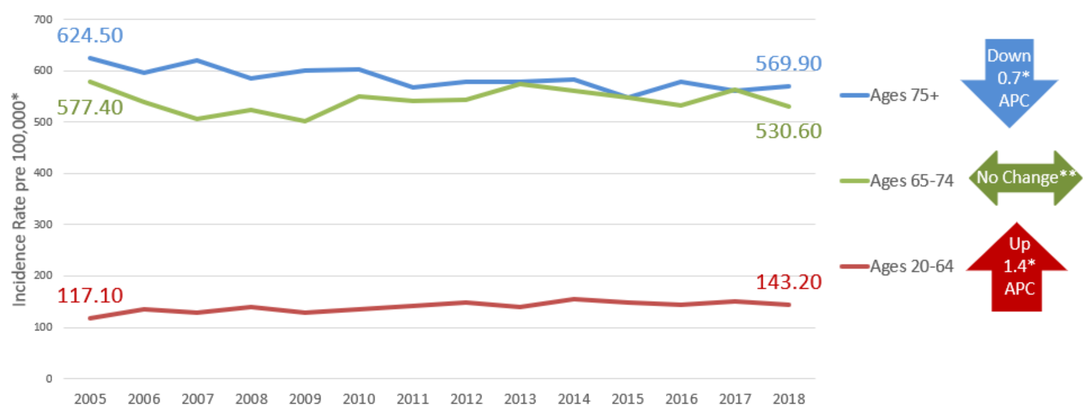


Data source: Maine: Maine Cancer Registry, November 2020 submission.
Only malignant cases included.

LIMITATIONS & CONCLUSIONS

This analysis shares many of the limitations noted in the original national analysis of obesity-associated cancers, including that cancer patient BMI is not known based on current registry data and the definition of obesity-associated cancers may expand in the future with additional research.[1] While Maine's overall cancer incidence has decreased over the last two decades, obesity-associated cancers (excluding colorectal cancer) have not decreased over the past 10 years, and there are differences in incidence by age sub-group and sex. This research suggests that cancers associated with obesity will continue to be a public health priority for Maine in the coming decade. Obesity prevention activities and policies that promote healthy eating and active living may contribute to reducing the disproportionate burden of cancer in Maine.

Figure 4. Trends in Obesity-associated Cancers, excluding Colorectal, by age group, Maine, 2005-2018



Data source: Maine: Maine Cancer Registry, November 2020 submission.
*Crude/Age-Specific Rates. Only malignant cases included.
Trend Calculation: Joinpoint Average Percent Change.
*Denotes significant AAPC trend, p < 0.05. ** 2 Joinpoints, no significant trend.

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ACKNOWLEDGEMENTS

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Trends of colorectal cancer stage distribution in Europe and the USA, 1993-2015

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European Commission, Joint Research Centre, Ispra, Italy

BACKGROUND

- Colorectal cancer screening programmes have been successfully implemented in Europe and the USA, allowing for detection of precancerous lesions or early stage cancers, significantly decreasing mortality.
- This analysis reports trends in stage distribution for patients aged 50-74 years, which are often the target of **screening programmes**.

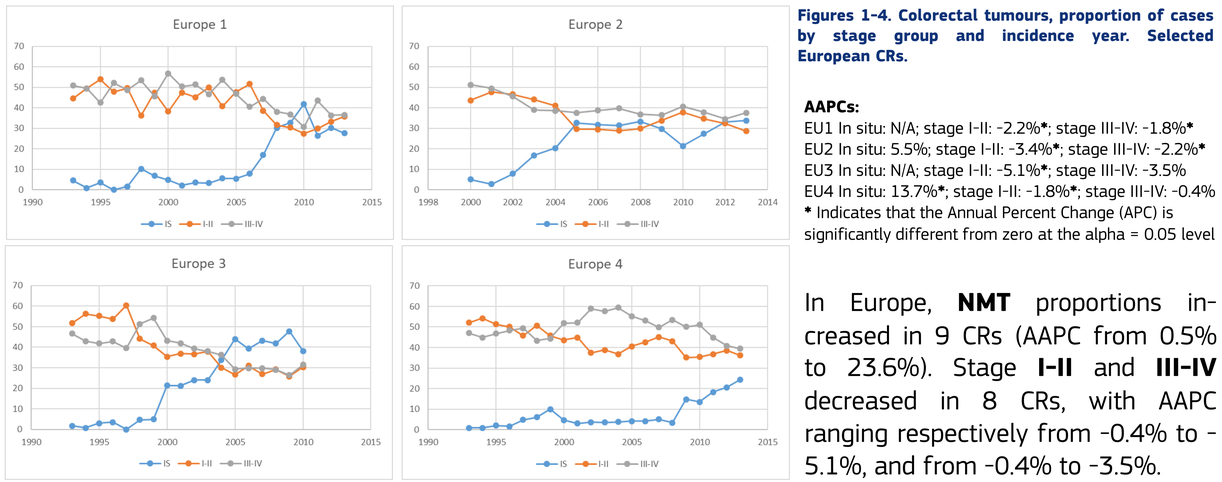
METHODS

Data from cancer registries (CRs) contributing to the **European Cancer Information System** (ECIS), reporting **stage** and data from the **SEER** database.

- Colorectal as first cancer, including non-malignant tumours (NMTs)
- Period **1993-2015**
- **3** stage groups: **NMTs**, stage **I-II**, stage **III-IV**.
- Stage group proportion by CR and incidence year.
- Average Annual Percent Change (AAPC) of proportions computed with the Joinpoint Trend Analysis Software.

RESULTS

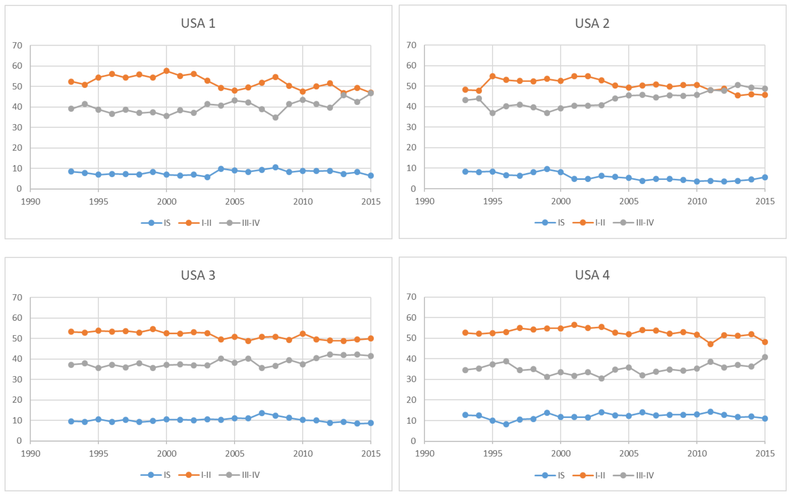
126,656 cases from **10** CRs in **5** European Countries and **224,390** cases from **13** US CRs were analysed.



Figures 1-4. Colorectal tumours, proportion of cases by stage group and incidence year. Selected European CRs.

AAPCs:
EU1 In situ: N/A; stage I-II: -2.2%*; stage III-IV: -1.8%*
EU2 In situ: 5.5%; stage I-II: -3.4%*; stage III-IV: -2.2%*
EU3 In situ: N/A; stage I-II: -5.1%*; stage III-IV: -3.5%
EU4 In situ: 13.7%*; stage I-II: -1.8%*; stage III-IV: -0.4%
* Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05 level

In Europe, **NMT** proportions increased in 9 CRs (AAPC from 0.5% to 23.6%). Stage **I-II** and **III-IV** decreased in 8 CRs, with AAPC ranging respectively from -0.4% to -5.1%, and from -0.4% to -3.5%.



Figures 5-8. Colorectal tumours, proportion of cases by stage group and incidence year. Selected US CRs.

AAPCs:
US1 In situ: 0.7%; stage I-II: -0.6%*; stage III-IV: 0.7%*
US2 In situ: -3.7%; stage I-II: -0.5%*; stage III-IV: 1.1%*
US3 In situ: 0.1%; stage I-II: -0.4%*; stage III-IV: 0.6%*
US4 In situ: 0.5%; stage I-II: -0.3%*; stage III-IV: 0.3%*
* Indicates that the Annual Percent Change (APC) is significantly different from zero at the alpha = 0.05 level

In the **USA**, **NMT** proportions increased in 5 CRs (AAPC from 0.1% to 1.5%), and decreased in 8 CRs (AAPC from -0.6% to -4.6%). Stage **I-II** decreased in 12 CRs (AAPC from -0.1% to -0.7%), and stage **III-IV** in 13 CRs (AAPC from -0.1% to -1.4%).

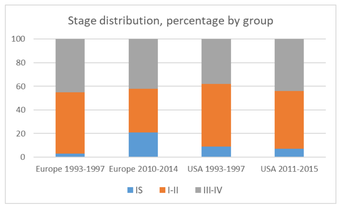


Figure 9. Colorectal tumours, proportion of cases by stage group, area and incidence period.

- An increase in the proportion of **NMTs**, and a decrease in the proportion of stage **I-II** and **III-IV** cases was observed in Europe between the largely pre-screening period 1993-1997, and 2010-2014, when screening had already been implemented in many European countries
- In the USA stage distribution remained similar between the two periods, with a small increase in stage III-IV proportion, and a slight decrease for NMTs.

CONCLUSIONS

- Differences in stage trends were observed between the selected European and US CRs.
- Diverging screening strategies or registration rules could partly account for such differences.
- Migration from stage II to III due to improved imaging and detection of positive lymph nodes could have also played a role.
- Further analyses are necessary to explore the possible association between the observed stage shift and screening-programme related factors.

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ENCR European Network of Cancer Registries

CENTERS FOR DISEASE CONTROL AND PREVENTION

U.S. Cancer Statistics: New Design with Updated Data Visualizations Tool

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NAACCR Summer Forum

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BACKGROUND

- Cancer surveillance data must be easy to access, understand, and share.
- *U.S. Cancer Statistics (USCS)* Data Visualizations tool gives users access to the official federal cancer statistics.
- CDC makes continual enhancements to add data and improve technology.

OBJECTIVES

- To improve USCS data usefulness and relevancy, CDC redesigned and updated the Data Visualizations tool with additional data and more interactive graphics.

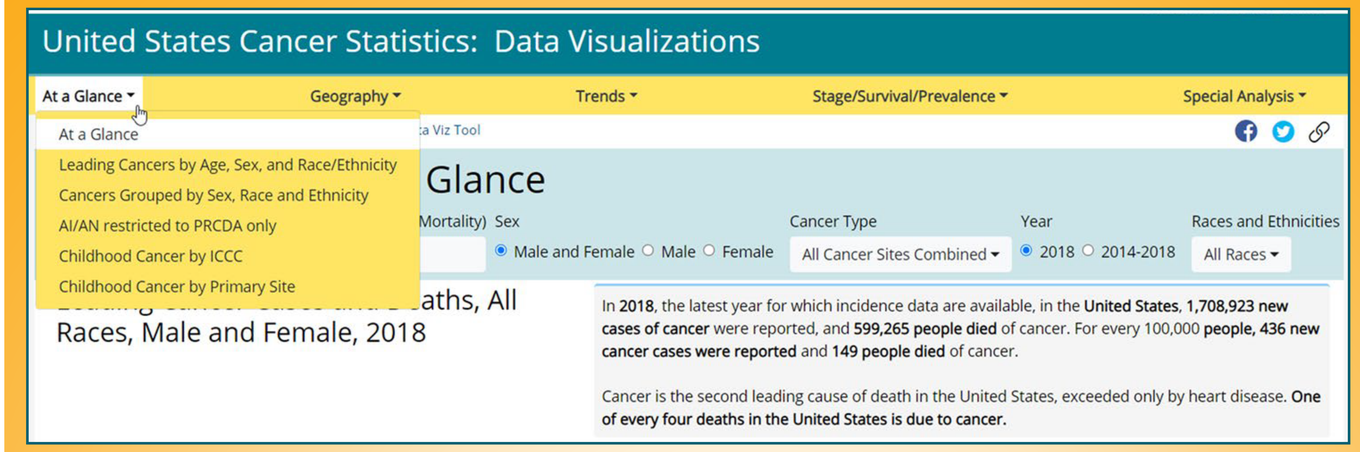
METHODS

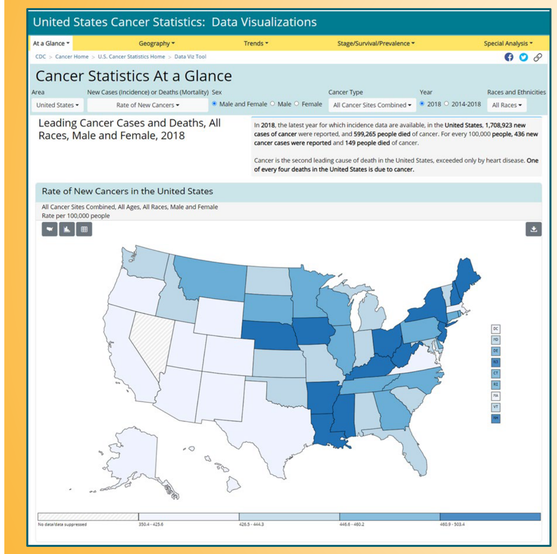
- Cancer Surveillance Branch collaborates with the Geospatial Research, Analysis, and Services Program at ATSDR to develop, update, and maintain the USCS Data Visualizations tool.
- Techniques such as usability assessments, site metrics, and User Experience and User Interface (UX/UI) design services to develop layout prototypes were leveraged.
- Updates include adding more visualizations, improved data sharing, and implementing and evaluating website metrics.

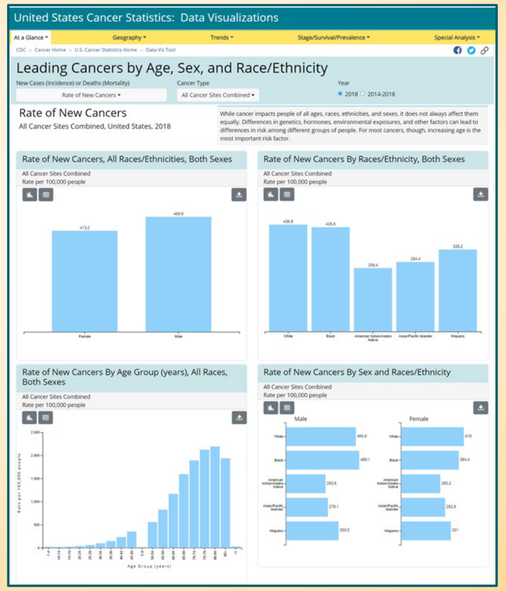
CONCLUSION

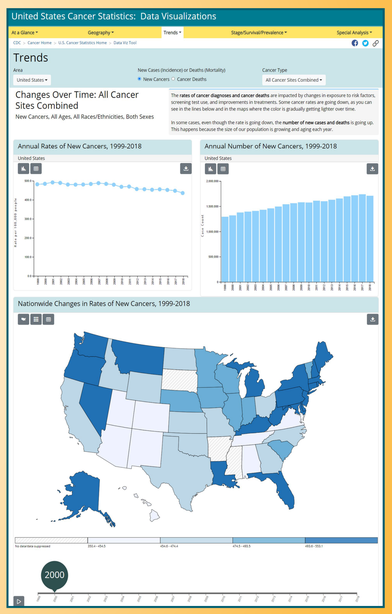
- Surveillance data are fundamental to measure progress and target action. CDC's updated interactive, user-friendly USCS Data Visualizations tool is designed to make cancer data more easily accessible and usable and enables users to better interpret and disseminate cancer data.

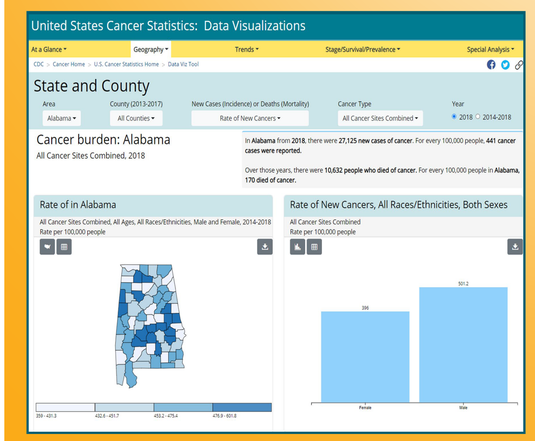
New Design Highlights

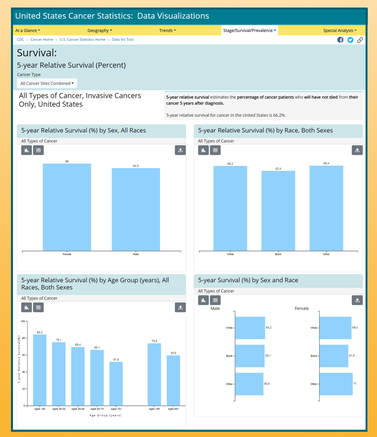












HIGHLIGHTS

- Redesigned application includes five tabs. Each tab has underlying webpages where data are displayed as maps and bar charts with interpretative text.
- Users can customize displays of overall and cancer-specific statistics, create PowerPoint slides, and share each view via social media.
- The new design summarizes the data and encourages comparisons between cancer sites, geographies, demographic groups, risk factors, and over time.

FUTURE UPDATES

- Cancer staging
- Survival by stage
- Cancer screening and risk factors variables from the Behavioral Risk Factor Surveillance System
- Human Papilloma Virus (HPV) vaccination data from immunizations

SCAN HERE FOR MORE INFORMATION

www.cdc.gov/uscs

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Division of Cancer Prevention and Control
For more information visit www.cdc.gov/uscs/dataviz

CS324178-A | 05/12/2021

Using Cancer Registry Data to address prostate cancer treatment disparities in Massachusetts

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BACKGROUND

One of the objectives for the Massachusetts State Cancer plan was to conduct an in-depth analysis of the Massachusetts Cancer Registry (MCR) data to identify racial/ethnic disparities in the treatment of prostate cancer and to guide development of interventions aimed at ensuring equitable treatment for prostate cancer.

OBJECTIVES

This presentation will describe the collaborative process in which the Massachusetts Comprehensive Cancer Prevention and Control Network (MCCPCN) worked with the MCR and the Prostate Cancer Workgroup to conduct an in-depth analysis of the MCR data and prepared a manuscript on racial differences in the treatment and outcomes for prostate cancer in Massachusetts. Perceived barriers to prostate cancer treatment for Black non-Hispanic (nH) men were identified through key informant interviews (KIIs). The main objectives for this presentation are as follows:

- To demonstrate how MCR data were used to identify prostate cancer treatment disparities in Massachusetts.
- To describe how the MCR collaborated with the MCCPCN and the Prostate Cancer Workgroup to analyze MCR data and prepare a manuscript on prostate cancer treatment disparities.
- To show that in addition to the quantitative (MCR) data, qualitative data such as key informant interviews are needed to fully understand the extent of prostate cancer treatment disparities.

METHODS

Three sets of data analyses were conducted to identify prostate cancer disparities.

- The MCR looked at treatment disparities by race/ethnicity.
- The Prostate Cancer Workgroup conducted an in-depth analysis of the 2004-2015 MCR data.
- A qualitative study to examine disparities in prostate cancer treatment between Black nH and White nH men was conducted using KIIs.

Table 1: Predictors of Cancer Specific Mortality Among 20856 Black and White nH Men in Massachusetts with Intermediate- and High-Risk Prostate Cancer, 2004-2015

	Hazard Ratio	Upper Limit	Lower Limit	p-Value
Race/Ethnicity				
White nH Men	ref			
Black nH Men	0.833	0.703	0.986	0.0334
Risk Category				
Intermediate	ref			
High Risk	1.498	1.4	1.603	<.0001
Insurance Category				
Private	ref			
Medicaid	1.693	1.383	2.073	<.0001
Medicare	1.238	1.136	1.35	<.0001
Uninsured	1.272	0.805	2.01	0.3034
Age				
(per year of additional age)	1.089	1.084	1.094	<.0001
County				
Suffolk	ref			
Barnstable	1.081	0.876	1.335	0.4656
Berkshire	1.094	0.858	1.395	0.4687
Bristol	1.07	0.87	1.316	0.5216
Dukes	1.149	0.646	2.041	0.6364
Essex	1.119	0.923	1.356	0.2524
Franklin	0.937	0.638	1.378	0.7422
Hampden	1.081	0.874	1.336	0.4732
Hampshire	1.019	0.761	1.366	0.8974
Middlesex	1.179	0.989	1.406	0.0663
Nantucket	1.1	0.437	2.765	0.8397
Norfolk	1.162	0.951	1.419	0.141
Plymouth	1.239	1.01	1.519	0.0401
Worcester	1.215	1	1.475	0.0502

Census level variables including percentage of residents living under the poverty line, median home value, percentage with no HS diploma, population density, and race-income index were not associated with receipt of definitive treatment (p > 0.05) and are left out for clarity.

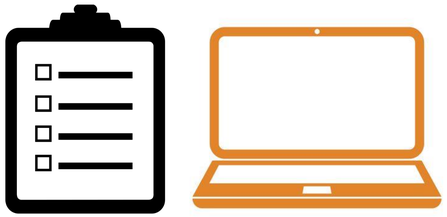
QUANTITATIVE RESULTS

Results from the preliminary data analysis conducted by the MCR to examine disparities in prostate cancer treatment are listed below:

- Black nH men were significantly less likely to receive treatment (surgery, hormone therapy or radiation) for prostate cancer than White nH men.
- A significantly higher proportion of White nH men also received surgery compared to Black nH men.
- Similar results were found for hormone therapy.
- Although a greater proportion of White nH men received radiation compared to Black nH men, the difference was only borderline statistically significant.

Based on results from the MCR data analysis on treatment disparities, the Prostate Cancer Workgroup conducted an in-depth analysis of MCR data and found that:

- Black nH men were less likely to receive definitive therapy compared to White nH men
- Men with public insurance including Medicaid and Medicare experienced lower odds of definitive therapy compared to men with private insurance.
- There were significant county-level differences in odds of receiving definitive therapy.
- Despite the lower odds of definitive therapy, Black nH men in Massachusetts had a 17% lower cancer-specific mortality hazard compared to White nH men on both unadjusted and adjusted analyses (HR 0.83, 95% CI: 0.7-0.99).
- Having high-risk cancer (Adjusted HR 1.498, 95% CI: 1.4 - 1.603) and public insurance including Medicaid (Adjusted HR 1.693, 95% CI: 1.383-2.073) and Medicare (Adjusted HR 1.238, 95% CI: 1.136-1.35) were associated with worse cancer specific survival.



QUALITATIVE RESULTS

1 Understanding of racial disparities in prostate cancer treatment and outcomes

There was a growing awareness that disparities exist in prostate cancer disease occurrence and severity, treatment decision-making, and related outcomes, including increased mortality for Black nH men compared to White nH men.

2 Potential correlates or indicators of prostate cancer treatment disparities

All respondents identified a range of factors that could affect prostate cancer treatment disparities. These included access to health care
health literacy
socioeconomic status
and financial concerns

3 Factors affecting patient decision-making

Interviewees described several factors that they believed had an impact on treatment decision-making including medical and research mistrust, tolerance of side effects including baseline sexual and urologic functionality, shared decision-making, family and other support, and severity of disease or stage at diagnosis.

4 Addressing disparities in prostate cancer treatment

Respondents provided a number of suggestions on how to reduce disparities in prostate cancer treatment between Black NH and White NH men. These included
patient education
decision tools
improved communication
and the use of community health workers and patient navigators.

CONCLUSIONS

MCR data were used to identify prostate cancer treatment disparities in Massachusetts and KIIs were used to look at possible causes of these disparities. The MCCPCN and the Prostate Cancer Workgroup will be using results from the MCR data analysis as well as qualitative data to prepare interventions for addressing disparities in prostate cancer treatment in Massachusetts.

ACKNOWLEDGEMENT

We acknowledge the Centers for Disease Control and Prevention under cooperative agreement 5 NU58DP006271-03-00 and the National Cancer Institute under contract HHSN261201800008I awarded to the Massachusetts Cancer Registry at the Massachusetts Department of Public Health. The contents of this poster are solely the responsibility of the authors and do not necessarily represent the official views of the Centers for Disease Control and Prevention nor the National Cancer Institute.

Using Voter Registration Data to Fill in Physical Address in Montana

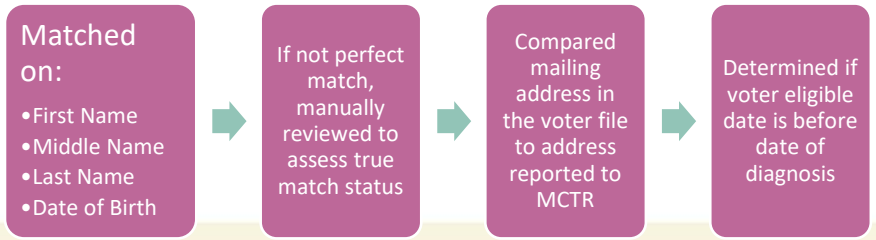
Heather Zimmerman, MPH Debbi Lemons, CTR

Background

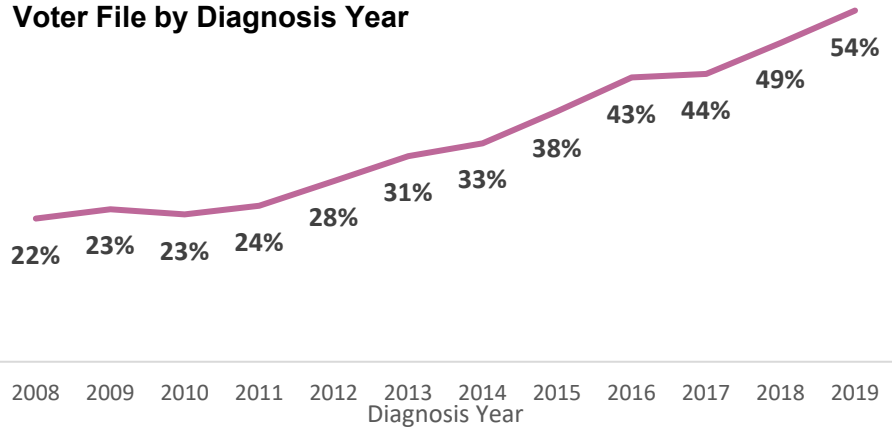
Historically, about 15% of cancer cases reported to the Montana Central Tumor Registry (MCTR) have only a PO Box for address at diagnosis and no physical address. Physical address is used to geocode cases and assign them to the appropriate census tract. PO Box only cases are assigned to the center of their zip code when geocoded and have a high likelihood of being classified to the wrong census tract. Additionally, the zip code of a person's PO Box is not necessarily the same as the zip code where they live. Because census tract is useful for analysis of sub-county areas in response to cancer cluster concerns, it is a priority of the MCTR to improve the proportion of cases with physical address in the registry.

Methods

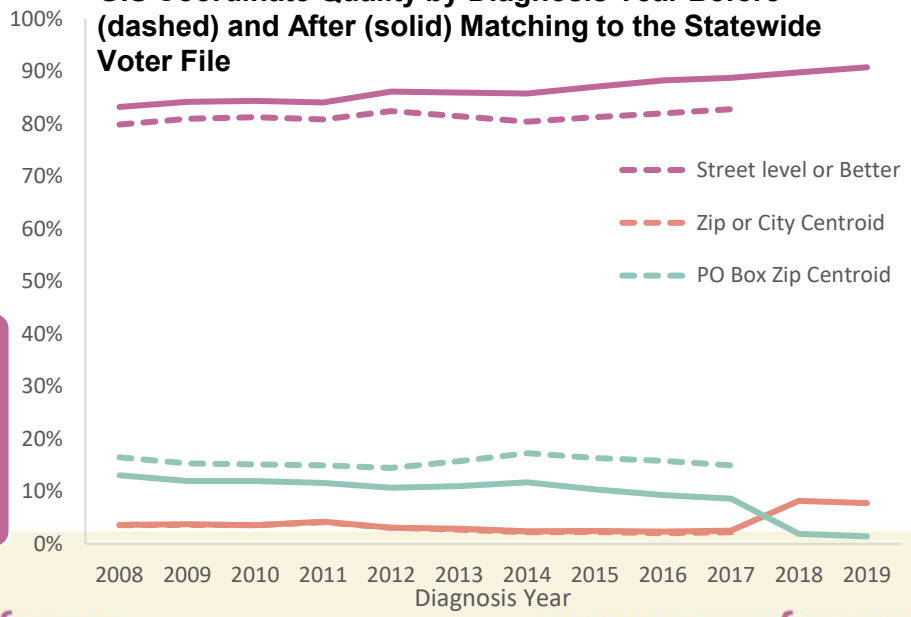
The Montana Secretary of State's office maintains the statewide voter file including the name, date of birth, mailing address, physical address, and voter eligible date (the date when that person is eligible to vote at the given physical address) for all registered voters. MCTR matched PO box only cases to the statewide voter file to assess the usefulness of the file to obtain physical address. MatchPro software from the National Cancer Institute was used to link all PO box only cases reported to the MCTR as of November 2, 2020 and diagnosed from 2008 to 2019.



Percent of PO Box only Cases that Linked to the Statewide Voter File by Diagnosis Year



GIS Coordinate Quality by Diagnosis Year Before (dashed) and After (solid) Matching to the Statewide Voter File



Results

Linkage with the statewide voter file resulted in 4,311 cases having a physical address added to their record. The proportion of PO Box only cases that were able to be matched increased as year of diagnosis became more recent. About 20% of PO Box only cases diagnosed in 2008 to 2011 had a physical address added. While over half (54%) of PO Box only cases diagnosed in 2019 were able to be linked. The additional physical addresses led to a significant improvement in the proportion of cases geocoded to the street level or better for all diagnosis years and the magnitude of the improvement increased as the year of diagnosis became more recent. Ninety-one percent of cases diagnosed in 2019 were able to be geocoded to the street level or better. There was a corresponding decrease in the proportion of cases geocoded to the PO Box zip centroid, less than 2% of cases diagnosed in 2018 and 2019. The proportion of cases with a physical address that were still geocoded to the centroid of their zip code did not change for diagnosis years 2008 to 2017. However, there was an increase in the proportion of cases geocoded to the zip code centroid diagnosed in 2018 and 2019 indicating that some of the physical address imported from the voter file could not be geocoded precisely.

Conclusions

The statewide voter files is a valuable resource for obtaining physical address for cases reported with only a PO Box. MCTR will start matching to the voter file annually.