



ABSTRACT PROGRAM

NAACCR ANNUAL CONFERENCE
JUNE 9 – 14, 2018

WYNDHAM GRAND
PITTSBURGH, PENNSYLVANIA



BRIDGING THE PATH TO THE
FUTURE OF CANCER SURVEILLANCE

naaccr.org

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NAACCR 2018 CONFERENCE Final Abstract Program

NAACCR would like to thank the poster, plenary, and concurrent session oral presenters for their contributions to the conference.

Electronic versions of the posters and oral presentations will be made available online at naaccr2018.org after the conference.

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POSTER LISTINGS

All delegates are encouraged to take the opportunity to visit the posters to become familiar with some of the latest advances and research in the field.

OPERATIONS

- P-01** MatchPro - New platform for Probabilistic Record Linkage (or Teaching an Old Dog new Linkage Tricks)
R. Pinder
- P-02** Agreement Between Self-Reported and Tumor Registry-Recorded Cancer Among Alaska Native People
S. Nash
- P-03** Missed Cancer Cases from Texas Hospital Inpatient/Outpatient Data and Death Certificate Files: Combining Previously Separate Processes
P. Miller-Gianturco
- P-04** Doing Less with More! Finding Creative Solutions for File Storage and Processing of Meaningful Use CDA Files
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- P-05** Collection of Active Follow-Up Data in a NPCR Registry: A Review of the Patient-Centered Outcomes Project at the New Hampshire State Cancer Registry
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- P-06** Can the CCR Leverage NLP for Quality Control Activities?
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- P-07** Implementation of Natural Language Processing Applied to Pathology Reports
C. Moody
- P-08** SCAN 360
L. Bouzoubaa
- P-09** Enhancement of the Metro Chicago Breast Cancer Registry (MCBCR) Through Data Linkages
T.A. Dolecek
- P-10** Enhancing the Completeness of Birthplace Data Through Linkage to Death Certificate Data: an Assessment from the California Cancer Registry Database
A. Sipin
- P-11** API Errors on Central Registry Level: Successful or is There a Disconnect?
J. Mazreku

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- P-12** Opposing Trends in HPV-Associated Cancers in Massachusetts: Cervical and Oropharyngeal Cancers from 2006-2015
S. Gershman
- P-13** Can a Name Reduce the Risk of Cancer?
E. Miller
- P-14** Trends in the Incidence of Overweight- and Obesity-Associated Cancers in Texas
R. Sardell
- P-15** Human Subjects Protection and Cancer Surveillance Research: Revised Regulations, Expanded Opportunities
R. McLaughlin
- P-16** Characteristics and Survival of Children with Acute Leukemia, with Down Syndrome or Other Birth Defects in New York
B. Qiao
- P-17** Black-White Disparities in Colorectal Cancer Treatment, 2000-2007
A. White
- P-18** Breast Cancer in Young Women Ages 20-39 in the US
C. DeSantis
- P-19** Prognostic Multigene Testing in Breast Cancer: Patterns, Disparities, and Opportunities for Advancing Standardized Patient Care
V. Celaya
- P-20** An Assessment of Comorbid Health Conditions Among Incident Cancer Diagnoses within the Virginia Cancer Registry, 2005-2014
S. Wang
- P-21** Recent Trends in Childhood Cancer Incidence in Canada (2001-2014): Report from the Cancer in Young People in Canada (CYP-C) Surveillance Program
L. Xie
- P-22** Trends in Incidence and Mortality of Liver Cancer in New Jersey Residents
L. Eberhart
- P-23** Incidence of Cancer in Adolescent and Young Adults in Puerto Rico: a Descriptive and Comparative Study
M. Alvarado Ortiz
- P-24** Risk of Subsequent Invasive Cancers among Cervical Cancer Survivors in New Jersey, 1990-2015
K.S. Pawlish

Posters will be located in the Grand Ballrooms 2, 3 and 4 on the Ballroom level and are available for viewing at the following times.

Monday, June 11	5:30 pm – 7:00 pm
Tuesday, June 12	7:00 am – 5:00 pm
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POSTER LISTINGS

DATA USE

- P-25** Female Breast, Cervical and Colorectal Cancer Survival in Missouri, 1996-2014
Y. Yoshida
- P-26** Stage at Diagnosis by Health Insurance Status Among Adolescent and Young Adult Cancer Patients in California
Y. Chen
- P-27** Three-Year Relative Survival for Gynecologic Cancers in Puerto Rico & USA Ethnic Groups: 2007-2011
C. R. Torres-Cintrón
- P-28** Rare Cancer Incidence in North Carolina (pancreas, male breast, adrenal/other endocrine glands)
S. Ali
- P-29** Producing Cancer Statistics at the Census Tract Level: a Louisiana Story
L. Maniscalco
- P-30** Contrary to the Popular Belief: Differential Impact of HRT and MPH Rules on Female Invasive Breast Cancer Incidence
A. Balamurugan
- P-31** Cervical Cancer and Emergency Department Use in California from 2010 to 2014
J.A. Killian
- P-32** Competing Risks Survival and Cause of death in Female Breast Cancer Patients in Korea
H. Cho
- P-33** What's Behind the Decreasing Cervical Cancer Survival in the US?
H.K. Weir
- P-34** Innovative Sources for Breast Cancer: Supplementing Registry Multigene Assay Data Through Linkages
S. Hill
- P-35** Characteristics of Comorbidity Indices Derived from Health Administrative Claims Data for Younger and Older Patients
B. Huang
- P-36** Lung Cancer Survival in American Indians, Hispanics, and non-Hispanic Whites in New Mexico, USA
Z. Galochkina
- P-37** Worldwide Incidence of Colorectal Cancer: 10-year Forecast
M. Hughes, J. Olabisi
- P-38** Building Linkage among Central Registration Systems - Uncover the Impact of HPV Immunization on Cervical Cancer Incidence
M. You

- P-39** Patterns and Recent Trends in Mastectomy and Breast Conserving Surgery for Women with Early-Stage Breast Tumors in Missouri: An Update and Further Investigation
C.L. Schmaltz

STUDENT

- P-1S** The Association Between Diabetes and Depression Among Adults Residing in Brazil: Does It Differ Among Cancer Survivors when Compared to the General Population?
I.W. Watson
- P-2S** Depressive Symptoms and Health-Related Quality of Life in Older Women with Gynecological Cancer: A Population-Based Analysis Using the Surveillance, Epidemiology, and End Results Medicare Health Outcomes Survey
A.K. Klapheke
- P-3S** Lifestyle-Related Risk Factors for Cancer and Associations With Social Determinants of Health: Case Study of the Cancer Risk Factors Atlas of Ontario in Toronto
T.A. Norwood
- P-4S** A Spatio-Temporal Investigation of Breast Cancer Treatment Delay in Missouri
J. Du
- P-5S** Colorectal Cancer Survival in the Mountain West State of Nevada
K.E. Callahan
- P-6S** Descriptive Epidemiology of Germ Cell Tumors in the Central Nervous System from 2005-2014
H. Gittleman
- P-7S** Data Collection Strategies and Survey Technology Preference in a SEER Rapid Response Surveillance Study (SEER RRSS) Offering No Participant Incentive
A. Reed



CANCER REGISTRY IS A MARATHON
M Jones¹
¹Matt Jones International, Austin, TX, United States

Being in A Cancer Registry, like a marathon, can be an endurance event. To achieve greater VICTORY and cross your finish line you must stay energized, push through the wall of adversity, and persevere until the end.

Through Matt Jones’ experiences of overcoming major adversity and insurmountable odds, your members of will be inspired and learn strategies to achieve greater VICTORY as a Cancer Data Professional by developing their “Marathon Mentality” to cross their Finish Line! As an added bonus, Matt also shares the most current and groundbreaking research in the science of success and leadership from his research as a PhD student in Organizational Leadership.

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9:00 am - 10:00 am

1PL1

J Silverstein¹

Dr. Silverstein will speak from his experience in developing and implementing data collection, workflows, and predictive models from electronic health records. He will make the case for consistency and completeness of data collection as the most difficult and essential component of enabling advances in health care. He will use the concepts of learning health systems and precision medicine to provide insights into a future of health care where the data derived from the care of every patient contributes to population information that informs the care of each individual patient in increasing detail.

NOTES:

[illegible]

1PL2

While traditional cancer treatment approaches such as surgery, radiation, and chemotherapy still remain important components of cancer care, novel therapies harnessing the body's own immune system have now taken center stage. Dr. Dorritie will briefly discuss the history of immune therapy and various ways we can harness the power of the immune system to eliminate cancer cells. She will provide examples of ways in which immune therapy is being incorporated into the treatment of both solid tumors and hematologic malignancies. Lastly, she will touch on the potential for future applications of immunotherapy and how this might change the landscape of oncologic care.

This image shows a single sheet of white paper with horizontal blue or grey ruling lines. The lines are evenly spaced and run across the width of the page. There are approximately 20 lines visible. The paper has a slight shadow on the right side, suggesting it's resting on a surface. The overall appearance is that of a clean, unused piece of stationery or notebook paper.

2PL1

ESTABLISH AND USE LEGAL AUTHORITY TO ACHIEVE GOALS FOR CANCER REGISTRATION: A STATE EXPERIENCE**X Wu¹**¹LSU Health Sciences Center, New Orleans, LA, United States

Background: Cancer is a reportable disease in all states within the United States. The population-based cancer registries are designated agencies to collect cancer data from medical records. However, in the exercise of legal authority, registries often encounter some obstacles. One of the reasons is that the legal provisions may not be detailed enough, which could be interpreted in multiple ways. Second, laws or rules may not have clauses authorized certain measures (e.g., implementations of electronic pathology reporting and health information exchange). The objective of this presentation is to share Louisiana Tumor Registry's (LTR) experience in revisions and implementations of legislative rules to achieve its goals for data collection.

Methods: The LTR has modified the legislative rules three times since 2009 based on its needs. The 2009 modification amended rules that require pathology labs to report cancer cases within 2 months of diagnosis, to allow the linkage of LTR data with outside data, and to clarify data release policies and interstate data exchange. The 2013 modifications added the requirements of electronic transmission of all cancer cases, remote access to electronic medical records, and the 2-month deadline for reporting by non-hospital sources. The 2017 amendment clarified the LTR's authority to access identifiers and diagnostic materials.

Results: Examples will be given in regards to how the modified rules helped with LTR to implement the electronic pathology/radiology reporting and recruit physician offices for health information exchange. The uses of the rules in other registry activities will also be presented.

Conclusions: Population-based cancer registries need to establish complete and detailed legal rules to obtain the cooperation of reporting facilities and to authorize implementation of innovative approaches for enhancing registries' ability to collect cancer data meeting demands in the new electronic era.

2PL2

CHANGING LAWS TO COLLECT E-PATH IN CALIFORNIA**D Deapen¹, A Sipin¹**¹Los Angeles Cancer Surveillance Program, Los Angeles, CA, United States

Background: Cancer registration is governed by state and provincial laws and regulations. As changes occur in technology, health care, and public health policy, these may need modification for the registry to achieve maximal success. Registry leadership may be unfamiliar with how to support these modifications, which may require governmental review and approval.

Purpose: The Los Angeles Cancer Surveillance Program (CSP) provided leadership in achieving legislative modification for cancer reporting in California and seeks to encourage others to advocate for public health policies in support of cancer registry initiatives.

Methods: With other registry colleagues, we identified improvements for cancer reporting, and as subject matter experts, informed legislative and policy action to eliminate barriers to these improvements.

Results: California Assembly Bill 1823 and Assembly Bill 2325 unanimously passed both houses of the legislature creating an e-path reporting program and cancer clinical trials program.

Conclusions: While there may be hesitation to engage in advocacy for cancer surveillance, the solution lies in improving the understanding of cancer registry employees' permissible involvement in legislative processes. Being informed on policies that govern California, the CSP was able to contribute to legislative changes to enhance the registry and benefit cancer surveillance and control in California. These changes represent the sixth and seventh times that the California legislature has approved requested changes to the cancer reporting law.

1:30 pm - 3:00 pm

3PL1

USING DATA FROM EMRS: THE RISE OF NATIONWIDE NETWORKS**J Asnaani¹**¹CommonWell Health Alliance, Boston, MA, United States

CommonWell Health Alliance is a not-for-profit trade association of technology vendors, clinical provider organizations, state and federal agencies, and other organizations that are collectively dedicated to the notion that the individual's data should be available regardless of where care has occurred.

CommonWell has built a nationwide interoperability network much akin to the networks in the financial industry, but focused on secure clinical data exchange. Access to the CommonWell network has been turned on at 8,000+ clinical facilities, enabling 100+ million transactions for 25+ million unique patients.

As CommonWell continues to gain adoption, there is a growing opportunity for federal partners and others to learn from and to leverage this industry utility in order to further a variety of goals ranging from patient treatment to public health to precision medicine. This discussion will provide an overview of the Alliance, its network, its partnership with complementary industry initiatives, and its future, including how we should expect interoperability to serve a growing number of use cases nationwide, with a specific emphasis on oncology.

3PL2

NEW DATA AND APPROACHES TO LEARN AND CAPTURE RECURRENCE INFORMATION**A Mariotto¹**, A Noone¹, X Wu², M Hsieh², M Davidson², J Warren¹, C Johnson³

¹National Cancer Institute, Bethesda, MD, United States, ²Louisiana Tumor Registry, School of Public Health, Louisiana State University Health Sciences Center, New Orleans, LA, United States, ³Cancer Data Registry of Idaho, Boise, ID, United States

Recurrence is a key outcome in cancer management at both individual and population levels, reflecting progression to a greater disease burden with a correspondingly higher risk of disease-specific death. Given increasing cancer survivorship, there is a growing demand to understand the post-diagnosis course of the disease including recurrence. However, cancer registries lack such information because the collection of recurrence information requests intensive surveillance, ability to access and extract information from medical records longitudinally which are not always available.

Recently, there has been an increasing availability of electronic pathology (e-path) reports to cancer registries. In this presentation we explore the feasibility of two approaches to obtain information on recurrence. The first uses e-path reports to obtain recurrence information at the individual level. The second is a modeling approach applying cure survival to disease-specific survival curves from cancer registry data to calculate risk of recurrence for groups of cancer patients.

In both studies, we used a "gold standard" recurrence data on 2011 diagnosed colorectal and breast cancer cases collected by Louisiana and Idaho cancer registries for the Centers for Disease Control and Prevention (CDC) funded Patient Centered Outcomes Research (PCOR) study. We investigate the percent of pathology reports within 2 months from the "gold standard" recurrence event from the Louisiana registry that have likely, probable, and no information on recurrence. We compare the probability to progress to recurrence from the modeling approach to the "gold standard" data from both registries.

NEW PATHS TO NEW DATA AND NEW SOURCES

11:00 am - 1:00 pm

NOTES:

This presentation will describe the current state of SDC, its effect on the cancer surveillance community, adoption of this approach to improve real-time data collection for other types of cancer data, and activities to encourage and adopt implementation.

4PL1

AMERICAN CANCER SOCIETY CAN; HOW ACS CAN USES CANCER SURVEILLANCE DATA AND DATA NEED TO PROMOTE CANCER PREVENTION AND CONTROL (INCLUDING NEW LEGISLATIONS AND INCREASING FUND FOR CANCER RESEARCH AND CANCER REGISTRY) IN THE UNITED STATES

K McMahon¹

¹American Cancer Society Cancer Action Network, Inc., Washington, DC, United States

The American Cancer Society Cancer Action Network (ACS CAN), the nonprofit, nonpartisan advocacy affiliate of the American Cancer Society, is the nation's leading cancer advocacy organization, working to save lives and eliminate death and suffering from cancer through involvement, influence and impact. ACS CAN educates the public, policymakers, elected officials and candidates about cancer's devastating impact and encourages them to make cancer a top priority. Eliminating cancer as a major health problem relies as much on public policy as it does proven medical research. And like the American Cancer Society, ACS CAN is an evidence-based organization. Advocacy campaigns are a combination of policy development, grassroots and volunteer engagement, direct lobbying and media advocacy. Cancer data and published research are fundamental components of comprehensive, effective advocacy campaign. Seeing the impact of cancer on their own constituents can be the deciding factor for a policymaker to support legislation or champion a cancer issue, such as access to cancer screenings and insurance coverage. The objective of this presentation is to provide showcase the use of cancer data and published research in ACS CAN advocacy campaigns at the federal and state levels.

4PL2

USING CENTRAL CANCER REGISTRIES TO DOCUMENT THE IMPACT OF NOVEL THERAPIES IN A POPULATION-BASED SETTING
C Wiggins¹

¹New Mexico Tumor Registry

The efficacy of novel, cancer-directed therapies is well-documented in randomized controlled trials (RCTs) before such modalities are licensed and widely administered in the general population of eligible cancer patients. However, therapeutic RCTs often rely on highly selected patient populations that may not well represent the wide range of patients to whom the therapies will ultimately be administered. Further, therapeutic RCTs are conducted in a closely-controlled environment to optimize adherence and minimize deviations from established protocols. For these reasons, the potential impact of promising therapies outside of the setting of a therapeutic RCT may fall short of the expected results. Population-based cancer registries are increasingly being used to address this knowledge gap. This presentation will focus on results from several investigations that utilized data from central cancer registries to document successes and limitations of promising cancer-directed therapies that were widely disseminated in the United States, including imatinib for chronic myelogenous leukemia, novel and repurposed therapies for myeloma, and KRAS inhibitors for late stage kidney cancer. Data from population-based central cancer registries can be used to validate efficacies shown in clinical trials and identify problems and challenges that were not evident in the relatively constrained environment and time frame of the RCT.

4PL3

ESTIMATING THE CURRENT AND FUTURE BURDEN OF CANCER IN CANADA: IDENTIFYING OPPORTUNITIES FOR PREVENTION IN THE COMPARE PROJECT

D Brenner^{1,2}, C Friedenreich^{1,2}, S Walter³, A Poirier², E Franco⁴, W King⁵, P Demers⁶, P Villeneuve⁷

¹University of Calgary, Calgary, Alberta, Canada, ²Alberta Health Services, Calgary, Alberta, Canada, ³McMaster University, Hamilton, Ontario, Canada, ⁴McGill University, Montreal, Quebec, Canada, ⁵Queen's University, Kingston, Ontario, Canada, ⁶CancerCare Ontario, Toronto, Ontario, Canada, ⁷Carleton University, Ottawa, Ontario, Canada

This presentation will focus on the work that our Pan-Canadian team has been conducting to model and estimate past, current, and future cancer incidence attributable to modifiable risk factors in Canada. The Canadian Population Attributable Risk of Cancer Project (ComPARE) is a multi-centered project aimed at estimating the current attributable and future avoidable burden of cancer due to all established lifestyle factors, environmental exposures, and infectious agents in Canada up to 2042.

Using a potential impact fraction framework, we have modelled future exposure prevalence levels based on past and current trends using national population-based surveys and cohort studies where available. We then applied "counterfactual" exposure trends based on known exposure reductions from existing interventions or under ideal scenarios based on agency/panel recommendations or guidelines.

Our preliminary results suggest that modifiable factors account for a sizeable proportion of the current cancer burden in Canada – with dramatic variations by province. Implementation of presently available individual and population-level interventions is estimated to reduce tens of thousands of cases of cancer annually in Canada by the year 2042. Results from this project will be presented across exposure categories, with a focus on opportunities for intervention and prevention. As part of the ComPARE project, we have also examined age-specific cancer incidence trends across cancer sites using historical cancer incidence data. Current trends in specific age groups will be discussed in the context of changing epidemiologic risk factor profiles in Canada.

4PL4

PATIENT REPORTED OUTCOMES IN CANADA

Dr. Craig Earle¹

¹Canadian Partnership Against Cancer, Toronto, ON, Canada

Measuring patient reported outcomes (PROs) can contribute to high quality cancer care by ensuring patient symptoms, concerns, and quality of life are used to inform clinical practice, health services programming, planning and policies, performance measurement, comparative effectiveness analysis, and quality improvement initiatives. PROs provide insight on the effectiveness of care from the patient's perspective and complement existing information on quality of care and services provided. Several sources of patient-reported data now exist in Canada, including data routinely collected as part of care in several jurisdictions across the country using tools such as the ESAS-r, and the recent 'Experiences of Cancer Patients in Transition Study'. These demonstrate that more than half of people with cancer have unmet needs during the diagnostic phase, while undergoing treatment, and after treatment is completed. During treatment 35% of patients reported moderate or high levels of fatigue, 20% reported moderate to high levels of anxiety, 19.0% reported moderate to high levels of pain, and 16% reported moderate to high levels of depression. After treatment, 68% of patients who participated in the Transition Study reported physical, emotional or practical challenges, with up to 36% unable to get help for these problems. Participants report frequently being unable to access psychosocial services in their cancer center when no longer on active treatment, leaving primary care physicians to try to manage these issues alone. These findings demonstrate the need to continue advancing work on PROs so that clinicians have access to real-time data to identify patients with distress so that targeted services can be offered. Additionally, more work needs to be done to identify community-based resources for patients' post-treatment, and to identify models of care, perhaps in other diseases, that have been successful in addressing these gaps.

1A1

DEVELOPMENT AND REFINEMENT OF RECURRENCE IDENTIFICATION AT A POPULATION LEVEL USING ROUTINE HEALTHCARE DATASETS

J Charnock^{1,2}, Y Lyratzopoulos^{2,3}

¹Macmillan Cancer Support, London, United Kingdom; ²Public Health England, London, United Kingdom; ³University College London, London, United Kingdom

Background: There is currently no established method in the UK to use routine data to identify recurrence in cancer survivors initially treated with curative intent. Identification of recurrence is vital in bettering our understanding of the patient pathway and treatment outcomes. We have developed a method to identify recurrences based on the formation of patient pathways that depicts a timeline of sequential treatment events, and the development and refinement of these approaches will be described.

Methods: Our method relies on defining an initial treatment window in colon and rectal cancer patients (TNM stages I-III), during which we expect all anti-cancer treatment and healthcare delivery to have curative intent. As this is a critical assumption, we have examined empirically the effect that initial treatment window period may have on the algorithm. Specifically, we tested the impact of treatment windows between 3 and 18 months post-diagnosis, at 1-month intervals.

Results: Stage-specific estimates (assuming an initial treatment window of 6 months) indicated a strong association with greater risk of recurrence as detected by our algorithm. The recurrence risk was 9%, 15%, and 27% for stages I, II, and III colon cancer respectively, with higher risk for patients with rectal cancer. Varying the length of the treatment window, the recurrence risk was 44%, 27%, 24%, 20%, 18%, and 15% at lengths of 3, 6, 8, 12, 15, and 18 months post diagnosis for patients with stage III colon cancer respectively, and with a very similar pattern for rectal cancer.

Conclusions: The findings suggest that using a 6-month initial treatment window is likely to have acceptable sensitivity and specificity in defining recurrence in colon and rectal cancer patients. Further validation studies are required. We have now shown that the approach has face validity, and should be expanded to other cancer sites (i.e., lung cancer).

1A2

THE EPIDEMIOLOGY OF LUNG CANCER IN ISRAEL 1990-2014

B Silverman¹, M Perelman², A Onn², D Urban², M Wollner³, A Agbarya⁴, H Nehushtan⁵, J Dudnik⁶, E Dudnik⁷, M Gottfried⁸, J Bar²

¹Israel National Cancer Registry, Israel Ministry of Health, Tel HaShomer, Israel; ²Sheba Medical Center, Tel HaShomer, Israel; ³Rambam Medical Center, Haifa, Israel; ⁴Bnei Zion Medical Center, Haifa, Israel; ⁵Hadassah Medical Center, Jerusalem, Israel; ⁶Soroka University Medical Center, Beersheba, Israel; ⁷Rabin Medical Center, Petach Tikva, Israel; ⁸Meir Medical Center, Kfar Saba, Israel

Introduction: Lung cancer is the third most common cancer and the leading cause of cancer death in Israel. In 2016, 27.8% of Jewish men, 17.7% of Jewish women, 43.9% of Arab men, and 9.8% of Arab women were smokers. Smoking rates dropped in Israeli Jews from the 1970s through 2015, and have remained stable in the Arab population. Lung cancer surveillance supports assessment of preventive programs and new screening and treatment modalities.

Methods: The Israel National Cancer Registry (INCR) covers the population of Israel (8.4 million). We searched the INCR database for invasive cancers, ICD-O-3 topography code 34.* diagnosed 1990-2014. Age-standardized incidence rates (ASR) were calculated using the Segi World Standard. We used Joinpoint software to assess incidence trends.

Results: ASR in 2015 was highest in Arab men (49.2/100,000) and lowest in Arab women (7.9/100,000). For Jewish men, lung cancer incidence was stable from 1990-2007 (APC = 0.4, 95% CI -0.1-0.8), and decreased from 2007-2014 (APC = -1.5, 95% CI -2.8-0.1). Incidence increased in Jewish women (APC = 2.4, 95% CI 2.1-2.7), Arab men (APC = 1.2, 95% CI 0.4-1.8), and Arab women (APC = 2.8, 95% CI 1.4-4.1). ASR for adenocarcinoma increased in all groups. ASR for squamous cell carcinoma dropped for Jewish men (APC = -1.9, 95% CI 2.4-1.4), and was stable in Jewish women. The rate of small cell carcinoma was stable in Jewish men, and increased for Arab men (APC = 2.4, 95% CI 1.2-3.5) and Jewish women (APC = 1.8, 95% CI 0.1-3.6).

Conclusions: The decrease in lung cancer in Jewish men, and concurrent increase in Jewish women mirror trends in other Westernized countries, and reflects historic differences in smoking rates. Trends in the Arab population, reflect the effect of sustained high rates of smoking and second-hand smoke. The rise in adenocarcinoma of the lung, in parallel with a drop in squamous cell carcinoma has been reported elsewhere, and may be related to the increased use of filtered cigarettes.

1A3

FACTORS ASSOCIATED WITH PRIMARY TUMOR RESECTION IN STAGE IV COLON CANCER PATIENTS: A SEER PATTERNS OF CARE ANALYSIS**M Charlton**^{1,2}, A Kahl^{1,2}, C Lynch^{1,2}, A Lin³¹University of Iowa, Iowa City, IA, United States; ²Iowa Cancer Registry, Iowa City, IA, United States; ³VA Palo Alto Health Care System, Palo Alto, CA, United States

Background: Due to the development of effective chemotherapeutic and targeted agents, current National Comprehensive Cancer Network guidelines recommend systemic therapy without primary tumor resection (PTR) in patients with nonobstructive unresectable stage IV colon cancer (CC). Accordingly, studies show the PTR rate decreased over time (75% in 1988 to 57% in 2010). However, previous studies did not evaluate impacts of perforation, obstruction, or comorbidities on rates of PTR.

Objective: To examine recent rates of PTR among stage IV CC patients and determine the impact of geographic location, perforation, obstruction, and comorbidities on these rates.

Methods: 2014 SEER Patterns of Care data was used to evaluate PTR rates in stage IV CC patients. Chi square tests and logistic regression were used to compare patient and tumor characteristics between PTR and systemic therapy only groups.

Results: Of 1,444 patients, 55% received surgery. Of those who received PTR, 57% had a perforation or obstruction compared to 33% of patients who did not receive PTR ($p < .0001$). Overall, Atlanta had the highest rate of PTR (74%) and Detroit had the lowest (44%), but among patients with no perforation or obstruction, Detroit had the highest rate (74%) and Kentucky had the lowest (26%). The multivariate model showed those with higher odds of PTR were white, married, rural, and had left-sided cancer with undifferentiated grade, $\geq T4$ (vs. $\leq T3$), lymph node involvement and metastasis to the liver or lung only (vs. other or multiple sites). In addition, odds of PTR were at least two times greater among those with perforation (OR: 2.81, CI: 1.96, 4.03) or obstruction (OR: 2.00, CI: 1.59, 2.52). Comorbidities and hospital size were not significantly associated with PTR in the model.

Conclusion: There is wide variation in use of PTR in stage IV CC patients, particularly among those without perforation/obstruction. It is possible PTR is being overused in some areas despite treatment guidelines.

1A4

WAIT TIME TO SURGERY AND SURVIVAL AMONG COLORECTAL AND LUNG CANCER PATIENTS IN ONTARIO**T Navaneelan**¹, S Fallahpour¹, P De¹¹Cancer Care Ontario, Toronto, ON, Canada

Background: While some wait for cancer treatment is inevitable, a delay in surgery may reduce the chances of successful treatment. In order to effectively manage wait times, Ontario has introduced a prioritization approach to cancer surgery, with recommended maximum wait times, based on the urgency of the case. This paper aims to examine how this system has affected survival outcomes by analyzing survival among colorectal and lung cancer patients, based on their wait time to surgery.

Methods: All cases of colorectal and lung cancer diagnosed between 2011 and 2016 were extracted from the Ontario Cancer Registry and linked to the Wait Time Information System. Wait time was defined as the time from the decision to treat with surgery to the first therapeutic surgery. Associations with wait time were estimated using a multivariate Cox proportional hazards model. Possible confounding variables (age, stage, histological sub-type, socio-economic status [SES], geography, facility, chemotherapy use, comorbidity) were included in the models.

Results: The results will include descriptive statistics of wait times to surgery (median wait times, distribution by stage, geography, SES). Hazard ratios by wait time will be presented separately for each cancer type, first in univariate models to assess overall survival by wait time and then in a multivariate model that controls for the possible confounders. Any effect modification by the associated variables will also be examined.

Implications: Understanding and tracking the impact of wait times on cancer survival can identify opportunities for prevention and changes in patient care, which may lead to better outcomes. The results of this analysis will be useful for evaluating the current wait time prioritization approach for cancer surgery currently in use in Ontario. The results will indicate whether the current approach has been successful in prioritizing the correct cases and minimizing survival disparities.

NOTES:

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1B1

SURVIVAL AMONG NATIVE AMERICAN ADOLESCENT AND YOUNG ADULT CANCER PATIENTS IN CALIFORNIA**C Morris¹**, Y Chen¹, A Parikh-Patel¹, K Kizer¹, T Keegan¹¹UC Davis, Sacramento, CA, United States

Background: California has the largest and most diverse Native American (NA) population in the U.S. Over 75% of NAs in CA live in urban areas and many are not eligible for Indian Health Services (IHS) care provided in Contract Health Service Delivery Areas (CHSDA). Adolescents and young adults (AYAs, defined as 15-39 years old) are the population group least likely to be insured. A dearth of information exists on cancer burden and outcomes in this underserved population subgroup. This study sought to describe NA-AYAs diagnosed with cancer in California and compare their survival to other racial/ethnic groups, by rural/urban area of residence, and type of health insurance, adjusted for stage at diagnosis and demographic factors.

Methods: NA-AYS cancer patients diagnosed from 2005 to 2014 were identified through the IHS-linked California Cancer Registry (CCR) database. Insurance status data was enhanced by linking AYA cancer cases with Medicaid enrollment files. Frequency distributions were obtained for type of insurance, rural residence, CHSDA, type of cancer, stage at diagnosis, sex, and a CCR-developed SES index. Multivariable Cox regression models were used to obtain adjusted hazard ratios (HR).

Results: Of 57,378 AYAs, 417 were NAs (162 males and 255 females). 70% of NA-AYAs lived in urban areas and 46% lived in a CHSDA county. Rural area NA-AYAs lived in significantly poorer communities, were less likely to be privately insured (43% in rural, 59% in urban), and more likely to be diagnosed at stages II-IV (45% vs. 35%). In multivariable models, AYA-NA patients had lower survival than all other races (HR: 1.47, $p = 0.003$). Compared with private insurance, survival was also significantly lower for Medicaid (HR: 2.07, $p < 0.001$) and IHS/public coverage (HR: 1.42, $p < 0.001$). The urban-rural survival difference was not significant.

Conclusion: Factors underlying survival disparities between AYA-NAs and other population subgroups need to be better understood and addressed.

1B2

RE-EVALUATING CANCER SURVIVAL TRENDS AMONG ADOLESCENTS AND YOUNG ADULTS IN THE UNITED STATES**L Liu¹**, D Moke², K Tsai¹, A Hwang¹, D Freyer^{2,3}, A Hamilton¹, J Zhang¹, M Cockburn^{1,3,4}, D Deapen^{1,3}

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Introduction: Cancer survival among adolescents and young adults (AYAs, aged 15-39 years) has been reported as showing little or no improvement for decades. This conclusion was based on SEER data for the period of 1975-1997. Subsequent reports on this topic recognized the HIV/AIDS epidemic of the 1980s and early 1990s on lowering AYA survival from Kaposi sarcoma (KS) and non-Hodgkin lymphoma (NHL), two major cancer types closely associated with HIV/AIDS. However, the impact of the HIV/AIDS epidemic on the overall cancer survival improvement among AYAs has not been fully examined.

Methods: Using data from nine SEER registries for 1973-2014 and SEER*Stat software (Ver. 8.3.45), we examined the 5-year relative survival rate among patients diagnosed during 1973-2009 by sex and age group for children (ages 0-14), AYAs (ages 15-39), and older adults (ages 40+). The analysis was conducted for all invasive cancers combined (including bladder *in situ* cases), with and without KS and lymphomas (including NHL and Hodgkin lymphoma, as both could be related to HIV/AIDS).

Results: We found that 5-year relative survival for AYAs was markedly higher for 1983-1997 after excluding KS and lymphomas, more so in males than in females; improved between 1973-1977 and 2005-2009; and was equal to or higher than that for younger or older age groups in those time periods.

Conclusion: These findings indicate that cancer survival among AYAs in aggregate continues to exceed that of other age groups, and survival improvement measures provide only partial information for understanding the progress in cancer survival. However, this re-evaluation does not negate other serious challenges facing this population, which requires better understanding and more research.

1B3

ETHNIC DISPARITIES IN MELANOMA DIAGNOSIS AND SURVIVAL: THE EFFECTS OF SOCIOECONOMIC STATUS AND HEALTH INSURANCE COVERAGE

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Background: Hispanics with melanoma tend to be diagnosed with thicker, more advanced stage tumors and have worse survival than non-Hispanic whites (NHW). Studies evaluating the effect SES and insurance status have on the Hispanic melanoma burden are limited

Purpose: Examine whether the Hispanic disparities in melanoma diagnosis and survival are able to be explained by modifiable factors and differences in SES or insurance coverage, rather than by tumor characteristics or other unmeasured biological factors.

Methods: We obtained population-based incidence data for all Hispanic (n = 6,557) and NHW (n = 116,976) patients diagnosed with invasive cutaneous melanoma from 1995-2014 in California. Using an area-based measure for socioeconomic status and patient-level insurance status, we conducted univariate and multivariate analyses of late stage at diagnosis and survival.

Results: Late stage at diagnosis was more common among Hispanics with respect to age, SES, insurance coverage, histology, and anatomic site. After covariate adjustment, Hispanics were significantly more likely to be diagnosed at an advanced stage than NHW (aOR: 1.65, 95% CI: 1.52-1.79). Hispanics maintained an increased risk of death (aHR: 1.19 (95% CI: 1.13-1.25) after controlling for stage, histology, and anatomic site. However, the survival disadvantage was abrogated after further adjusting for SES and insurance coverage (aHR: 0.99, 95% CI: 0.94-1.04).

Conclusion: Differences in survival for patients with melanoma are mostly attributable to SES, insurance status, and presenting at a late stage, rather than ethnic background or melanoma histology.

1B4

CANCER INCIDENCE, BY STAGE, IN CANADA

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Background: Currently, there is limited publicly available information on cancer stage at diagnosis for Canada because until recently this information had not been available at a pan-Canadian level. Over the past several years, efforts have been made by all provinces and territories to increase the amount of cancer staging data recorded in their registry. Since the collaborative staging (CS) framework became a Canadian standard in 2004, all registries have worked towards collecting collaborative staging data for at least 90% of all incident cases for the four most common cancers (lung, colorectal, female breast, prostate); many have collected stage data on other cancers as well.

Methods: Using data from the Canadian Cancer Registry, this project will describe cancer incidence by stage at diagnosis (based on CS derived AJCC 7th Edition stage groupings) for selected cancers. Specifically, the number, proportion and rate of new cancer cases diagnosed during a 5-year period (2011 to 2015) will be determined by stage for the four most common cancers, as well as cervical cancer for jurisdictions with stage data for this cancer. These data will be presented by sex, age, and geography (provinces and territories, excluding Quebec). In addition, an assessment of the completeness of staging data for other cancer sites by geography will be undertaken to identify existing data gaps.

Results: Canadian (excluding Quebec) cancer incidence data by stage at diagnosis will be presented for selected cancers by basic demographic characteristics (age, sex, and geography).

Conclusions: This project will provide the first national data on cancer stage at diagnosis for Canada, thus filling an important gap in the current knowledge of the cancer burden in Canada. The results will aid health care providers and decision makers in the assessment of current programs, in the allocation of resources and in setting future directions for cancer screening, early detection, and treatment.

1C1

UNCERTAINTY QUANTIFICATION: CHARACTERIZING THE SOURCES OF ERROR IN AUTOMATED INFORMATION EXTRACTION FROM PATHOLOGY REPORTS

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Background: Automated information extraction from electronic pathology (epath) reports could greatly expand the timeliness and scope of cancer surveillance-based epidemiology. Powerful natural language processing (NLP) tools exist to answer with high accuracy certain types of questions with existing training data. For more complex questions, or rarer forms of cancer, however, such algorithms do not perform as well. The purpose of our study is to establish a knowledge model for hierarchically extracting information from epath reports, starting with a classification of report type (single tumor, spread to nodes, metastasis) and an anatomical classification into one of eighteen groups of cancer types. This enables subsequent cancer-specific nomenclature to be used with higher accuracy in characterizing cancer grade, behavior, laterality, subsite, and histology.

Methods: Using a rule-based classification and minimal training, we systematically explore the accuracy and sources of error across cancer types and the questions listed above, as well as strategies for targeted enrichment of the training set for further algorithm improvement.

Results: Significant sources of misclassification include confusing anatomy, reports concerning lymph nodes, reports concerning metastasis, reports concerning multiple samples, and cancer-type-specific nomenclature. We assess the significance of these various types of errors as well as strategies to reduce their importance

Conclusions/Implications: Understanding sources of errors of off-the-shelf classification methods, when combined with subject matter expertise, can help identify important features and possible additional data requirements to improve accuracy of machine learning algorithms.

1C2

COMBINING MACHINE LEARNING AND UNCERTAINTY QUANTIFICATION (UQ) TO DEVELOP TRIAGE RULES TO PARTIALLY AUTOMATE REGISTRY WORKFLOW

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Background: Manual extraction of information from electronic pathology (epath) reports to populate the Surveillance, Epidemiology, and End Result (SEER) database is labor intensive. Systematizing the data extraction automatically using machine-learning (ML) and natural language processing (NLP) is desirable to reduce the human labor required to populate the SEER database and to improve the timeliness of the data. This enables scaling up registry efficiency and collection of new data elements. To ensure the integrity, quality, and continuity of the SEER data, the misclassification error of ML and NLP algorithms needs to be negligible. Current algorithms fail to achieve the precision of human experts who can bring additional information in their assessments. Differences in registry format and the desire to develop a common information extraction platform further complicate the ML/NLP tasks. The purpose of our study is to develop triage rules to partially automate registry workflow to improve the precision of the auto-extracted information.

Methods: The epath reports were provided by the Louisiana Tumor Registry. We used a two-step semi-automatic classification approach based on triage: (1) all of epath reports are scored to determine which ones are easy to classify, and which ones are challenging, and (2) an ML algorithm classifies the 'easy' reports while the challenging ones are sent to be reviewed by registry staff or directed to more specialized expert systems. These triage steps can be carried out most simply either with a rule-based expert system or by training an ML algorithm on the output of an independently developed classifier. Alternatively, it is possible to develop a classifier that combines the two steps. A neural net architecture of this latter kind will be described.

Results: We implemented the rules on free-text of epath reports and the performance of the various triage strategies were quantified empirically. The results demonstrate that we can reliably extract information from a reasonable fraction of epath reports while performing at an extremely high level of accuracy.

Conclusion: Triage offers the opportunity to improve the efficiency of registry information extraction from e-path reports while maintaining the quality and integrity of the data.

1C3

DEEPPHE - A NATURAL LANGUAGE PROCESSING SYSTEM FOR EXTRACTING CANCER PHENOTYPES FROM CLINICAL RECORDS

G Savova^{1,2}, E Tseytlin⁴, S Finan¹, M Castine⁴, T Miller^{1,2}, O Medvedeva³, D Harris¹, H Hochheiser³, C Lin¹, G Chavan⁴, J Warner^{5,6}, R Jacobson⁴

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Background: Electronic medical records offer a potential wealth of information about cancer patients; most automated extraction efforts have focused on single document types or data elements. Our system - DeepPhe - differs from prior efforts in that we move beyond entity mention recognition to summaries over the entire set of patient's records, and longitudinally from primary tumor to regional recurrence or metastasis. These tasks require sophisticated extraction techniques to achieve reliable summarization

Purpose: We describe the DeepPhe system for extracting rich cancer phenotypes.

Methods: DeepPhe ingests multiple clinical documents and optionally discrete data, and outputs a single summary of the patient's clinical phenotype. It uses a novel design, combining a *mention-annotation pipeline* (extending cTAKES^{®1}), a *phenotype summarization pipeline*, and the DeepPhe *ontology*². The methods range from pattern-matching to modern machine learning to knowledge engineering.

Results: System accuracy, measured against a human-annotated gold standard, is high at the cancer summary level and modest at the tumor summary level.³ Strengths include the assignment of clinical N and M stages (76% and 92% accuracy, respectively). Biomarker interpretation (e.g., ER/PR/HER2 status) was mixed, with 44-55% accuracy.

Conclusion: Extraction of specific attributes is promising but requires refinement. Our study emphasizes the importance of research in challenging areas including word sense disambiguation, relation extraction (e.g., coreference, temporal and body location relations), and summarization.

References:

1. Savova G et al. Mayo clinical Text Analysis and Knowledge Extraction System (cTAKES). doi: 10.1136/jamia.2009.001560.
2. Hochheiser H et al. An Information Model for Cancer Phenotypes. doi: 10.1186/s12911-016-0358-4.
3. Savova G et al. DeepPhe: A Natural Language Processing System for Extracting Cancer Phenotypes from Clinical Records. doi: 10.1158/0008-5472.CAN-17-0615.

1C4

CAPTURING HIGH-RESOLUTION TEMPORAL CANCER PHENOTYPES USING DEEPPHE

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Background: The treatment phase of the cancer journey, which is far longer than the diagnostic and decision-making phases in patients with recurrent or metastatic disease, is not typically captured in granular fashion by the registry community, beyond details of first-course therapy.

Purpose: We describe a granular information model for cancer treatment episodes and a preliminary extraction task using the DeepPhe¹ natural language processing (NLP) system.

Methods: The initial DeepPhe episodes information model² contained four cancer episodes: pre-diagnostic, diagnostic, treatment, and follow-up. We expanded the granularity of the treatment episode class, and performed preliminary gold-level annotations using the new annotation schema.

Results: We created a hierarchy of treatment episode subclasses, categorized by *intent* and by *temporality*. *Curative intent* episodes can be pre-definitive (e.g., neoadjuvant therapy), definitive, or post-definitive (e.g., consolidation). *Non-curative intent* episodes include first-line and subsequent lines of therapy. This effort has been coordinated with the development of the HemOnc.org ontology (described in separate abstract). Gold-level annotation was shown to be feasible at the paragraph level and integration into DeepPhe's NLP pipelines and visualization tools is underway. Initial performance evaluations demonstrate >80% accuracy.

Conclusions: DeepPhe has shown how NLP might be used to extract fundamental concepts of cancer diagnosis and treatment. Here, we describe extensions to the system focused on temporal treatment phenotypes beyond those typically captured by registries and other secondary users of clinical data.

References:

1. Hochheiser H, Castine M, Harris D, et al. An information model for computable cancer phenotypes. doi: 10.1186/s12911-016-0358-4.
2. Savova GK, Tseytlin E, Finan S, et al. DeepPhe: A natural language processing system for extracting cancer phenotypes from clinical records. doi: 10.1158/0008-5472.CAN-17-0615.

10:30 am - 12:00 pm

NOTES:

Implications: To our knowledge, this approach represents the largest effort to date to systematically categorize and relate hematology/oncology drugs and regimens. The ontology can be used to reason individual drug components from shorthand used in EHRs (e.g., R-CHOP) and also to reconstruct regimens from individual drug component mentions. The OWL ontology is free for non-commercial use through the Creative Commons 4.0 BY-NC-SA license.

[illegible]

1D1

**INTEGRATION OF INDIVIDUAL RESIDENTIAL HISTORIES INTO
CANCER RESEARCH: AN OVERVIEW**

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In 2011, I reviewed a large number environmental epidemiological studies which made use of residential histories. Most studies attempted to collect all lifetime addresses resided in for at least 1 year. At the time, I observed that I had little knowledge of my own residences before the age of 5 beyond the state level, and surmised that this might be widely true. I also concluded that collecting residential histories, while useful, was only really suitable for focused research studies involving direct contact with subjects, and not for population-based surveillance.

Much has changed in 7 years. It is now possible to capture residential histories electronically through linkage with external databases comprising upwards of billions of public records from diverse sources. These databases are heavily weighted toward recent residential histories, and they contain little information on children. Nonetheless, they offer many useful possibilities for cancer surveillance. For example, they can allow easy identification of “snowbirds” (persons maintaining two residences in different states by season) which can facilitate deduplication efforts between registries.

In this session we will hear examples of research that has been done and is being done integrating residential histories, tools and methods for conducting this research, and information on active research funding opportunities from the National Cancer Institute.

1D2

**USE OF RESIDENTIAL HISTORIES IN EXPOSURE
RECONSTRUCTION AND SPACE-TIME CANCER CLUSTERING**

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Residential history data has only recently become available and its use in the analysis of cancer registry data is increasing. New insights and applications in cancer epidemiology and surveillance include exposure reconstruction over the life course, and the identification of space-time excesses of unexplained cancer risk (clusters). This presentation provides background and approaches for the use of residential histories in exposure estimation and clustering. It provides several examples from peer-reviewed studies, including arsenic exposure from drinking water in southeastern Michigan. Examples provided for space-time clustering of residential histories include studies of breast and testicular cancers in Denmark, and identification of focused clusters of bladder cancer in Michigan. Conclusions drawn from this study support the use of residential histories in studies of cancer, with caveats including the need to estimate cancer latencies, and uncertainties in residential history data.

1D3

**PROGRESS TOWARD A LIFE-COURSE PERSPECTIVE IN CANCER
SURVEILLANCE RESEARCH: INCORPORATING RESIDENTIAL
HISTORIES INTO POPULATION-BASED CANCER REGISTRIES
THROUGH LINKAGES WITH PUBLIC RECORDS**

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Background: Residential histories are needed for testing hypotheses about geographic exposures over the life course and their impact on cancer risk. But population-based cancer datasets with long-term residential histories are not readily available as cancer registries only collect residence at diagnosis. Geographic methods that account for residential histories are also lacking.

Purpose: Assess the feasibility of integrating residential histories into a large population-based sample of incident cancer cases by linking cancer registry data with public record databases while also maintaining confidentiality.

Methods: New Jersey State Cancer Registry (NJSCR) data for Non-Hodgkin Lymphoma (NHL) and colon cancer cases aged 20+ diagnosed from 2006-2014 were linked to residential histories from LexisNexis (LN) following robust encrypted data transfer and honest broker protocols. To further protect the confidentiality of cancer cases, 7,001 SSDI records were added to the data file to mask cancer-specific records.

Results: NJSCR negotiated agreements with LN, obtained IRB approval for an honest broker protocol, and established a secure encrypted portal between the registry and LN. Two test files were transferred and linked to calibrate the linkage. Ninety-eight percent (98%) of 29,188 (17,067 colon; 12,121 NHL) cancer cases linked to LN records. LN returned a maximum number of 20 addresses from 1917-2017 with residential histories spanning an average of 34.5 years (range 1-102). Quality review will be performed before we develop hierarchical Bayesian models to estimate cancer risk as a function of the location-specific risks associated with past residences.

Conclusion: With a comprehensive honest broker protocol, it is feasible to link cancer surveillance data to public records through LN to obtain residential histories. This approach may be scaled and expanded to other population-based cancer registries to advance cancer risk models.

CONCURRENT SESSION 1

Tuesday, June 12

10:30 am - 12:00 pm

FINDING HOME: ADVANCES IN
RESIDENTIAL HISTORY DATA

D

1D4

THE USE OF RESIDENTIAL HISTORIES IN GEOSPATIAL RESEARCH OF CANCER: THE MULTIETHNIC COHORT STUDY

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Geospatial research is a rapidly emerging field in cancer epidemiology that addresses innovative questions on the role of place where one lives, works, and plays in relation to cancer development, progression, and survivorship. Within the Multiethnic Cohort Study, a long-standing prospective study established in 1993-1996 of over 215,000 adult participants from five major U.S. racial/ethnic groups, we have capitalized on collected residential addresses and emerging geographic resources to develop a research program focused on the role of the neighborhood environment and cancer risk. This resource provides unique opportunities to investigate neighborhood adversities and assets, which may accumulate and change over time, and in turn be embodied by individuals to impact their risk of cancer.

For this session, we will present our work using residential addresses and linkage to geospatial datasets to investigate among this racially/ethnically and socioeconomically diverse cohort: (1) the relationships between the neighborhood obesogenic environment (social and built environmental attributes associated with obesity and physical inactivity) with prostate cancer risk and obesity-related biomarkers; (2) the relationships between long-term air pollution exposure and breast cancer risk; and (3) a validation study to examine the utility of commercially-obtained address histories for epidemiologic research. In particular, we will highlight the strengths and challenges of using residential addresses in epidemiologic studies of cancer, central findings from our geospatial studies, and next steps to expand on these opportunities to examine the role of place and health.

1D5

NCI ACTIVITIES TO FACILITATE RESIDENTIAL HISTORY RESEARCH

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There is a growing recognition that a person's lifetime residential history should be routinely incorporated into cancer research because it encapsulates the person's multiple interactions with social and physical environment that may have lasting health impact as demonstrated in focused studies. The increased awareness of commercially available residential history data presents an opportunity to capitalize on the role of residential history in the context of cancer research and encourage the research community to generate new knowledge about the interactions between place and cancer over time. The goal of this presentation is to: (1) present the latest funding opportunities at NCI for research addressing the role of residential histories in cancer etiology, prevention, and outcomes; and (2) summarize available tools for using commercial sources of residential histories for cancer research.

1E1

SETTING THE STANDARD: NPCR AND SEER JOIN FORCES TO ESTABLISH DATA QUALITY BENCHMARKS

S Negoita¹, C Lam¹, R Ehrenkranz¹, A Solis², R Wilson³, M Wu³, V Benard³

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Background: The Surveillance, Epidemiology, and End Results Program (SEER) and the National Program of Cancer Registries (NPCR) constitute a nationwide population-based registry system providing cancer statistics with data collected from registries across the United States. Together, SEER and NPCR collect data for the entire U.S. population, release the data to the research community, and identify further requirements for cancer prevention and control efforts at national, state, and local levels. Data quality is vital to SEER and NPCR, and both programs routinely conduct rigorous quality control assessments.

Purpose: Although both programs follow internal data quality procedures, standardized systematic data quality benchmarks across standard-setting organizations do not exist. To address this gap, SEER and NPCR collaborated to devise a methodical process to evaluate the quality of existing and future data. Additionally, SEER and NPCR will develop a joint framework to validate data for timeliness, availability, completeness, and accuracy.

Methods: Our methods include identification and examination of data items in SEER and NPCR, literature reviews, and review of central cancer registries program evaluation instruments and audits. Data analyses will involve documenting system and guideline changes, and establishing evaluation tools for data assessment. SEER and NPCR are piloting this approach by assessing grade in brain and breast cancers.

Results: Our mutual goal is to develop cross-program data quality procedures based on consistent, validated benchmarks. In the future, we expect to create evidence-based benchmarks for a broad range of data items.

Conclusions: This collaboration between SEER and NPCR will provide strategies to create data quality benchmarks and set up rules to use these benchmarks in cancer surveillance. SEER and NPCR will publish methodology for implementing a quality audit process that can be adopted across standard-setting organizations.

1E2

2017 NATIONAL PROGRAM OF CANCER REGISTRIES DATA QUALITY EVALUATION

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Background: Timely, complete, and high-quality cancer registry data are critical to cancer planning and control. CDC's National Program of Cancer Registries (NPCR) conducts Data Quality Evaluation (DQE) activities with funded Central Cancer Registries (CCRs) to ensure data collection and management practices adhere to national program standards.

Objective: The 2017 NPCR-DQE assessed record consolidation and completeness of treatment information with a focus on subsequent primaries utilizing the 2007 SEER Multiple Primary and Histology (MPH) Coding Rules.

Methods: Ten CCRs participated in the 2017 DQE audit. A sample of 4,028 consolidated cases diagnosed between 2008 and 2014 in 6 cancer sites were selected: bladder, breast, colon, lung, melanoma, and prostate. Each case was reconsolidated, and for each case, 23 to 34 data elements were reviewed.

Results: Of 93,082 data elements reviewed, 1,907 data elements (2.1%) were found to have major errors. The percentage of total errors by CCRs ranged from 1.3% to 7.6%. Grade, derived summary stage 2000, scope of regional lymph node surgery, date of first course treatment, and date of surgery accounted for 63% of the major errors. Bladder, breast, and lung sites accounted for 61% of all major errors. For the MPH assessment, among 8,548 tumors from 3,881 MP patients, the error rate by CCRs ranged from 0.3% to 7.6%. There were 182 tumor-level sequencing errors with the most errors occurring in head and neck, ureter, and connective, subcutaneous and other soft tissues.

Conclusion: Multiple approaches such as continuing education for registrars on data collection, quality assurance, registry operations, and software improvement may help ensure high-quality data is collected.

CONCURRENT SESSION 1

Tuesday, June 12

10:30 am - 12:00 pm

1E3

THE DATA QUALITY PRE-EVALUATION FRAMEWORK & APPROACH TO SEER-WIDE QUALITY AUDIT PLAN: OPERATIONAL RESULTS FROM TWO PILOT STUDIES

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Background: The SEER Quality Audit Plan (QAP) is an innovative approach to systematically evaluate, monitor, and address possible data quality issues. The QAP framework and approach was presented at the 2017 Annual NAACCR Conference. The first step of the QAP, the pre-evaluation approach, was piloted and refined in 2017.

Purpose: The objectives of the QAP pre-evaluation approach is to allow for the systematic estimation of data quality issues: (1) in a timely manner; (2) utilizing minimal resources; and (3) with sufficient level of detail to support the decision that the data are of sufficient quality, that additional incremental analysis is required, or that a comprehensive QAP is needed. This process encompasses the aspects of understanding of the clinical plausibility and aspects of data fidelity, establishing quality benchmarks, and conducting standardized set of analysis to support decision-making. The operational outcomes generated from conducting two QAP pilot pre-evaluation studies are presented.

Methods: A multidisciplinary group was constituted to develop the QAP pre-evaluation approach. Two specific pilot projects were selected: reactive QAP (i.e., a potential issue that has been identified *a priori*) and proactive QAP (i.e., standard data evaluation with no identified *a priori* issues). Each pilot project completed the QAP pre-evaluation approach; the two pilot projects were conducted in coordinated efforts to ensure consistency and opportunities to modify the approach. Results from QAP pilot projects were presented to SEER Leadership for decision-making and prioritization of efforts.

Conclusion: The QAP pre-evaluation approach is a systematic, timely, and resource-efficient approach to examining quality of data items within a population-based registry. Lessons learned from the pilot projects will be incorporated for future iterations of QAP projects and shared with all NAACCR members.

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NATIONAL QUALITY CONTROL INITIATIVES

E

1E4

SEER QUALITY AUDIT PLAN: PROACTIVE QUALITY AUDIT PLAN PILOT STUDY

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Background: As part of the SEER Quality Audit Plan (QAP), the proactive (P-QAP) pilot addressed possible data quality issues related to estrogen receptor (ER), progesterone receptor (PR), and human epidermal growth factor receptor-2 (HER2) for breast cancer. These are important indicators for risk assessment, prevention, and treatment and are required for staging in 2018.

Purpose: The objectives of the P-QAP approach are to develop a process for surveillance that routinely assesses data quality and reliability, without impetus of a known problem, and to evaluate this process using data items ER/PR/HER2.

Methods: A multidisciplinary group was convened to develop the P-QAP pre-evaluation methodology. Changes to coding instruction over time were identified and expected population distributions were obtained from alternative sources. Registry data was analyzed for ER/PR/HER2 from 2004-2014. Abstract-level data for ER/PR was used to compare consolidated values to abstract values and to compare immunohistochemical (IHC) lab values to IHC interpretation.

Results: Data quality associated with ER/PR/HER2 was reliable overall with minor data entry inconsistencies identified. Since 2000, missing/unknown data has improved from as high as 46% to 2% by individual registry. Percent ER and PR positive show increasing trends with ER approaching 80%, higher than the expected level of approximately 70%. Comparisons of consolidated to abstract values are 98% and 97% for ER and PR, respectively. Discrepancies for HER2 IHC value/interpretation comparability ranged from 2% to 18%.

Conclusion: Analyzing trends by registry, understanding coding changes, and identifying expected distributions for variables under study were found to be key components in assessing quality. For ER/PR/HER2, it was concluded the data was consistent with expectations but could benefit from data validation at the point of entry to address minor inconsistencies.

NOTES:

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1F1S

MOLECULAR CHARACTERIZATION OF THE MORTALITY DISPARITY IN TOBACCO-ASSOCIATED APPALACHIAN HNSCC

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Head and neck squamous cell carcinoma (HNSCC) is an aggressive neoplasm caused by tobacco use or human papillomavirus (HPV). HPV⁺ HNSCC patients have worse overall survival than HPV⁻ patients due to tobacco-induced DNA damage and associated mutations. Appalachian residents have greater exposure to all HNSCC risk factors than the rest of the nation. Male Appalachian patients display worse overall survival than Appalachian females or non-Appalachian residents. Secondary analysis of NAACCR CiNA Deluxe Appalachian outcome registry data from 2007-2013 indicates that white males with Stage IV oral cavity/pharyngeal (OC/P) HNSCC ("Disparity") are responsible for the increased male mortality within Appalachia. Preliminary results with primary tumor cells derived from Appalachian patient-derived xenografts (PDXs) indicate that Disparity tumors have enhanced ability to degrade extracellular matrix (ECM), a requirement for tumor invasion. Statistical analysis of gene copy number variants (CNVs) from the Cancer Genome Atlas (TCGA) HNSCC cohort indicates that smoking significantly correlates with amplification of genes found in several chromosomal cytobands. Of these, 11q13.3 and 11q13.4 are the only amplified segments that correlate with reduced overall survival in smokers. We hypothesize that the heavy tobacco use by male Appalachian HNSCC patients leads to increased tobacco-related carcinogenic insult and amplification of 11q13 regions, enhancing tumor aggressiveness. The goals of this project are to identify biomarkers within the Disparity, to determine if Disparity tumors harbor increased mutational load or CNVs, and to determine if Disparity tumors display increased aggressiveness. This will be accomplished by statistical analysis of available datasets and whole exome sequencing with CNV determination in male Stage IV Appalachian tumors. Cellular and animal models to mechanistically determine the impact of the Disparity on tumor progression will also be used.

1F2S

THE PROGNOSTIC VALUE OF NEGATIVE LYMPH NODE COUNT AND LYMPH NODES RATIO IN MALE BREAST CANCER

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Background: Male breast cancer (MBC) is a rare tumor accounting for less than 1% of all cancers affecting males. Recently, lymph node (LN) status was suggested to play a vital prognostic role. Noteworthy, positive LNs (PLNs) count is used for breast cancer staging according to the 7th Edition of the American Joint Committee on Cancer. Many researchers, however, criticized depending on PLNs because this number may be biased by the number of examined LNs (ELNs). After then, LN ratio (LNR) was suggested to be beneficial for breast cancer prognosis. Additionally, some studies have suggested that not only PLNs count, but also ELNs and negative LNs (NLNs) counts should be used in prediction of breast cancer survival.

Purpose: We aimed to investigate the prognostic value of ELNs, NLNs, and PLNs counts, as well as LNR.

Methods:

- Study design: A retrospective population-based cohort study.
- Study population: Data for 2,627 MBC patients were formally retrieved from SEER cancer registry database.
- Analysis: We used the X-tile program to determine the best threshold of ELNs, NLNs, and PLNs counts, and LNR depending on the appropriate threshold with the minimum P-value and maximum Chi² test. We also used Kaplan-Meier analyses to create our survival curves. A multi-variable analysis was conducted as well.

Results: From X-tile analysis, we found that 2,003 patients had ≤ 2 PLNs, 624 patients had > 2 PLNs, 2,075 patients had ≤ 31.3 LNR, and 552 patients had > 31.3 LNR. We found that worse survival was associated with older age, black patients, stage IV, ≤ 1 NLN, and $> 31.3\%$ LNR. We also demonstrated a survival improvement of MBC patients across the MBC-SS (HR, 95% CI=0.98, [0.96, 0.998], P = 0.03) and the 10-year MBC-SS (HR, 95% CI = 0.98, [0.96, 0.999], P = 0.04) models.

Conclusion: We suggest incorporating it to the current staging system of breast cancer. Further studies are needed to demonstrate the reason for such association.

1F3S

NONCLINICAL FACTORS ASSOCIATED WITH HEAD AND NECK CANCER SURVIVORSHIP AMONG PATIENTS WITH METASTATIC DISEASE

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Background: More than half of head and neck cancer (HNC) patients present with advance staged disease, and distant metastasis is a poor prognostic factor. Survivorship may also be influenced by other nonclinical factors associated with access to care. We examined HNC survivorship among patients with distant metastatic cancer

Methods: Patients ≥ 18 years old diagnosed with metastatic HNC from the Surveillance, Epidemiology, and End Results 18 database (2007 – 2014) were included in the study. Kaplan-Meier curves compared survival among cohort strata. Fine and Gray competing risks proportional hazards model yielded adjusted hazard ratios (aHRs) and 95% confidence intervals (CIs) to estimate significant factors (age, sex, race, marital status, and health insurance) associated with death from HNC among patients with metastatic cancer.

Results: There were 14,603 patients with metastatic HNC in the study, 78% males, with an average age of 61 years and median survival of 24 months. Significant nonclinical factors included having health insurance and marital status. Patients on Medicaid (aHR = 1.18, 95% CI 1.11, 1.26) or uninsured (aHR = 1.24, 95% CI 1.12, 1.36) had increased hazard of death from HNC compared to those insured. Divorced/separated (aHR = 1.23, 95% CI 1.14, 1.33), never married (aHR = 1.27, 95% CI 1.19, 1.36), and widowed (aHR = 1.25, 95% CI 1.14, 1.38) patients had increased hazard of death compared to those married/partnered. Married patients also had the highest HNC-specific median survival (51 months vs. 15 months [widowed], 24 months [never married], and 25 months [divorced/separated]).

Conclusion: Nonclinical factors such as health insurance and marital status impact HNC survivorship among patients with metastatic cancer. It is important to understand these factors in optimizing survivorship among this population of HNC survivors.

1F4S

IMPROVED CANCER REPORTING EFFICIENCY AND REDUCED PAPER WASTE: LESSONS LEARNED FROM AN ELECTRONIC REPORTING PORTAL RECRUITMENT EFFORT

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Background: In 2016, the California Cancer Registry launched an online web portal for reporting cancer cases. To expedite adherence to these new requirements, the Public Health Institute utilized in-house cancer reporting expertise (Cancer Registry of Greater California [CRGC]) and research methods (Survey Research Group) to enroll medical offices.

Purpose: Electronic cancer case submissions reduce errors in paper trails and data entry, are more efficient, and can save man hours when compared to fax and mail submissions. The primary purpose of this study was to assess the feasibility of proactively enrolling self-reporting medical offices to an electronic portal. A secondary aim was to determine if electronic submissions are more timely, accurate, and complete than mail or fax.

Methods: Computer Assisted Telephone Interviewing (CATI) software was utilized to initiate contact with medical offices that had responded to CRGC requests in the previous 12 months. After an initial fax, each facility was contacted via phone up to 5 times over 11 months.

Results: There were 3,440 telephone attempts to 926 medical offices. Of these, 341 were successfully contacted to enroll in the portal, 348 refused, and 207 were called 5 times without successful response. To date, the CRGC has 305 medical offices enrolled in the portal. Of these, 72% have used the portal to submit at least one cancer case. However, of the offices our team successfully enrolled to the portal, the submission rate was 91% (65% for offices we did not contact), resulting in 763 man-hours saved over 13 months compared to mail and fax.

Conclusion: Proactively recruiting to an electronic portal may increase the likelihood of receiving electronic submissions, resulting in reduced staff efforts and increased data accuracy. Future research will include analyzing data quality metrics pre- and post-portal implementation to determine if electronic submissions are more timely, accurate, and complete.

2A1

TRENDS IN PREMATURE CANCER MORTALITY IN THE USA BY RACE/ETHNICITY AND COUNTY-LEVEL INCOME QUINTILE

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Purpose: Cancer accounts for >25% of all deaths among persons aged 25-64, making it the leading cause of premature mortality. We describe trends in premature cancer mortality rates between 1999 and 2015 by county-level income quintile in non-Hispanic whites (NHW) and non-Hispanic blacks (NHB).

Methods: Death certificate and population data were from the U.S. National Center for Health Statistics and Census Bureau. For all cancers combined and the six most common cancer sites, we estimated age-adjusted cancer mortality rates and annual percent changes (APC) in these rates by race/ethnicity and county-level median income quintile. We compared the relative risk of being in the lowest income quintile counties vs. highest at the start and end-points of the study period.

Results: Overall, premature cancer mortality rates have declined between 1999 and 2015 (NHW APC: -1.60, 95% CI: -1.70, -1.50; NHB APC: -2.29, 95% CI: -2.36, -2.22). However, among both NHW and NHB, the differences in rates between residents of the highest and lowest income quintile counties widened over time. For example, among NHW in 1999 the relative risk of premature cancer mortality associated with being in the lowest income quintile county relative to the highest was 1.24 (95% CI: 1.22, 1.25), by 2015, the equivalent relative risk was 1.57 (95% CI: 1.55, 1.59). Among NHB, the gap between the highest and lowest income quintile counties widened for lung, colorectal, and liver cancers. Among NHW, all six cancer sites (above plus breast, pancreas, brain) showed widening disparity by income.

Conclusions: Cancer mortality rates among persons aged 25-64 declined during 1999-2015. Within race/ethnicities, county-level differences in premature cancer mortality grew, as the most advantaged counties improved at a faster rate than the least advantaged. Despite widespread cancer mortality declines, within racial/ethnic groups there remain substantial and growing disparities between counties with high and low median income.

2A2

A PRELIMINARY ASSESSMENT OF CANCER TRENDS USING DATA FROM NPCR-CSS

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Introduction: Continuous improvements in the quality of cancer surveillance data reported to CDC's National Program of Cancer Registries (NPCR) made it feasible to estimate cancer incidence trends based on data covering over 90% of the U.S. population

Purpose: The study aims to provide a preliminary assessment of cancer incidence trends in the U.S. using NPCR cancer surveillance data.

Methods: All reportable malignant cancer cases diagnosed 2001-2014 submitted in November 2016 are included in this study. The age-adjusted cancer incidence rates and annual percent change, stratified by primary site, race, and sex, are summarized using SEER*Stat 8.3.4 and joinpoint regression analysis.

Results: Preliminary results show decreases in incidence rates for all sites combined, colon and rectum, lung and bronchus, female breast, and prostate cancers. For all sites, the decrease was smaller among white males compared to Black, American Indian/Alaskan Native, and Asian/Pacific Islander males. Differences in decreasing rates were identified when comparing males and females. White persons had a larger decrease in rates for colon and rectum and Black persons had a larger decrease for lung and bronchus. Final results using joinpoint regression analysis will be evaluated and reported.

Implications: This assessment will help us understand changes in cancer incidence over time, the rate at which the change occurred, and whether it was statistically significant. Our trend analysis can provide policy makers and health professionals with information on cancer burden and thus assist in planning and prioritizing prevention activities, allocating health services, evaluating interventions or treatments, and developing cancer control strategies.

2A3

INCIDENT CANCERS AMONG PARTICIPANTS OF THE ALASKA EARTH STUDY, AND ASSOCIATIONS WITH KNOWN CANCER RISK FACTORS

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Background: Cancer is a leading cause of morbidity and the leading cause of mortality among Alaska Native (AN) people. The Alaska Education and Research Towards Health (EARTH) cohort was established to examine risk and protective factors for chronic diseases (including cancer) among AN people.

Purpose: To describe the cancer experience of the Alaska EARTH cohort, and assess associations with key cancer risk factors

Methods: From 2004-2006, 3,812 Alaska Native participants were recruited into the Alaska EARTH cohort. Data collected from each participant included demographic information, anthropometrics, medical history, and information on lifestyle. This study linked data from the Alaska EARTH cohort with cancer diagnoses (through 12/31/15) recorded by the Alaska Native Tumor Registry (ANTR). We calculated cancer counts and incidence rates among the Alaska EARTH cohort; these were compared to statewide figures from the ANTR. We also examined associations of cancer risk factors (smoking, diet, obesity, physical activity) with the leading cancers using multivariable-adjusted Cox proportional hazards regression.

Results: There were 164 Alaska EARTH study participants who were diagnosed with an incident cancer during the period of follow-up. Incidence (95% CI) of cancer (all sites) among Alaska EARTH participants was 629.7 (510.9-748.6) per 100,000 person-years, which was comparable to ANTR 680.5 (660.0-701.5) per 100,000 population. The leading cancers among Alaska EARTH participants were female breast, lung, and colorectal cancer; reflecting patterns observed statewide. We observed statistically higher risk of all-sites cancer incidence among ever smokers, the physically inactive, and those who did not meet fruit and vegetable intake recommendations.

Conclusions: Cancer incidence among the Alaska EARTH cohort was generally similar to that observed statewide. Risk factors for leading cancers among AN people mirror those observed among other populations.

2A4

TRENDS IN COLORECTAL CANCER INCIDENCE AMONG YOUNGER ADULTS - DISPARITIES BY SUBSITE, AGE, SEX, RACE, ETHNICITY, AND STAGE

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Background: A rise in colorectal cancer (CRC) incidence rates has been observed in adults who are younger than the current recommended screening age of 50^{1,2}.

Purpose: We examined time trends in CRC incidence rates among NJ and U.S. younger adults.

Methods: NJ and U.S. annual incidence rates by age, sex, race, and ethnicity were generated using SEER*Stat and imported into JoinPoint Regression Program to calculate annual percent changes (APCs). Further comparisons by stage, histology, and subsite were of interest in NJ, and similarly analyzed. Demographic and clinical features by age group at diagnosis (20-49 vs. ≥50) were compared using SAS. A total of 181,909 invasive CRC cases diagnosed from 1979-2014 in NJ and 448,714 in the U.S. were included in the analyses.

Results: In NJ, younger adults with CRC were significantly more likely than older adults to be male, a race other than white, Hispanic, have rectal cancer, and be diagnosed at late stage. Racial/ethnic subgroup analyses showed considerable variation by race and sex, as well as between NJ and the U.S. The rate changes in whites, men, and younger adults ages 20-39 years appear to be driving the increasing incidence of rectal cancer. Carcinoids were present in higher proportions in younger adults across all time periods, moreover, the proportion of carcinoids has increased in younger adults, more so than that of screening age adults.

Conclusions: Additional studies are needed to discern if, and to what extent, genetic, cultural, and behavioral factors play a role in the increasing CRC risk in younger adults, as well as the possible involvement of human papillomavirus (HPV) or other infections.

References:

1. Siegel RL, et al. Colorectal Cancer Incidence Patterns in the United States, 1974-2013. *JNCI* 2017;109(8): djw322.
2. Screening for Colorectal Cancer US Preventive Services Task Force Recommendation Statement. US Preventive Services Task Force. *JAMA*. 2016; 315(23): 2564-2575.

CONCURRENT SESSION 2

Tuesday, June 12

3:30 pm - 5:00 pm

GLOBAL PERSPECTIVE ON SURVIVAL

B

2B1

A COMPARISON OF RELATIVE SURVIVAL WITH CAUSE-SPECIFIC SURVIVAL USING UPDATED METHODS IN THE SEER PROGRAM

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Background: Relative survival (RR) and cause-specific survival (CSS) are two distinct methods used to estimate net survival. Improvements to both methods have been introduced in the NCI's Surveillance Epidemiology and End Results (SEER) Program, but a comparison of results is still lacking.

Methods: We used data from the SEER Program for patients diagnosed with a malignant cancer from January 1, 2000 to December 31, 2013 with follow-up through December 31, 2014. In RS, we used the new life tables that account for socio-economic status. In CSS, we used SEER cause-specific death classification as the endpoint. Analyses were stratified by sex, age group, survival since diagnosis, and cancer site.

Results: In both sexes and for all sites combined, differences between 5-year RS and 5-year CSS were dismal (64.2% vs 64.6%, respectively). 5-year RS was always higher in cancers most commonly detected through screening, such as breast in women (89.1% vs 86.9%) and prostate (98.3% vs 93.2%). For these cancer sites, the gap between methods was larger with increasing age or time since diagnosis. Conversely, 5-year CSS was always higher in cancers with poor prognosis, such as lung (19.0% vs 17.0%), pancreas (7.7% vs 7.3%), and stomach (30.3% vs 28.3%). 5-year CSS was also usually higher in cancers most commonly related to infectious diseases and to tobacco consumption.

Discussion: RS in patients diagnosed with screen-detectable cancers might be overestimated due to a "healthy screener bias." When dealing with more advanced ages, RS may still be the best method though as the accuracy of the cause of death in older people is more challenging due to co-morbidities. The same may apply to cancers with long-term survival, as CSS estimates may become progressively distorted as time since diagnosis increases. CSS might be considered in specific settings (e.g., states that follow comparable reporting of death certificates) or studies (e.g., survival in smokers or in people with HIV).

2B2

COMPREHENSIVE CANCER SURVIVAL COMPARISONS ACROSS SEVEN COUNTRIES, 1995-2014: THE ICBP SURVMARK2 PROJECT

M Arnold¹, M Rutherford¹, A Bardot¹, I Soerjomataram¹, F Bray¹, S Local Leads¹

¹International Agency for Research on Cancer, Lyon, France

Background/Purpose: Cancer survival provides a means to assess the effectiveness of early detection strategies and the quality of clinical care and management. The SURVMARK2 project provides comprehensive and updated international benchmarking of cancer survival across seven high-income countries, namely Australia, Canada, Denmark, Ireland, New Zealand, Norway, and the UK, with the aim of increasing our understanding of possible drivers of international differences and informing health policy.

Methods: Data on primary cancers of the esophagus, stomach, colon, rectum, liver, pancreas, lung, and ovary diagnosed in the period 1995-2014, with follow-up until Dec 31, 2015, were obtained from population-based cancer registries in 21 jurisdictions in 7 countries. Key survival measures, including 1- and 5-year net survival, were calculated by age, sex, period, and cancer subtype, using a modelling approach.

Results: Considerable variation in net survival from cancer continues to exist across the seven included countries during 1995-2014. Survival was consistently higher in Australia, followed by Canada and Norway, and lower in the UK, Ireland, and New Zealand. For colon cancer, 5-year net survival ranged from 69% in Australian women to 55% in women from the UK. Large discrepancies were also found for lung cancer, where 22% of all Canadian women survived 5-years after diagnosis, as opposed to only 10% of UK men diagnosed with this cancer. The poorest survival was observed for pancreatic cancer, with 5-year net survival ranging from 11% in Australia to 5% in the UK.

Conclusions/Implications: International differences in cancer survival persist, even for poor prognosis cancers. Possible reasons could be related to differences in detection and treatment, but could also be partly due to local registration practices. Unveiling the factors contributing to these differences is crucial to eliminate survival disparities in the future.

2B3

WOMEN'S CANCERS: PROSPECTS FOR A WORLD-WIDE HIGH-RESOLUTION STUDY**C Allemani**¹¹London School of Hygiene and Tropical Medicine, London, United Kingdom

Background: Breast, ovarian, and cervical cancers are a major public health problem world-wide. CONCORD-3 has updated cancer survival trends to 2014 for 18 malignancies, including breast (women), cervix, and ovary (15-99 years). World-wide differences in survival from these cancers are striking. Inequalities in survival also exist between and within high-income countries.

Aims: To assess whether variations in patterns of care explain the world-wide inequalities in survival and the number of avoidable premature deaths.

Approach: The CONCORD-3 database includes incidence and follow-up data from 322 population-based registries in 71 countries for 37,513,025 patients diagnosed with one of 18 malignancies during the 15 years 2000-2014, including 7,948,798 women diagnosed with a cancer of the breast, cervix, or ovary. I propose to enhance the CONCORD database:

1. By collecting and analysing detailed data from the medical records (e.g., stage at diagnosis, staging procedures, first course of treatment, and where available, prognostic biomarkers) of women diagnosed with breast, ovarian or cervical cancer in at least two countries per continent, in the most recent year during 2010-2014 for which data are available.
2. By estimating the number of avoidable premature deaths that are attributable to inequalities in 5-year survival between and within countries.

Results: I will present the protocol for data collection and analysis for discussion. This will include plans for a pilot study to assess the availability of high-resolution data world-wide.

Implication: The NAACCR conference will be an ideal platform to discuss and refine the study design with North American cancer registry colleagues, and to identify which registries would be suitable to participate. The insights from this project will help bridge the Path to the Future of Cancer Surveillance.

2B4

THE AMERICAN CANCER SOCIETY'S CANCER PREVENTION STUDY-3: A LARGE-SCALE NATIONWIDE PROSPECTIVE COHORT**A Deka**¹, P Briggs¹, E Jacobs¹, S Gapstur¹, A Patel¹¹American Cancer Society, Atlanta, GA, United States

Background: Prospective cohort studies have been instrumental in understanding the role of lifestyle, genetic, and other factors in cancer etiology. From 2006-2013, the American Cancer Society enrolled adults who were cancer free and ages 30-65 years into the Cancer Prevention Study-3 (CPS-3). The purpose of CPS-3 is to better understand the causes of and factors related to the prevention of cancer.

Methods: Enrollment took place in 35 states, the District of Columbia, and Puerto Rico. Participants completed two lifestyle and medical surveys (a brief survey at enrollment and a more comprehensive one at home), had waist circumference measured, and provided a blood sample. Exposure data will be updated with triennial surveys. Incident cancers will be ascertained through routine linkages of the entire cohort with cancer registries, and mortality will be ascertained through periodic linkage with the National Death Index. Tumor tissues are being collected from participants who self-report incident breast, colorectal, prostate, ovarian, and hematopoietic cancers. The first follow-up survey was administered in 2011 to 52,328 participants enrolled from 2006-2009. Using self-reported cancers from this survey confirmed by medical records, the feasibility and validity of ascertaining incident cancers through registry linkage was examined. The first full follow-up survey was administered to the entire cohort in 2015.

Results: In total, 303,682 participants initially enrolled in CPS-3, of whom 254,650 completed all aspects of enrollment and are being sent regular follow-up surveys. Twenty-three percent of participants were male, 17.3% were non-white, and the median age was 47 years. Approximately 32% of men and 30% of women were obese, and 51% of women were pre-menopausal. The response rate to the 2011 follow-up survey was 86% and the sensitivity of registry linkage was 89%. Response to the 2015 follow-up survey was 73%, and over 1,500 tissue specimens have been received to date.

Conclusions: CPS-3 will be a valuable resource for cancer research due to its size, rich exposure data, blood samples, tumor tissue, and cancer outcomes collected over time. Furthermore, linkage with multiple cancer registries appears to be a sensitive method for ascertaining cancers in large-scale epidemiologic cohort studies.

3:30 pm - 5:00 pm

[illegible][illegible]

NOTES:

3:30 pm - 5:00 pm

D

[illegible]

2D2

CHILDHOOD CANCER DATA COLLECTION: A TREND ANALYSIS OF TIMELINESS FROM NPCR-ECC (OCTOBER 2012-OCTOBER 2017 SUBMISSIONS)**KB Zhang**¹, O Galin¹, J Stanger¹, Y Ren¹, S Ranasinghe¹, R Wilson², T Williams², L Douglas²¹ICF, Fairfax, VA, United States; ²Centers for Disease Control and Prevention, Atlanta, GA, United States

Introduction: Compared with cancers diagnosed in adults, cancer incidence in children and young adults (aged 19 years and younger) is less common. Therefore, a focused approach is needed to obtain timely report and sufficient data to support scientific research and public health surveillance. CDC's Early Case Capture (ECC) of Pediatric and Young Adult Cancers (PYAC) program was created to address this issue. Built on the existing National Program of Cancer Registries – Cancer Surveillance System (NPCR-CSS), the ECC project captures state surveillance data on childhood cancers from the latest available year, sometimes within 30 days of diagnosis for specific sites

Purpose: This study examines trends in the timeliness of childhood cancer incidence data from the ECC system, which began submitting data in October 2012 through November 2017.

Methods: Measures of timeliness are an essential aspect of the ECC project and must be calculated in a similar manner across ECC registries. Three timeliness measures have been applied by the ECC registry and the results have been reported to CDC during each ECC data submission. These measures assess improvements in reporting timeliness and data availability for use by a researcher. They address the intent of the Caroline Pryce Walker Conquer Childhood Cancer Act and have been shared with Congress to demonstrate progress. These three measures are: (1) timeliness of first source record, (2) timeliness of reporting a case to the central registry, and (3) timeliness of data availability for use by a researcher. For all the three measures, cases with an unknown day of first contact or day of diagnosis have been excluded from the calculation.

Results and Conclusion: The changes in timeliness over time may suggest the overall improvements in data collection among the participating states. Areas for improvement will also be revealed.

2D3

TIMELINESS OF CANCER REPORTING AT THE MARYLAND CANCER REGISTRY**W Ross**¹, K Stern², A Stanley-Lee¹¹Westat, Rockville, MD, United States; ²Maryland Department of Health, Baltimore, MD, United States

Background: Cancer registries collect tumor-related data to monitor incidence and in some circumstances prevalence rates. Cancer registries also support population-based research. A concern among researchers with using population-based registry data is timeliness of reporting. Delayed reporting of cancer cases can result in an underestimation of cancer rates. Data timeliness has been recognized as an important data characteristic by the standard setters for cancer registries.

Purpose: The goal of this study is to evaluate the timeliness of case reporting and explore the factors that aid and hinder timeliness in the Maryland Cancer Registry (MCR).

Methods: Using MCR data where the date of diagnosis occurred from years 2011 to 2015, Westat calculated the average time to reporting among hospital reporters. Timeliness of reporting was measured from date of diagnosis to the date the case was submitted to the MCR. Westat categorized the time to reporting into 6, 9 and 12+ months. Hospital reports were then placed in 6-month and 9-month reporting categories. Feedback was given to the reporters for comparison among other hospital facilities. Analyses were conducted using SAS.

Results/Discussion: In this presentation, we will discuss the time to reporting statistics and trends as well as factors that facilitated more timely reporting and barriers against timeliness. Lastly, we will discuss processes used by the MCR to improve timeliness.

3:30 pm - 5:00 pm

NOTES:

Results and Conclusion: Qualitative and quantitative findings from early case capture of pediatric cancer from 2012-2017 will be presented. We will discuss methods, timeliness, completeness, and areas for improvement. We will also describe the impact of the ECC project on cancer prevention and control policy in Kentucky, new data dissemination tools, as well as research projects that have resulted from this work.

2E1

**SOCIAL VALUE JUDGEMENTS IN SES DISPARITIES ASSESSMENT
USING HD*CALC - COLORECTAL CANCER MORTALITY**

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Background: Colorectal cancer mortality rates dropped by half in the past three decades, but these gains were accompanied by striking differences in colorectal cancer mortality by socioeconomic status (SES). Evaluations of SES disparities in CRC mortality are usually based on implicit or explicit value judgements towards disparity aversion. The absolute concentration index (ACI) and relative concentration index (RCI) in HD*Calc have been extended to allow modify the value of the aversion parameter to reflect different value judgements.

Purpose: The objective of this study is to examine disparities in colorectal cancer mortality by SES using summary measures of health disparities considering alternative social value judgements about disparity aversion.

Methods: All reported CRC deaths in the United States from 1980 to 2010 were categorized into SES quintiles and assessed at the county level. Absolute and relative concentration indices (ACI and RCI) were computed using HD*Calc to graph disparity over time. The ACI and RCI calculated based on several values of aversion parameters are presented in addition to the default value. Joinpoint was used to test for significant changes in trends.

Results: Disparities by SES significantly declined until 1993–1995, and then increased until 2010, due to a mortality drop in populations living in high SES areas that exceeded the mortality drop in lower SES areas. HD*Calc results were consistent for both absolute and relative concentration indices. Inequality aversion parameter of 2, 4, 6, and 8 were compared to explore how much CRC mortality was concentrated in the poorest quintile compared to the richest quintile. Weights larger than 4 did not increase the slope of the disparities trend.

Conclusion: There is consistent evidence for a significant crossover in CRC disparity from 1980 to 2010. Trends in disparity can be accurately and readily summarized using the HD*Calc tool. The disparity trend, combined with published information on the timing of screening and treatment uptake, is concordant with the idea that introduction of medical screening and treatment leads to lower uptake in lower compared to higher SES populations and that differential uptake yields disparity in population mortality.

2E2

USING HD*CALC WITH COMPLEX SURVEY DATA

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Background: The National Cancer Institute's Health Disparities Calculator (HD*Calc) allows simultaneous examinations of multiple summary measures of health disparities. Early developments have focused on analyzing data collected from population-based disease surveillance systems, such as cancer incidences from the Surveillance, Epidemiology, and End Results Program and cancer deaths from the National Vital Statistics System. However, as detailed studies of health disparities in outcomes, such as cancer screening uptake, can be conducted only through national complex surveys, inference methods and tools are not available.

Purpose: This paper describes the NCI's recent development of extending the use of HD*Calc to survey data collected with complex designs, such as the data from National Health Interview Survey and the National Health and Nutrition Examination Survey.

Methods: This presentation demonstrates the impacts of survey sampling features (i.e., weighting, stratification, and clustering) on the accuracy and precision in estimating HD measures. This new development derives point, variance, and interval estimation methods for all 11 measures that were considered in the original version of HD*Calc. These methods are evaluated numerically under various sample designs through Monte-Carlo simulation studies, and seamlessly incorporated into the HD*Calc.

Conclusions: The new survey estimators produce unbiased and consistent estimates of all measures of HD. Health outcomes can be measured as binary variable, such as whether a woman receives screening, or a continuous variable, such as the body mass index. Using this software, survey data users can obtain estimates of all 11 measures of health disparities at once and have the option to visually compare these measures and explore temporal trends.

3:30 pm - 5:00 pm

2F1S

CHANGES IN HEALTH-RELATED QUALITY OF LIFE IN OLDER WOMEN AFTER DIAGNOSIS WITH GYNECOLOGICAL CANCER: A POPULATION-BASED ANALYSIS USING THE SURVEILLANCE, EPIDEMIOLOGY, AND END RESULTS – MEDICARE HEALTH OUTCOMES SURVEY

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Background: The impact of gynecological cancer on health-related quality of life (HRQOL) in older women is not fully understood. One of the major limitations of previous studies is the lack of pre-cancer diagnosis quality of life data, which makes it difficult to draw conclusions about the impact of cancer on HRQOL. While several studies have evaluated the impact of cancer treatment on HRQOL, few studies, if any, have measured the differences in HRQOL from before to after gynecological cancer diagnoses.

Purpose: To evaluate the impact of gynecological cancer diagnosis on HRQOL in older women.

Methods: This longitudinal analysis uses the Surveillance, Epidemiology, and End Results – Medicare Health Outcomes Survey linked database. Women aged 65 and older who were diagnosed with cervical, ovarian, or uterine cancer between baseline and follow-up surveys ($n = 233$) were propensity matched to cancer-free controls ($n = 1,165$). Physical component summary (PCS) and mental component summary (MCS) scores of HRQOL were derived from the Short Form 36 and Veterans RAND 12. Analysis of covariance was used to estimate changes in HRQOL scores between surveys. Logistic regression was used to evaluate impairments in activities of daily living.

Results: Preliminary findings show that PCS and MCS scores worsened for women with cancer, and that these declines were significantly greater than for women without cancer. Greatest declines were observed for PCS scores in women with ovarian and uterine cancers. Compared to cancer-free women, women with cancer were significantly more likely to have difficulty bathing, dressing, eating, getting in/out of chairs, walking, and using the toilet.

Implications: These findings may provide insight into the adverse effects of gynecological cancer on physical and mental health in older women and improve understanding of changes in functional status associated with gynecological cancer.

2F2S

THE ASSOCIATION BETWEEN LIFETIME SCREENING FOR CANCER AND RECEIPT OF ANNUAL FLU VACCINATION: ARE THERE REINFORCING EFFECTS OF PREVENTION SEEKING?

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Background: An annual flu vaccination (AFV) is a simple, effective method to reduce the effects and complications of seasonal flu.¹ This is especially true for health compromised individuals.² Screening for cancer (SC) is another proactive way individuals can reduce health risk.

Methods: We hypothesized that people with SC are motivated to receive other preventative measures. This study tests the association between lifetime SC and receipt of AFV using data from the BRFSS 2016 survey. Weighted and adjusted multivariable logistic regression models were used to investigate this association within 3 groups; males and females 50-65 years old (YO) ($N = 131,062$; males = 58,165; females = 72,897), females 25-65 YO ($N = 133,630$), and males 50-75 YO ($N = 90,782$); groups chosen based on breast, cervical, prostate and colorectal SC standard recommendations.

Results: The odds of receiving AFV were significantly greater in males 50-65 YO ($OR = 2.25$, 95%CI: 2.03-2.48), males 50-75 YO ($OR = 2.29$; 95%CI: 2.09-2.50), and females 25-65 YO ($OR = 1.22$; 95%CI: 1.06-1.41) who received SC compared to their counterparts without SC. However, no significant association between SC and AFV was observed among females 50-65 YO ($OR = 1.11$; 95%CI: 0.80-1.54).

Conclusions: The finding of no association for 50-65 YO women is of concern. There is more to understand regarding why women do not experience the same reinforcing effect of lifetime SC on receiving an AFV.

References:

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2F3S

DISPARITIES IN SYSTEMIC THERAPY USE IN ADVANCED-STAGE NON-SMALL CELL LUNG CANCER (NSCLC) BY SOURCE OF HEALTH INSURANCE

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Background: Research advances have shed light on the biology and pathophysiology of NSCLC and resulted in the development of numerous systemic therapies, including targeted therapies, that have extended survival for many people with advanced-stage disease. However, a high proportion of patients do not receive systemic treatment and the treatments associated with the best survival are underutilized, especially among persons with low socioeconomic status (SES). While prior studies have considered associations by SES, the impact of health insurance on receipt of systemic treatment is unclear.

Purpose: To describe disparities in systemic therapy utilization by health insurance status among stage IV NSCLC patients in California

Methods: Using California Cancer Registry data (2012-2014), we developed multivariable logistic regression models to assess the independent effect of health insurance type on systemic therapy use. Systemic treatment information was abstracted from treatment text fields.

Results: A total of 17,314 patients were evaluated. The likelihood of receiving any systemic therapy was significantly lower for patients with insurance coverage by Medicaid/other public (OR = 0.39, 95% CI = 0.34-0.46), Medicare-Medicaid dual-eligible (OR = 0.84, 95% CI = 0.76-0.93), military (OR = 0.57, 95% CI = 0.41-0.82), and the uninsured (OR = 0.25, 95% CI = 0.19-0.34) compared to those with private insurance. Among patients with nonsquamous histology, the likelihood of receiving targeted therapy was significantly lower for patients with insurance coverage by Medicaid/other public (OR = 0.46, 95% CI = 0.38-0.56), military (OR = 0.37, 95% CI = 0.21-0.67), and the uninsured (OR = 0.35, 95% CI = 0.23-0.54) compared to those with private insurance.

Conclusions: Substantial disparities in the use of systemic therapies exist by health insurance type in California. Patients with public or no insurance have significantly decreased odds of receiving targeted therapy or any systemic treatment at all.

2F4S

CANCER SURVIVOR PREVALENCE OF HEPATOBILIARY CANCERS IN THE SEER POPULATION, 1975-2014

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Background: The number of U.S. cancer survivors is rapidly increasing due to an aging population and improvements in care. Cancers with an incidence rate of <15 cases per 100,000 persons are underrepresented in the literature. Rare cancer survivorship is not well understood. We conducted a descriptive analysis of the prevalence of hepatobiliary cancer survivors among the Surveillance, Epidemiology, and End Results (SEER) program population

Methods: We examined point prevalence estimates within the SEER 9 Registries Research Database for cases diagnosed 1975-2014 for liver, bile duct, gallbladder, and ampulla of Vater primaries. Prevalence estimates were overall and by anatomic site, sex, and race for 2000, 2005, 2010, and 2014, adjusted to U.S. population estimates. Percent changes in point prevalence from 2000-2014 were calculated.

Results: In 2000, the estimated prevalence of liver cancers was 0.005% (n = 1,318), was higher among males (0.007%, n = 865) than females (0.003%, n = 453), and was highest among people of other race (0.01%, n = 362). For biliary cancers (0.007%, n = 1,818), the estimated prevalence was equal by sex and was higher among whites (0.007%, n = 1,465) and people of other race (0.008%, n = 232). From 2000-2014, all sites showed increasing point prevalence with largest increases in liver (302%) and intrahepatic bile duct cancers (105%). By sex, percent increase in survivors for liver cancer was higher among males (346%) than females (219%), without a marked difference in biliary cancers. The percent increase in point prevalence in liver cancer was higher among whites (340%) and blacks (305%) and lowest among people of other race (176%). These changes in biliary cancers were highest among blacks (76%) and lower in whites (47%) and people of other race (41%).

Conclusion: Despite the fatal nature of hepatobiliary cancers, survivorship prevalence increased between 2000-2014 highlighting questions about changes in cancer etiology, treatment, and survivorship.

3A1

THE DEVIL'S IN THE DATA DETAILS: NATIONAL PROGRAM OF CANCER REGISTRIES (NPCR) COMPONENT 2 PUBLIC HEALTH SURVEILLANCE PILOT PROJECTS ON PROGNOSTIC FACTORS, BREAST AND CERVICAL CANCER SCREENING, AND CIN III

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Background: In 2017, NPCR funded Component 2 surveillance projects to promote advanced data collection and linkage activities within cancer registries related to prognostic factors, breast and cervical cancer screening, and cervical intraepithelial neoplasia (CIN III)

Purpose: To identify the feasibility of, and the barriers to, collection of new information on cancer cases via cancer registries.

Approach:

1. Prognostic Factors: Grantees created a list of biomarker items, met with stakeholders, identified facility partners, worked on data capture and data use process, and plan to use eMaRC software.
2. Breast and Cervical Cancer Screening: Some grantees are focusing project efforts in one region and will work with health care providers, hospitals, and mammography centers. Grantees are linking registry to State National Breast and Cervical Cancer Early Detection Program minimum data elements, All Payer Claims, and other data sources.
3. CIN III: Grantees are exploring the possibility of linkage with vaccine (Michigan) or cervical cancer screening data. To understand CIN III classifications used by pathologists, grantees will perform CIN III audits in early 2018.

Results: NPCR Component 2 grantees are currently in the planning phase of the project. Results are forthcoming.

Implications: Prognostic factors data collected through public health surveillance projects may bridge the gap between population-based health and personalized diagnosis and treatment of cancer in clinical settings. Linkage with central cancer registries leads to more specific and readily available cancer data, which may facilitate more informed and targeted decision making between physician and patient. Linking immunization or cervical cancer screening data with cancer registry data may potentially provide a more complete picture of cervical cancer prevention and burden. Breast and cervical cancer screening data may enhance data completeness and improve screening and treatment outcomes for women.

3A2

RACIAL DISPARITIES IN UTERINE CORPUS CANCER SURVIVAL IN THE UNITED STATES BY AGE AND STAGE

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Background: Cancer of the uterine corpus has among the largest racial disparities in cancer survival in the United States. Information is limited regarding how this gap differs by age and stage.

Purpose: To describe black vs. white uterine corpus cancer survival by stage and age.

Methods: We identified patients diagnosed with uterine corpus cancer from 2007 to 2013 in the Surveillance, Epidemiology, and End Results Program registries. Cases were stratified by race (white, black), age group (0-49, 50-64, 65-74, 75+), and SEER summary stage (localized, regional, distant). SEER*Stat software was used to obtain 5-year relative survival rates with 95% confidence intervals (95% CI).

Results: For all stages combined, the racial disparity in uterine corpus cancer 5-year relative survival rates increased with age, from an absolute difference of 10.4% among women <50 years (89.1% [95% CI 88.2% - 89.9%] in whites vs. 78.7% [95% CI 75.4%-81.6%] in blacks) to 31.9% among those ages ≥75 years (71.5% [95% CI: 69.7% - 73.2%] vs. 39.6% [95% CI: 35.0% - 44.0%]). By stage, the black-white survival disparity within each age group was largest for regional stage disease, for which the absolute difference ranged from 11.8% in ages <50 years (82.5% [95% CI: 79.8% - 84.8%] in whites vs. 70.7% [95% CI: 61.9% - 77.8%] in blacks) to 26.6% in ages ≥75 years (55.6% [95% CI: 52.0% - 59.0%] vs. 29.0% [95% CI: 21.6% - 36.7%]). The difference in the proportion of cases diagnosed at a localized stage in whites and blacks was substantially smaller in ages <50 years (72% vs. 64%, respectively) compared to ages ≥75 years (58% vs. 40%).

Conclusion: The magnitude of the black/white disparity in uterine corpus cancer survival dramatically increases with older age. Reasons for this pattern may reflect in part differences in stage distribution. However, further research on the impact of treatment receipt and other factors, including histologic type, is needed.

3A3

MONITORING THE IMPACT OF HPV VACCINE USING TISSUES FROM CENTRAL CANCER REGISTRIES (HPV TYPING 2 STUDY)

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Background: In the United States there is no population-based systematic effort to track the human papillomavirus (HPV) genotypes among HPV-associated cancers.

Objectives: To describe an infrastructure and process for the systematic monitoring and assessment of the distribution of HPV types in HPV-associated cancers after introduction of the HPV vaccine

Methods: In December 2016, the Centers for Disease Control and Prevention partnered with three population-based cancer registries (in Iowa, Kentucky, and Louisiana) to obtain archival tissue for HPV-associated cancers diagnosed in 2014 and 2015. Cancer sites included cervix (invasive and *in situ*), anus, and oropharynx. Additionally, a majority of rectal squamous cell cancers and all scrotal cancers were included to evaluate HPV prevalence. Younger age groups (<35 years at cancer diagnosis) were oversampled for most cancers to better detect vaccine impact. Following tissue block selection and sectioning, samples were sent to the CDC HPV lab for DNA assays. Demographic and clinical characteristics will be evaluated by cancer site and HPV status. HPV genotype distribution will be compared to 2005 pilot study results (pre-vaccine introduction) to determine the potential impact of the vaccine.

Results: This study has implemented cost-saving measures and improved upon the pilot study's methodology by utilizing centralized labs at the state level for tissue processing. The reliance on pathology labs to pull tissue blocks remained a major rate-limiting step. As of December 2017, 65% of samples had been transmitted (n = 864/1331). Data collection will continue through February of 2018.

Conclusion: Findings from this study can be used to further optimize future monitoring of HPV genotype distribution in HPV-associated cancers, determine the type-specific prevalence of HPV-associated cancers in the United States, and evaluate the impact of the vaccine after its introduction to the market in 2006.

3A4

OVARIAN CANCER INCIDENCE AND SURVIVAL IN THE UNITED STATES BY SUBTYPE, AGE, AND RACE/ETHNICITY

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Background: Ovarian cancer is a highly fatal disease with differences in occurrence and survival by histologic subtype. Information on this variation by race/ethnicity is limited.

Purpose: To describe ovarian cancer incidence and survival patterns by subtype, age, and/or race/ethnicity in the United States.

Methods: We analyzed ovarian cancer incidence rates for 2010–2014 by age, race/ethnicity, and major histologic type (epithelial, germ cell, and sex cord-stromal) using data obtained from the North American Association of Central Cancer Registries, Inc. We present 5-year cause-specific survival for cases diagnosed during 2007–2013 using data from all 18 Surveillance, Epidemiology, and End Results program registries.

Results: Most ovarian cancers are epithelial tumors, accounting for about 90% of total cases in non-Hispanic whites (NHWs) and Asians/Pacific Islanders (APIs); 84% in Hispanics; and 82% in non-Hispanic blacks (NHBs). Although epithelial tumor incidence is highest among NHWs and lowest among APIs overall, rates are similar in these two populations through ages 50–54 years; after age 70, however, rates in NHWs are double those in APIs. Five-year cause-specific survival is higher for germ cell (94%) and sex-cord stromal (88%) than for epithelial (47%) tumors, with even lower survival (43%) for serous carcinoma, the predominant epithelial subtype. Five-year survival for epithelial tumors is 57% in APIs, 52% in Hispanics, 47% in NHWs, and 35% in NHBs; survival is lowest among NHBs for all stages and types.

Conclusions: Ovarian cancer survival varies substantially by race/ethnicity, with NHBs and APIs showing the lowest and highest survival, respectively, across all major histologic types. The low survival in NHBs may reflect non-optimal treatment, while the higher survival in APIs may reflect a lower proportion of serous epithelial tumors and higher survival for this type of tumor. Further research is needed to determine the source of these disparities.

3B1

INVESTIGATION OF A POSSIBLE LINK BETWEEN POLLUTION FROM MILITARY FACILITIES AND CANCER ON ST. LAWRENCE ISLAND, ALASKA**D O'Brien¹**¹Alaska Cancer Registry, Anchorage, AK, United States

Background: St. Lawrence Island (SLI) is home to the 2 remote Alaska Native communities of Savoonga & Gambell. The community residents had healthcare concerns from pollution left behind from formerly used defense sites on the island. Although the military structures were removed from the island in 2003 and remediation of the sites occurred, there are still some chemicals in the environment, the main ones of concern being petroleum, dioxin, and PCBs

Methods: ATSDR contacted the Alaska Cancer Registry (ACR) on behalf of the SLI communities to conduct a cancer study. A study was conducted in January 2014 and was updated in September 2015 with more recent data. The number of expected cases was calculated and compared to the number of observed cases. Although there were more observed cases than expected, the additional observed cases were not statistically significant. A case count review for incidence and mortality was also performed. There was nothing unusual about the number of cases occurring annually or the types of cancers observed, though the number of lung cancer cases and deaths were unusually high, with 27% of all cancer cases and 45% of all cancer deaths.

Results: In July 2017, ACR performed a cancer mortality study. There were more observed cancer deaths than expected, but unlike the incidence study, the additional observed deaths were statistically significant. Since lung was by far the most common type of cancer, ACR conducted a lung cancer study for mortality and incidence. The additional lung cancer mortality and incidence cases were both found to be statistically significant. BRFSS smoking data for SLI indicated 53% of adults were current smokers, more than twice the state average. ACR smoking data indicated that 100% of the lung cases were current or former smokers.

Conclusions: These findings suggest that lung cancer cases and deaths on SLI are correlated with smoking in this community. Public health efforts focusing on reducing tobacco use could decrease the burden of cancer for SLI residents.

3B2

DID 9/11 CAUSE CANCER? THE ROLE OF THE STATE CANCER REGISTRY IN ANSWERING THE QUESTION**A Kahn¹, M Schymura¹, B Qiao¹**¹New York State Cancer Registry, Albany, NY, United States

Background: The World Trade Center (WTC) attacks had both short- and long-term effects. While not an urgent concern, cancer became a significant personal as well as political issue. In January 2007, the New York State Cancer Registry (NYSCR) was invited to participate in a meeting that included three groups tasked with studying health effects of 9/11: The World Trade Center Health Registry, the Fire Department of New York, and the WTC Health Program. We subsequently matched each cohort to the NYSCR several times, providing varying levels of data and expertise.

Purpose: We will describe our involvement in WTC-related cancer incidence studies, focusing on our role of trusted third party for a new, collaborative project involving WTC responders from all three groups.

Methods: Previously, we had used LinkPlus to match each cohort to the NYSCR. The three groups had used different exposure measures, reference populations, and start dates for their analyses. Their study populations were not mutually exclusive. For the new project, we used LinkPlus and SAS to de-duplicate and consolidate 79,062 records of adult responders from the three study cohorts into one file of 69,143 persons. The collaborators agreed on common definitions of start date and exposure measures. We are providing the consolidated file to twelve additional central registries for linkages

Results: Early reports from the studies had identified 1,277 invasive cancers among responders. All three found excesses of prostate and thyroid cancers and fewer than expected lung cancers. We found over 5,500 matches in the recent match of the consolidated cohort to the NYSCR and will provide preliminary results.

Conclusions: Identifying cancers possibly associated with 9/11 continues to be an important and challenging function of the NYSCR. We are enthusiastic about the possibilities for the current project to provide a unified, comprehensive message regarding this politically sensitive public health issue.

3B3

CANCER RISK AMONG FLORIDA FIREFIGHTERS

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Background: Cancer risk among firefighters is greater for select cancer sites; however, further research is needed to determine the role of various sociodemographic and occupational factors.

Purpose: To describe the cancer risk among Florida firefighters using a unique data linkage between the Florida Cancer Data System (FCDS) (1981-2013; ~3.2 million records) and the Florida State Fire Marshal's Office employment records (n = 108,772).

Methods: Over 78% of Florida firefighter employment records with sufficient information was linked with Lexis Nexis to obtain social security number (SSN) and other missing information (e.g., gender). A probabilistic linkage using R (v 3.3) with the following identifiers were used to link these records to FCDS data: SSN, address, date of birth, gender, and name. We calculated gender-specific age-adjusted standardized incidence ratios (SIR). Since linkage completion, permission was obtained for SSN release from the Fire Marshal's Office that will enable us to update our linkage with ~30,000 additional firefighter records.

Results: Firefighters in our initial linkage were 91% male and 9% female. Among males, the risk of cancer was significantly elevated for colon (SIR = 1.26, 95% Confidence Interval: 1.04-1.47), rectum (1.35, 1.02-1.68), melanoma (2.39, 2.11-2.67), genital system, (1.66, 1.53-1.79), urinary system (1.60, 1.37-1.82), endocrine system (2.79, 2.21-3.37), oral/pharynx (1.46, 1.18-1.73), and prostate (2.10, 1.93-2.27). Among females, cancer risk was significantly elevated for the endocrine system (1.91, 1.13-2.70).

Conclusions: There is evidence of elevated risk in cancer sites not seen in previous studies, highlighting the need for continued surveillance and research of cancer risk among firefighters. Updated linkage efforts currently underway will enable us to confirm these findings and assess the level of bias introduced when attempting to assess occupational and non-occupational cancer risk using incomplete records.

3B4

MALIGNANT MESOTHELIOMA AGE-ADJUSTED INCIDENCE RATES AND TRENDS FROM THE NEW JERSEY STATE CANCER REGISTRY (NJSCR) AND THE SURVEILLANCE, EPIDEMIOLOGY, AND END RESULTS (SEER) REGISTRIES, 1992-2014

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Background: Malignant mesothelioma (MM) is a rare, aggressive cancer with a poor survival rate. The predominant risk factor for MM is asbestos exposure.¹ Malignant mesothelioma has been more common among men, which is likely due to their increased exposure to asbestos in the occupational setting. Given the latency for MM is a median of 32 years², and the implementation of safety regulations over the past several decades, it is an opportune time to evaluate this cancer's geographical incidence and time trends.

Methodology: Data were obtained from the New Jersey State Cancer Registry (NJSCR) and SEER public-use databases. SeerStat and JoinPoint were used to generate age-adjusted incidence rates and annual percent change (APC) for MM. ArcMap was used to display age-adjusted MM incidence rates and APC trends on a map of the SEER registries to visualize regional variations.

Results and Conclusions: In New Jersey men, there were statistically significant declines for MM between 1992 and 2010 (APC = -1.05[^]) and 2010-2014 (APC = -10.81[^]). This reflects trends seen nationally. Statistically significant declines were seen in men among SEER registries between 1992 and 2014: San Francisco-Oakland (APC = -3.86[^]), Seattle (APC = -2.56[^]), and Los Angeles (APC = -1.78[^]). There were no significant changes in MM incidence rates among women. This rate of decline among men coincides with the implementation of national safety regulations over the past several decades.

[^] = Statistically significant change in rates over time, p<0.05.

References:

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2. Lanphear BP, Latent period for malignant mesothelioma of occupational origin. J Occup Med.1992;34:718-721.

3C1

**VIRTUAL POOLED REGISTRY CANCER LINKAGE SYSTEM:
BUILDING A BRIDGE TO STREAMLINED IRB/REGISTRY
APPLICATION PROCESSES FOR MULTI-REGISTRY LINKAGES**

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MD, United States; ³Los Angeles Cancer Surveillance Program, Los
Angeles, CA, United States

Background: Central cancer registries currently have individual
data request applications and review processes. For multi-registry
linkages, completion of the varied forms and duplicative review
of the same protocol is time- and resource-intensive for both
researchers and registries.

Purpose: The NAACCR Virtual Pooled Registry Cancer Linkage
System, in coordination with NCI, is pursuing two initiatives to
streamline the application and review process: a Central IRB for
minimal risk linkage studies and a templated application when
Central IRB is not possible.

Methods: NCI posted a solicitation in 2017 for applicants to manage
a Central IRB for multi-registry minimal risk linkage studies which
could utilize an expedited review process and comply with NIH
policies stipulating use of a single IRB for NIH-funded multi-site
studies. NAACCR gathered local IRB and registry applications,
itemized all questions, and developed a Templated IRB/Registry
Application (TIRA) of common questions. Registries provided
feedback on the TIRA and completed a survey on their ability to use
the Central IRB or to adopt the TIRA in lieu of their state-specific form.

Results: Development of the Central IRB is ongoing. Comments on
the TIRA have been incorporated into the template or identified as a
state-specific addendum. Preliminary survey results reveal that over
42.3% of local IRBs favor using a Central IRB, 38.5% are uncertain,
and 19.2% are unable. Local IRBs that perform their own review are
unlikely to adopt the TIRA; however, among the registries without an
IRB, but with a registry review process, 41.9% are able to use the TIRA,
32.3% are uncertain, and 3.2% indicated that their registry-specific
form must be used.

Conclusions: Central registries and their IRBs have indicated
a positive response to use of the Central IRB or TIRA. Once
implemented, use of these two mechanisms will help streamline the
application and review process for multi-registry linkage studies.

3C2

**WEB PORTAL FOR VIRTUAL POOLED REGISTRY CANCER
REGISTRY LINKAGE SYSTEM (VPR-CLS)**

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Background: The Virtual Pooled Registry Cancer Linkage System
(VPR-CLS) has been created to address the inability of researchers
to efficiently perform linkages with multiple registries. Funded
by NCI and managed by NAACCR, the VPR-CLS provides a single
portal through which researchers apply to link their data with
multiple registries. Researcher cohort files are securely transmitted
to registries, linkages are run simultaneously, and reports on the
number of matched cases are sent back to the researchers. The
match counts enable researchers to prioritize which registries to
approach for IRB/Registry approval and release of individual-level
data on the matched cases.

Purpose: Authors will provide updates on the progress in
developing a portal and tracking system for the VPR-CLS. The
presentation will provide an overview of the system workflow and a
review of features from the researcher and registry perspective.

Methods/Approach: The VPR-CLS portal uses a customized instance
of Bioshare software developed by IMS, Inc. The goal of this project
is to develop an intuitive system where applications are submitted,
reviewed, and approved; provide a way for registries to receive files
and share match results; create a streamlined IRB/registry application
process; and allow NAACCR staff to monitor the status of linkages

Results: The result of this project web portal is a robust web
application with secure data transmission, auto-notifications, voting,
commenting, and an IRB/Registry application process.

Conclusions/Implications: Providing a web portal that is directly
connected to cancer registries will facilitate the process for
conducting initial registry linkages. The streamlined IRB/registry
application process will also assist researchers in coordinating multi-
state approval for release of cancer data.

3C3

USING THE VIRTUAL POOLED REGISTRY CANCER LINKAGE SYSTEM FOR INTERSTATE DEDUPLICATION, RESULTS FROM SECOND PILOT TEST

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Background: A potential use of the NAACCR Virtual Pooled Registry Cancer Linkage System (VPR-CLS) is to facilitate linkages among central registry databases. The impact of interstate deduplication and consolidation on measures of state and U.S. cancer burden is unknown.

Purpose: Based upon recommendations from the first pilot test of interstate deduplication using cryptographic hashing software that was performed in 2016, an expanded pilot test using data from three central registries with large caseloads and shared borders was conducted in 2017.

Methods: This pilot included data from CT, NJ, and NY and evaluated changes including modification of hashed linkage logic to allow for partial matches and streamlined data processing using a single honest broker site. Staff at IMS, Inc. hashed the registry data and Case Western Reserve University performed the linkage using a HIPAA-compliant process. A working meeting was held at the National Cancer Institute with attendees from the three states, NAACCR, IMS, Inc., and the Georgia registry to compare performance of the hashed person-level interstate linkage process with results of probabilistic linkage and to identify potential rules for automated adjudication of tumor-level matches.

Results: Over 3.4 million registry records were hashed and linked, and data on over 24,000 patients were in more than one registry. Comparison of hashed and probabilistic results for the CT/NJ linkage showed sensitivity of 97.01% and specificity of 99.98%. All tumor-level records associated with true person matches were run through algorithms to apply Multiple Primary and Histology coding rules and categorize the matches and identify potential rules for automated match adjudication.

Conclusions: This second pilot project plotted the course for future use of the VPR-CLS in interstate deduplication. Future plans include making further modifications to the hashing software and testing in additional registries and several tests of tumor-level matching.

3C4

LINKAGE OF THE U.S. RADIOLOGIC TECHNOLOGISTS (USRT) COHORT WITH NATIONWIDE NAACCR CANCER REGISTRIES: METHODS AND PRELIMINARY RESULTS

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Background: The nationwide USRT cohort (N = 146,022), through 4 questionnaires since 1983, has reported estimates of cancer incidence risk in relation to occupational radiation exposure. To address concerns about incomplete/inaccurate self-reported cancer case ascertainment (and declining questionnaire response rates), the USRT cohort was linked with 47 volunteer NAACCR population-based cancer registries as part of a Virtual Pooled Registry (VPR) feasibility study.

Purpose: To determine feasibility and the completeness and accuracy of cancer incidence ascertainment through NAACCR registries in comparison with questionnaire-based self-report

Methods/Approach: The VPR feasibility study has three phases: (1) link USRT data with 47 NAACCR registries to assess registry participation and the number of person matches, (2) obtain registry/IRB approvals for release of cancer incidence data for matched USRT cases, and (3) evaluate the added value of registry-based compared with self-reported cancer case ascertainment.

Results: In phase 1, registries reported 24,845 high-quality person matches. The ongoing phase 2 indicates that individual level data will be released from registries for 98% (N = 24,299) of these matches, but not for 2.2% (N = 546). To date, we have received 50% of requested data and preliminary results indicate that a substantial number of incident cancers not previously reported by cohort members are identified through linkage. Final phase 2 results and initial results from phase 3 will be presented. The primary challenge for the VPR feasibility study include:

1. For applicant: complexity/multitude of applications and agreements across registries.
2. For registries: non-standard protocols and increased demand for linkages.

Conclusions: Preliminary results indicate that cohort linkage with NAACCR cancer registries is feasible while simultaneously improving the completeness of case reporting as well as enhancing the level of detail characterizing the cancers compared with self-reports.

3D1

RECRUITMENT AND RETENTION: A CHALLENGE FOR CENTRAL CANCER REGISTRIES**F Ross**¹, M Dryden², M Schymura³¹Kentucky Cancer Registry, Lexington, KY, United States; ²Cancer Registry of Greater California, Sacramento, CA, United States; ³New York State Cancer Registry, Albany, NY, United States

An organization's most valuable assets are the talent, expertise and resources of its work force. Talent management—the area of human resources which includes recruitment and retention—is extremely important to an organization's success and long term survival. This is certainly as true in cancer surveillance as it is in business and industry. Both hospital-based and central cancer registries are experiencing a shortage of qualified, experienced, and interested prospective employees. The NAACCR Professional Development Steering Committee has been asked to examine the issues, strategies, and potential solutions for recruitment and retention of qualified staff at central cancer registries. To this end, the committee has developed a survey of 11 questions for central registry managers and directors, to assess their needs, concerns, and ideas in this area. The survey will be made available on the NAACCR web site and it will be advertised through the NAACCR listserv tool. The responses from the survey, both quantitative and qualitative, will be compiled and presented at the NAACCR Annual Conference in 2018.

3D2

WILL DATA QUALITY SUFFER WITHOUT VISUAL EDITING REVIEW OF "RESOLVE PATIENT SET" TASKS?**N Lozon**^{1,2}, P Nicolin^{1,2}, J Whitlock^{1,2}, I Han^{1,2}, J George^{1,2}, R Shore^{1,2}, F Vigneau^{1,2}¹Wayne State University, Detroit, MI, United States; ²Karmanos Cancer Institute, Detroit, MI, United States

Background: The Metropolitan Detroit Cancer Surveillance System (MDCSS) uses the SEER database management system (SEER*DMS) to review, process, and consolidate data from area facilities. SEER*DMS processes defined record types using automated jobs, such as data linkages and sends records through a workflow that creates tasks for staff review and input. A "Resolve Patient Set" task is created where at least one path record and one initial abstract have been linked to a patient and the only edits remaining are review flags to visually edit demographic, tumor, staging, or address information. To evaluate whether MDCSS could fully automate "Resolve Patient Set" tasks without adversely affecting the quality of the data, we investigated whether visual review by a trained cancer registrar was needed to capture coding errors.

Methods: We selected "Resolve Patient Set" tasks for 2015 diagnosed cases processed in August-September of 2016. We selected a random sample of breast (n = 53), colorectal (n = 58), prostate (n = 49), ovarian (n = 50), lymphoma (n = 40) and lung (n = 122) cases for a total of n = 372 cases. We assessed variables integral to describing stage at diagnosis and surgery: CS Stage, CS Size, CS Ext, CS Eval, CS LN Eval, CS Mets Eval, Mets at Dx, LN Exam, LN Positive, SEER Summary Stage, Site Specific Factors, Surgery, and LN Biopsy.

Results: After routine visual editing, we found errors which automated linkage would miss. The error rate per record (ERR) and average error per record (AER) varied by cancer site from 65-93% and 2.72-6.50, respectively (breast: ERR = 79%, AER = 2.72; colorectal: ERR = 90%, AER = 4.36; prostate: ERR = 65%, AER = 3.04; ovary: ERR = 90%, AER = 4.38; lymphoma: ERR = 93%, AER = 6.50; lung: ERR = 93%, AER = 4.84) and facility of origin. Review of frequent errors is in progress to determine if edit rules can be created for some cancer sites and facilities to fully automate, while requiring human review of problematic sites and facilities.

CONCURRENT SESSION 3

Wednesday, June 13

9:00 am - 10:30 am

IMPROVING REGISTRY OPERATIONS

D

3D3

NAACCR PATHOLOGY LABORATORY ELECTRONIC REPORTING VOLUME 5, VERSION 5

J Mazuryk^{1, 2, 3}

¹Cancer Care Ontario, Toronto, Ontario, Canada; ²NAACCR, Springfield, IL, United States; ³The College of American Pathologists, Chicago, IL, United States

Background: Since the original publication of the NAACCR Pathology Laboratory Electronic Reporting Version 4.0 in April 2011, a shift has been occurring in pathology from traditional diagnoses to person-centric care. Biomarker testing is increasing as new tailored treatments are being introduced. With this increase comes the need for registries to capture additional results from multiple types of reports, from the same specimen. This shift adds to the complexity in the transition from traditional domain hospitals and non-hospital setting, and expands on the number of players involved.

Purpose: To provide a summary and overview of changes between NAACCR Pathology Laboratory Electronic Reporting Version 4.0 and Pathology Laboratory Electronic Reporting Version 5.0

Approach: In 2015, NAACCR assembled an ePath Taskforce, consisting of subject matter experts from various cancer pathology-related healthcare fields; spanning multiple government and private sector organizations, in both the United States and Canada. The working group was assigned the task of revising version 4, to reflect the current shift occurring in cancer pathology reporting.

Results: Pathology Laboratory Electronic Reporting Version 5 is geared towards clarifying capture of Specimen, Date, Institutional, and Provider identifiers. Changes made to NAACCR pathology reporting requirements were necessary in order for central cancer registries to track multiple types of reports on the same specimen; and subsequently addendums, amendments, or consults.

Implications: The ramifications of the change in reporting requirements will require resources both within the state/provincial cancer registries and within the transmitting laboratories. With the new reporting requirements that have been properly implemented, cancer registries will benefit from the ability to create specimen pathology report collections and track missing reports that may not have been transmitted.

3D4

SETTING THE STAGE FOR CHANGE: UPGRADING THE PHYSICIAN CANCER CASE REPORTING APPLICATION IN NEW YORK

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Background: Since 2011, the New York State Cancer Registry has employed electronic reporting of cancer cases from physicians (especially dermatologists, urologists, hematologists, and oncologists) who diagnose/treat cancer in outpatient settings. Physicians use our secure web-based application to submit patient, cancer diagnosis, and treatment information. Through 2017, physicians submitted 30,320 invasive cancer reports: 6,167 melanoma, 12,543 prostate, 3,699 hematopoietic, and 7,911 other cancer types. Over 75% of the reports were proactively reported, and the remainder were in response to laboratory follow-back requests for 2011-2015 year of diagnosis.

Purpose: Our physician application was intentionally designed to capture NAACCR data elements that are available to clinicians in the medical record, using selection lists when possible to improve data quality and reduce unnecessary coding by NYSCR staff. The discontinuation of collaborative stage items, introduction of many staging/prognostic factors, and the implementation of AJCC Cancer Staging 8th Edition make it necessary to redesign the application, especially how we collect cancer stage at diagnosis.

Approach: After review of all final NAACCR 2018 Implementation documentation, we will carefully consider which prognostic and staging data items are necessary, while maintaining the favorable physician user experience. Additionally, data received through the current design will be examined to identify potential areas for improving quality, such as using additional edit checks or imposing more data submission requirements.

Program Outcomes/Implications: Redesign of our physician reporting tool requires careful consideration, detailed specification documentation, prioritization of technical resources, and revisions to all educational documentation. We will present our evaluation and subsequent decisions regarding the redesign of our application and plans for education/outreach to providers.

3E1

THE ASSOCIATION OF BREAST CANCER SUBTYPES, GUIDELINE-CONCORDANT TREATMENT AND SURVIVAL AMONG PATIENTS WITH STAGE I-III DISEASE**M Hsieh**¹, L Zhang¹, X Wu¹, M Davidson¹, M Loch², V Chen¹¹Louisiana Tumor Registry, School of Public Health, LSU Health Sciences Center, New Orleans, LA, United States; ²Hematology and Oncology, School of Medicine, LSU Health Sciences Center, New Orleans, LA, United States**Background:** Recent research has confirmed that breast cancer is not a single disease; it contains four subtypes based on its biomarker status. These subtypes respond differently to specific treatments and have varied survival rates.**Objectives:** We examined the association of treatment guideline-concordance and survival by breast cancer subtype after adjusted sociodemographic and clinical factors.**Methods:** Female breast cancer patients aged 20 years and older with microscopically confirmed stage I-III disease diagnosed in 2011 were obtained from the Louisiana Tumor Registry (LTR), which is one of CDC-NPCR funded Comparative Effectiveness Research Specialized Registries. The guideline-concordant treatment was defined according to the 2011 National Comprehensive Cancer Network (NCCN) treatment guidelines. Logistic regression was used to identify factors associated with treatment. Kaplan-Meier method and Cox proportional hazards model were employed for survival analysis.**Results:** Of 1,864 eligible patients, 70.3% were whites and 29.7% were blacks. The majority of patients (70.3%) had hormone receptor positive (HR+) and human epidermal growth factor receptor 2 negative (HER2-) tumor, followed by 13.9% HR-/HER2- (TNBC-triple negative breast cancer), 10.5% HR+/HER2+, and 5.3% HR-/HER2+. Women with HR+/HER2+ subtype had the least likelihood of receiving guideline-concordant therapy among all patients before and after adjusting for covariates, but had lower risk of dying from both cancer cause-specific and overall survival than those with HR-/HER2+ or TNBC subtype. After adjusting for the subtype and other factors, women who did not receive guideline treatment or did not complete treatment had higher risk of all-cause death, 55% (HR: 1.55; 95% CI: 1.16-2.09) and 51% (HR: 1.51; 95% CI: 0.99-2.30), respectively.**Conclusions:** The treatment guideline-concordance varies by breast cancer subtypes and not receiving guideline treatment is associated with increased risk of death.

3E2

TRIPLE-NEGATIVE BREAST CANCER INCIDENCE ACROSS THE UNITED STATES: CORRELATIONS WITH AREA-LEVEL SES AND BEHAVIORS**J Moss**¹, C Morgan¹, L Zhu¹, Z Tatalovich¹, K Cronin¹¹National Cancer Institute, Bethesda, MD, United States**Background:** Triple-negative breast cancer (TNBC) is an aggressive subtype of breast cancer, more commonly diagnosed among women who are young or African American than among other groups. TNBC varies across geography, but little is known about what area-level characteristics are associated with elevated TNBC incidence.**Purpose:** Map TNBC incidence across state economic areas (SEAs) and evaluate correlations with area-level social and behavioral characteristics.**Methods:** We generated 2011-2013 age-adjusted TNBC incidence rates for SEAs in 42 states using data from the Cancer in North America files. For breast cancer cases missing data on molecular markers, we imputed TNBC status. We linked these data to covariates drawn from national data sources: population characteristics, socioeconomic status (SES) variables, urbanicity, healthcare variables, and prevalence of selected health behaviors. Using Poisson regression, we examined bivariate and multivariable correlates of overall and race-/age-specific TNBC incidence per 100,000 women**Results:** The annual incidence of TNBC ranged across HSAs from 5 to 27 per 100,000 women (mean = 15 per 100,000 women), with especially high rates among African American women (mean = 22, range: 0-155 per 100,000 women). Incidence of TNBC is especially high in southeastern areas of the United States. In bivariate models, overall TNBC incidence was higher in areas with lower SES and with higher prevalence of smoking and obesity. In multivariable models, most measures of the relationship between SES and TNBC incidence lost statistical significance, and negative associations between recent mammography and TNBC incidence emerged. These patterns were similar for race- and age-specific TNBC incidence.**Conclusions:** TNBC incidence rates varied dramatically across the U.S., particularly for African American women. Additional research on area- and individual-level correlates of TNBC incidence are needed to support interventions to prevent TNBC.

3E3

BREAST CANCER SUBTYPES DEFINED BY JOINT HORMONE RECEPTOR AND HER2 STATUS AMONG U.S. CASES WITH AFRICAN ANCESTRY BY PLACE OF BIRTH**H Sung**¹, C DeSantis¹, S Fedewa¹, A Jemal¹¹American Cancer Society, Atlanta, GA, United States

Background: A recent finding indicated that the proportion of estrogen receptor (ER)+ to ER- breast tumors varied substantially among African American breast cancer patients by place of birth. Herein, we extended this study by incorporating information of human epidermal growth factor 2 (HER2) status from a high-quality population-based data.

Methods: Breast cancer cases diagnosed from 2010-2014 were obtained from database of the North American Association of Central Cancer Registries, Inc. (NAACCR). Among cases with known birth place, molecular subtypes were defined by joint hormone receptor (HR; ER and progesterone receptor [PR])/HER2 status. Unordered polytomous logistic regression was performed to assess associations of birth places (U.S., Western Africa, and Eastern Africa) with joint HR/HER2 subtypes adjusted for age, diagnosis year, stage, histology, grade, and poverty level. We used HR+/HER2- tumors as the reference outcome and U.S.-born black (or white) as the reference covariable.

Results: Compared with U.S.-born blacks, Eastern Africa born blacks were less likely to have triple-negative subtype (OR = 0.35; 95% CI = 0.24-0.52) and Western African born blacks were more likely to have HER2-enriched subtype (OR = 1.47; 95% CI = 1.06-2.03). Compared with U.S. born whites, U.S.-born and Western Africa born blacks were 83% and 91% more likely to have triple-negative and 17% and 65% more likely to have HER2-enriched subtype, respectively, while Eastern Africa born blacks were less likely to have triple-negative subtype (OR = 0.64; 95% CI = 0.44-0.94).

Conclusion: We found triple-negative and HER2-enriched subtypes were most common among Western Africa born blacks while both subtypes were least common among Eastern Africa born blacks. Our study highlights substantial heterogeneity of breast cancer molecular subtypes among self-identified black women in the U.S., which has implications in future investigations of breast cancer in both the U.S. and Sub-Saharan Africa.

3E4

EXAMINING SUBSEQUENT OCCURRENCE AND OUTCOMES OF ESTROGEN-RELATED CANCERS (BREAST AND THYROID) IN MISSOURI WOMEN**I Zachary**^{1,2}, J Jackson-Thompson^{1,2}, J Du², **C Schmaltz**^{1,2}¹Health Management and Informatics, University of Missouri, Columbia, MO, United States; ²Missouri Cancer Registry and Research Center, University of Missouri, Columbia, MO, United States

Background: Both breast and thyroid cancers occur primarily in women and both are estrogen-related. Women diagnosed with either breast or thyroid cancer are more likely to develop the other cancer. Because thyroid cancer has a relatively low mortality and breast cancer survival is high, follow up and treatment for this growing group of survivors is particularly important.

Purpose: Evaluate the risk of developing thyroid cancer after being diagnosed with breast cancer and thyroid cancer after being diagnosed with breast cancer; survival outcomes of these subsequent cancers will be evaluated.

Methods: We will examine demographic (age at diagnosis of first cancer, race, residence) and tumor-related characteristics (stage, time between diagnoses) of women with both thyroid and breast cancer in the central cancer registry database from 2005 through 2015 and their survival. All female patients with breast cancer, thyroid cancer, or both breast and thyroid cancer from 2005 to 2015 are included. Women with triple negative breast cancer will be excluded. The risk of subsequent tumors will be calculated for both women initially diagnosed with a breast tumor and those initially diagnosed with a thyroid tumor. Survival analysis will be used to compare the outcomes of women after being diagnosed with subsequent estrogen-related breast or thyroid cancer.

Results: Preliminary results have identified over 100 patients with subsequently-occurring breast and thyroid cancer, demonstrating an increased risk of thyroid cancer as a second malignancy after a breast cancer diagnosis and an increased risk of breast cancer as a second malignancy following a thyroid cancer diagnosis.

Conclusion: There is a clear increase in developing either breast or thyroid cancer as a secondary malignancy after a diagnosis with either cancer. Follow up of patients for this cancer survivor group is important and targeted follow up can be beneficial for outcomes.

4A1

CANCER PREVALENCE: THE BENEFITS OF A CENTRALISED NATIONAL REGISTRY IN ACCURATELY IDENTIFYING THOSE LIVING WITH AND BEYOND CANCER

J Charnock^{1,2}, L Young^{2,3}

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Background: The cancer population is growing, due to increases in incidence and improved survival. Understanding this population through the calculation of cancer prevalence is vital for healthcare providers to enable best possible care, to allow evidence-based service provision, and to explore demographic variations.

Purpose: This work aims to highlight the importance of accurate and timely cancer prevalence data, particularly at a local level where this has the biggest impact on the provision of healthcare for the cancer population.

Methods: 21-year prevalence was calculated (2005-2015) for England stratified by the following: 22 individual tumour types, sex, age at diagnosis, age in 2015, ethnicity, deprivation, and stage at diagnosis. These demographics are further segmented by sub-national geographies.

Results: 1.8 million people were living after a cancer diagnosis in England at the end of 2015, with large regional variation in cancer prevalence rates for all cancers. Per 100,000 population London has a substantially lower crude prevalence rate than any other region (2,420), whilst the South West has the highest (3,900). 12% received their diagnosis within the previous 12 months; however, the largest proportion of patients had been living between 5-10 years following their diagnosis (27%). Proportions vary by tumor type: 89% and 1% of those with mesothelioma are within 0-4 and 15-21 years of their diagnosis respectively, compared to 28% and 24% of those with cancer of the testis.

Conclusions: These granular results allow for an in-depth understanding of the cancer population at both national and sub-national levels. Understanding the size of the cancer population as well as the time since cancer diagnosis is vital in identifying the type and level of support required, including rehabilitation and mental health services. Using this data, local healthcare providers are able to plan services adequately and assist in identifying unmet need.

4A2

ARE MISSED CASES CONTRIBUTING TO THE DECLINE IN PROSTATE CANCER INCIDENCE?

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Background: Prostate cancer incidence declined 1.4% per year between 1999-2009, with a greater decline of 7.6% per year between 2009-2014. Prior studies have linked declining incidence to decreased PSA screening. However, some men with prostate cancer may have been missed by the cancer registry, contributing to declining incidence.

Purpose: This study assessed trends in the number of men who received treatment consistent with a prostate cancer diagnosis but were not identified as prostate cancers in the SEER data.

Methods: The cohort was obtained from a random 5% sample of Medicare eligible men age 65 and older who were linked to the SEER registry. Men in the study resided in a SEER area and did not have a prostate cancer diagnosis in the SEER registry data. Medicare claims for these men were reviewed for diagnosis and treatment codes consistent with a prostate cancer diagnosis. Men were considered probable missed cases if they received radical prostatectomy or radiation therapy for prostate cancer. Possible missed cases included men with a claim for a prostate biopsy, no claim with a prostate cancer diagnosis in the year prior to the biopsy, and a claim with a prostate cancer diagnosis code within 2 months after the biopsy.

Results: The number of men identified as potential prostate cancer cases decreased over the years considered. Based on probably prostate cancers, the percent of missed cases decreased from 11% in 2001 to 6% in 2013 (15% to 12% including possible cases).

Conclusions: Changes in the number of probable and possible missed cases did not contribute to the decreasing trend in prostate cancer incidence. However, using claims to identify active surveillance is challenging with some cases missed. As more men are actively followed as their first course of treatment, registries need to develop methods to determine if these cases are missed and how this impacts estimates of prostate cancer incidence.

4A3

PROSTATE CANCER INCIDENCE, MORTALITY AND PROSTATE-SPECIFIC ANTIGEN (PSA)-BASED SCREENING RATES IN MAINE IN RELATION TO CHANGES IN U.S. PREVENTIVE SERVICES TASK FORCE (USPSTF) PROSTATE SCREENING RECOMMENDATIONS**D Yob**¹, M Schwenn²¹University of Southern Maine, Portland, ME, United States; ²Maine Cancer Registry, Maine CDC, DHHS, Augusta, ME, United States

Background: Prostate cancer accounted for 20% of all malignant cancers among Maine males and 9% of all male cancer deaths in 2015. The impact in Maine of PSA screening rates and prostate cancer incidence and mortality following the USPSTF 2008 and 2012 changes in PSA screening recommendations is unknown.

Purpose: To characterize trends in prostate cancer incidence, mortality, and PSA screening rates in Maine and compare to U.S. rates. Comparisons include age, geography, race (white and non-white due to small non-white Maine population), cancer stage, and other demographics.

Methods: We used SEER*Stat and Joinpoint software and data from the 1995-2015 Maine Cancer Registry database, 1995-2014 NACCR Incidence-CiNA Public File, National Cancer Institute 1969-2015 Mortality file, and Behavioral Risk Factor Surveillance System (BRFSS) data using SAS and BRFSS WEAT to determine PSA screening rates.

Results: Incidence in Maine declined -9.5% APC in 2007-2014; among U.S. white males rates declined -7.6% APC 2007-2014. Differences were observed by age, stage, and county. Among U.S. white males, distant stage rates increased 4.0% APC 2010-2014 and 1.7% APC 2000-2014 in Maine. Mortality in Maine declined -3.3% APC 1991-2015 and in the U.S. -3.3% APC 1999-2013 and -0.4% APC 2013-2015. Current screening rates are significantly lower in Maine than the U.S. median and the decline in Maine has been greater than the U.S. change. 2016 estimates of PSA testing among men ages 40 years and older were 29% in Maine and 40% in the U.S.

Conclusions: Prostate cancer incidence and screening significantly declined among men after the 2008/2012 USPSTF guideline changes. Among U.S. whites, the decline in mortality appears to be slowing. Benefits are associated with reduced PSA screening although recent data support concerns about future increases in late-stage prostate cancer. Longer follow-up is needed to see whether decreases in screening are associated with increased mortality.

4A4

APPLICATION OF CINA DATA: GEOGRAPHIC PATTERNS IN LUNG CANCER INCIDENCE**D Lewis**¹, R Jones¹, J Fisher¹, B Graubard¹, D Silverman¹, S Devesa¹¹National Cancer Institute, Bethesda, MD, United States

Background: National geographic variation in lung cancer incidence overall and by histologic type in the United States has not been explored.

Purpose: We are evaluating lung cancer incidence by histologic type using Cancer Incidence in North America (CiNA) data. Aims include examining geographic patterns of lung cancer incidence and smoking prevalence.

Methods: The NAACCR Institutional Review Board approved this project. State cancer registries were asked for data access. We mapped age-adjusted lung cancer incidence rates overall and by histologic type and smoking prevalence data from the Behavioral Risk Factor Surveillance System and the NCI Current Population Survey-Tobacco Use Supplement.

Results: Cases diagnosed during 2004 to 2014 were included for NAACCR high quality data states (42 states plus the District of Columbia). Total lung cancer incidence rates per 100,000 males (in parentheses) were highest in Kentucky (104.6), Mississippi (94.1), Arkansas (90.2), Tennessee (89.3), and West Virginia (88.8). Female rates were highest in Kentucky (69.3), Delaware (60.0), West Virginia (59.0), Massachusetts (58.6), and Rhode Island (58.2). Rates were lowest in Utah among both males and females. Ongoing analyses are exploring the geographic variation in the cigarette smoking-lung cancer incidence relationship.

Conclusions: Male lung cancer rates are highest in the south; however, female rates are high in mid-Atlantic and New England states. Further analyses will provide insight into risk similarities and differences based on histologic type (adenocarcinoma, squamous cell carcinoma, and small cell carcinoma) by geography, demographic characteristics, and smoking prevalence. The comprehensive geographic coverage of the CiNA dataset enables evaluation of cancer incidence patterns across the United States.

4B1

USING SEER DATA TO DEVELOP SYNTHETIC CANCER TRAJECTORIES THAT ENABLE CANCER RESEARCH

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Background: Development of synthetic cancer data (i.e., cancer patient data that is realistic, but not actual patient data), could enable unidentifiable cancer data to be made more widely available for research. Further, it could lead to deeper understanding of the drivers of patterns and variation in population-based data. This study uses SEER data provided by LSUHSC-LTR to develop and assign computer-generated cancer diagnoses and treatment/outcome trajectories to individuals in a synthetic population.

Methods: The approach leverages a population of almost 4.4M synthetic individuals generated by RTI International to match 2010 Louisiana Census data on variables like sex, age, and race. SEER cancer case information is employed to appropriately assign synthetic breast cancer cases to synthetic individuals in the RTI population based on demographic and clinical variables included in SEER and the RTI data. SEER and vital statistics data are used to build a state space model that describes the probabilities that synthetic individuals transition from one state to another (e.g., from healthy to receiving a cancer diagnosis or from living with cancer to mortality due to cancer) that depend on individual characteristics in SEER such as sex, age, race, and stage of diagnosis. Applying the state space model to the 2010 synthetic population enables development of synthetic populations for other years.

Results: The synthetic population with synthetic cancer cases and the state space model enable investigation of key research questions, including healthcare demand modeling; the effects of changes in public health interventions, demographics, treatments, risk factors, and exogenous factors like climate change; estimation of recent SEER registry data not yet released; and prediction of cancer patient outcomes.

Conclusion/Implications: The method could be applied to include multiple cancer types or other diseases in the entire U.S. synthetic population developed by RTI.

4B2

ADVANCING CANCER SURVEILLANCE IN LESS RESOURCED SETTINGS THROUGH ADAPTATION OF SEER ANALYSIS TOOLS

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Background: Analysis of cancer mortality data is a key metric to evaluate progress against cancer. This requires vital data systems and cancer surveillance analytical tools, such as NCI's SEER*Stat used widely in North America. This software, however, requires data content and structure rarely available in low resourced settings

Methods: We made two technical improvements in SEER*Prep to facilitate data input into SEER*Stat. One, we used several conversion guidelines (NCI-SEER's Cause of Death Recode, IARC-CI5's groupings, CDC-NCHS's Translator) to match ICD-9 with ICD-10 codes at the 3-digit level. Two, we developed a feature to input aggregate mortality data (i.e., 5-year age group for death counts). U.S. cancer mortality data for 1979-2015 was compared to existing SEER Cause of Death Recode to validate the new classification.

Results: The 3-digit classification performs very well for cancer and non-cancer causes of death. For cancer, it can match almost all the ICD-9/ICD-10 groupings. Major non-correspondences include less specific sites and 'Hematopoietic' and 'Lymphoid' malignant neoplasms. For non-cancer, the exceptions are 'In situ, benign or unknown behavior neoplasms', 'Alzheimer's', 'Suicide', and 'Homicide'. Trends to evaluate consistency over time are shown.

Discussion/Conclusion: This new version of SEER analysis tools will advance cancer surveillance capacities in countries with limited staff and technical expertise, such as those in the IARC-GICR Caribbean Hub. As the leading public health agency for the Caribbean region, CARPHA has been a crucial broker that can provide a system for pooling country-specific mortality data, run checks/edits, and provide feedback to the country to correct/improve the mortality figures. These new features in SEER*Prep will be a valuable resource to build a stronger and more accessible cancer surveillance system for mortality data in the Caribbean region that can be used with confidence by public health officials/leaders.

4B3

BRIDGING THE PATH TO THE FUTURE USING A NEW DATA ITEM CONSOLIDATION TOOL: REGISTRY PLUS CONSOLIDATION RULES EDITOR

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Background: Automated data item consolidation is very complex, especially for cancer staging data. There is an increased need for customization and flexibility. Modifying customized consolidation tables for each NAACCR version release has become increasingly time consuming due to creating testing scenarios and testing consolidation logic. Understanding the consolidation language used in the Registry Plus software has been challenging for users. Depending on the quality of the incoming data, consolidation logic may not produce the same result for all registries. Extensive testing is needed to evaluate consolidation specifications and business rules.

Purpose: To present the features and plans of the Registry Plus Consolidation Rules Editor, a new tool to manage data item consolidation rules and implement modifications more efficiently; to review the user interface which simplifies the process of creating customized consolidation tables; and to present the ease of testing consolidation logic using the tool.

Approach: An overview of the Registry Plus Consolidation Rules Editor will be provided. The tool allows selection from a library of existing consolidation directives to generate data item-specific rules, provides the capability to modify consolidation directives using an interface, and includes the ability to test the consolidation logic as the rules are selected or generated. The presentation will illustrate the use of the Registry Plus Consolidation Rules Editor to generate a consolidation rule for a NAACCR data item and demonstrate the testing functionality to validate the generated consolidation rule

Conclusion: This presentation will summarize the features of the Registry Plus Consolidation Rules Editor, illustrate how the enhanced tool can assist staff in managing customized consolidation tables, and demonstrate how the tool can assist registries in testing consolidation.

4B4

IMPLEMENTING TELEMETRY RECORDING IN REGISTRY SOFTWARE TO PROVIDE ONGOING PERFORMANCE FEEDBACK

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Users are the most valuable source of information when it comes to assessing how well software tools perform in terms of efficacy and usability. However, while users will report errors or “bugs” in software, they often lack the time to provide feedback on how well the software is performing in day-to-day practice. Questionnaires and survey take too much time to fill out and are difficult to design to get meaningful information.

An alternative method is to have the software itself monitor user activity and provide on-going feedback in the form of “telemetry.” Telemetry has been incorporated into many software applications and consumer products, such as Netflix and automobiles. Telemetry is also an important aspect of quality management practice, particularly for software systems that are deemed to be medical devices or ancillary to medical devices.

In this talk, we describe the telemetry built into our automated cancer abstracting and coding system. We present the format and content of the telemetry data and show how the data are analyzed to gain insight into user interactions with the system and to ultimately improve the performance of the software on an ongoing basis.

4C1

EVALUATING RECORD LINKAGE SOFTWARE USING REPRESENTATIVE SYNTHETIC DATASETS**B Liu**¹, M Yu¹, EJ Feuer¹¹National Cancer Institute, Bethesda, MD, United States

Background: The NCI's Surveillance Epidemiology and End Results (SEER) program has been increasingly engaged in initiatives utilizing record linkage techniques to capture additional medical information (e.g., treatment information, genetic tests, etc.) that cannot be obtained through traditional medical record abstraction. A variety of linkage software products exist and some are freely accessible. In addition, to fulfill the linkage need of the Virtual Pooled Registry System, a new linkage software, Match*Pro, has been recently developed by Information Management Services, Inc. for the NCI. Evaluations of the software using real data have restrictions due to unknown truth and limited data accessibility to the patient health identifiers beyond other restrictions related to the Divisions' and Institute's requirements in sharing the dataset. Synthetic but representative datasets may facilitate a full evaluation.

Purpose: To systematically test the usability of the new software Match*Pro and compare it with other linkage software including the CDC's LinkPlus and the Census Bureau's BigMatch using representative synthetic datasets.

Methods/Approach: Representative model-based synthetic datasets containing patient health identifiers mimicking the U.S. cancer population are generated assuming different error rates/distributions using Python language. Record linkages are then run with the different record linkage software using each of the synthetic datasets as input respectively.

Results: Linkage quality measures including precision, recall, and F-measure are computed from each linkage software and each data scenario.

Conclusions: Synthetic data provides a useful data source for testing record linkage software as the truth is known. The quality of the final record linkage results may depend on user's pre-set up value of the cutoff point and user chosen blocking variables.

4C2

AN INTRODUCTION TO FASTLINK FOR PROBABILISTIC RECORD LINKAGE**A Alexandersson**¹¹Florida Cancer Data System, University of Miami, Miami, FL, United States

Background and Purpose: This presentation is an introduction to the R package fastLink for probabilistic record linkage. Probabilistic record linkage is also known as fuzzy matching and Fellegi-Sunter record linkage. Applications are many and varied. The three main steps are pre-processing, the actual linking, and post-processing. The authors of fastLink are Ted Enamorado, Ben Fifield, and Kosuke Imai at Princeton University. The presenter does record linkages at the Florida Cancer Data System (FCDS). FCDS is Florida's statewide cancer registry. At the time of the abstract submission, the presenter used the R package RecordLinkage for linkage data requests and he was evaluating fastLink and Link*Pro by IMS as possible alternatives. Why pick fastLink as opposed to RecordLinkage or Link*Pro? Three reasons: fastLink can be faster, easier to use, and easier to integrate with general-purpose statistical software.

Methods: The presentation will show how to use the current version of fastLink for a typical linkage data request at FCDS. Stata will be used for the steps that fastLink cannot handle. Two reasons are that the presenter mostly prefers Stata over similar general-purpose statistical software such as R and SAS, and presentation time is limited. fastLink will be compared with RecordLinkage and Link*Pro. The presentation tool is Stata Markdown for PDFs.

Results: At the time of the abstract submission, the version of fastLink was 0.2. The next version release was expected soon and to have two new critical features: (1) the confusion matrix for measuring linkage errors, and (2) new variables with the pattern, probability, and weight so that you can discard what is not of use.

Conclusion: fastLink, RecordLinkage, and Link*Pro are all useful software for probabilistic record linkage. If you know Stata or R, you likely will prefer fastLink (version 0.3 or later) for typical linkage data requests. If you do not know Stata or R, you likely will prefer Link*Pro.

4C3

LINKAGE ADJUDICATION PRACTICES AND PERSPECTIVES: A QUALITY STUDY IN SEER REGISTRIES

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Background: Linkages of cancer registry data with external data sources are increasing. In almost every linkage, a proportion of linked data can have a high degree of uncertainty due to incomplete or suboptimal linkage variables, which frequently necessitates a manual review and a decision to accept or reject the linkage for a case.

Purpose: (1) To assess the variability rates in accepting/rejecting linkages selected for manual review and adjudication. (2) To describe practices and approaches of SEER registries during review of linked data (3) To propose a plan for standardization of linkage adjudication process.

Methods: We used breast cancer cases diagnosed 2010-2015 that had Oncotype DX test reported in Site Specific Factor (SSF) 22 and compared it to linked test results from three separate linkages. All SEER registries completed a detailed questionnaire on practices and processes followed during the manual review of uncertain linkages, resources used, and threshold for accepting or rejecting a linkage

Results: Registries differed significantly in rejecting linkages for cases already reported having Oncotype DX in SSF22 (1% to 19%). The majority of the registries do not provide any formal training or have established procedures to guide personnel tasked with the manual review. Registries differ in the use of external sources they used to help with the decision to accept linkage as well as the degree of certainty they use as a threshold for accepting linkages.

Conclusion: Significant variability exists among SEER registries in their approaches to manual review of uncertain linkages. Implementing a standardized method for linkage adjudication could decrease variability, increase the number of linked cases, and enhance the quality of data.

4C4

FEASIBILITY OF DEDUPLICATING DEIDENTIFIED DATA SUBMITTED TO CDC'S NATIONAL PROGRAM OF CANCER REGISTRIES

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Background: Duplicate records of cancer cases make it difficult to assess the completeness of case ascertainment. Each year, state cancer registries in CDC's National Program of Cancer Registries (NPCR) submit deidentified data files to CDC. The registries are required to remove duplicate records from the data files before submission. However, if the same patient was diagnosed or treated in more than one state, duplicate records may exist in multiple states. The current process does not search for duplicate records in all state cancer registry databases.

Purpose: This project will analyze the feasibility of checking all deidentified NPCR records for duplicates each year.

Approach: Deidentified data will be imported into Link Plus or LinkPro, where a deduplication program will identify cases that have a high probability of being duplicates.

Results: The presentation will illustrate the analysis of cases with a high probability of being duplicates. The presentation will review multiple data items and explain why the final set of data items was chosen to provide the best results. Results will be reviewed for trends across annual submissions, and how they affect the completeness of case ascertainment.

Conclusion: This presentation will summarize the results and limitations of this approach to deduplication. If it is found to be feasible, the presentation will explain how NPCR registries can use this analysis.

4D1

CLUSTER BLUSTER: CANCER TENDS TO CLUSTER LESS THAN OTHER DISEASES AND CONDITIONS

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Background: The notion of cancer clusters is deeply embedded in public health consciousness, though wide use of the phrase only dates to 1983, when seven cases of childhood leukemia over a 28-year period in the village of Seascale, England received substantial publicity. We became interested in why cancer is the only disease that is perceived to occur in clusters, when racial and income segregation, regional cultural practices, variations in health care delivery, and variations in physical climate would suggest the existence of other stronger candidates.

Methods: We calculated measures of spatial inhomogeneity for all common causes of death, including specific cancer types, reported in the CDC Wonder database; a variety of conditions reported in a 5% sample of Medicare patients; site-specific cancer incidence reported to the North American Association of Central Cancer Registries, Inc.; and various sociodemographic measures collected by the U.S. Census.

Results: Preliminary results suggest that cancer tends to exhibit less spatial variation than other chronic diseases. Among more common cancer mortality sites, lung, larynx, stomach, and cervix exhibit relatively high spatial heterogeneity on par with conditions such as COPD and pneumonia while breast and pancreas exhibit little spatial variation even relative to cancer.

Discussion: The idea that cancer in particular occurs in a spatially clustered fashion is a sustained myth. It may persist so strongly in part due to the demographics of cancer patients and the relatively high survival for certain cancer types. Geospatial variation of cancer can provide insight into etiology, contextual social structures, and important intervention points. But the public perception about cancer clusters is a barrier to appropriate public health resource allocation.

4D2

CANCER CLUSTER INVESTIGATIONS – THE NEW MEXICO EXPERIENCE

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Background: In New Mexico, public concern about cancer clusters often arises from perceived risks related to environmental exposures, such as contaminants from uranium mining, national defense laboratories, nuclear test sites, and industrial waste. It is common for concerned citizens to contact multiple agencies with the same inquiry, thereby duplicating effort for public health officials. Officials also face the challenge of finding meaningful results with a small number of cancer cases in a sparsely populated state.

Purpose: To describe an infrastructure that was developed to address cancer cluster concerns in NM.

Methods: The NM Tumor Registry and NM Department of Health convened the Cancer Concerns Work Group (CCW), a cross-agency collaboration. The CCW is comprised of experienced public health professionals with complementary expertise in the areas of epidemiology, environmental and occupational health, toxicology, and health promotion. The CCW established a formal protocol to address public inquiries about cancer clusters based on recommendations from the Centers for Disease Control and Prevention, NAACCR, and other sources. The group created standardized protocols to govern investigations, communications, and report templates. Activities have been promoted via online and public meetings.

Results: The CCW has investigated 18 inquiries since the protocol's implementation. The streamlined process increased efficiency and timeliness of responses. To date, all but one report revealed negative findings.

Conclusions: Although results generated from most analyses were equivocal, the benefits of developing such reports remain. Cancer cluster inquiries have generated important opportunities for professional collaboration, as well as engagement with local communities, advocacy groups, and tribal governments. Reports provide cancer education and resources for prevention, and analyses of cancer concerns allow for quality control of cancer surveillance data.

CONCURRENT SESSION 4

Thursday, June 14

10:30 am - 12:00 pm

GEOSPATIAL & COMMUNITY CLUSTERS

D

4D3

INVESTIGATION OF OCULAR MELANOMA – AN AGGRESSIVE FORM OF RARE TUMOR DIAGNOSED CLINICALLY

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Background: Investigation of a potential rare form of cancer cluster can be challenging for the cancer registries and traumatic for the families concerned. In 2013, the North Carolina Central Cancer Registry (NC CCR) received a request to evaluate the incidence of ocular melanoma, a rare tumor diagnosed among five young women ages 19 – 31 between 2011 and 2015, who attended the same high school and/or lived in the Town of Huntersville prior to their diagnoses. Ocular melanoma is a rare disease, diagnosed clinically. In the United States, approximately 2,500 adults are diagnosed with ocular melanoma each year. The incidence is approximately 5 to 7.5 new cases per one million people per year. Males have an increased incidence compared to females. The incidence rate increases with age and peaks near age 70.

Methods: In November 2013, May 2014, January 2015 and again in May 2015, the NC CCR conducted cluster investigations of the incidence of ocular melanoma. Based on the cases reported from the North Carolina facilities, CCR did not observe an excess of ocular melanoma cases above what would be expected in the concerned area during 2009 - 2015.

Results: This presentation will address the multiple steps involved and the challenges faced by the NC CCR with respect to time, resources, lack of pathology reports, involvement of the media, knowledge, and communication skill required of the registry staff throughout the investigation. Further, this presentation will highlight the importance of timely case-ascertainment from physicians' office and data exchange between states.

Conclusion: This investigation provided an opportunity and information for ophthalmologists from different facilities and states to better understand this rare disease and the need for a clear and consistent case-definition to be used for the diagnosis of ocular melanoma.

4D4

AVAILABILITY OF CANCER TREATMENT IN MONTANA: WHERE ARE THE GAPS?

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Background: As a rural state, Montanans are often faced with extensive travel during cancer treatment and the added financial strain and time that entails. The Montana Cancer Coalition has identified "increasing the availability of and access to diagnostic and cancer treatment modalities" as one of its priorities.

Purpose: This study will identify where there are gaps in the availability of treatment and what patient populations are most affected. Study questions: What proportion of Montanans diagnosed with invasive cancer from 2011 to 2015 live within a < 90 minute drive from a facility that offers the type of treatment they received? Are some patient groups more likely to live ≥ 90 minutes from a treatment facility?

Methods: Montana Central Tumor Registry data will be used to identify patients who were diagnosed with invasive cancer from 2011 to 2015 and who received some form of treatment. These patients will be divided by broad treatment categories: each surgery specialty, chemotherapy, and radiation therapy according to the treatments they received. Facilities that offer each of these types of treatment will be geocoded. Geospatial analysis will identify patients within each treatment group that live ≥ 90 minute drive from any facility that offers their treatment type. Chi square tests will be used to assess whether a higher proportion of patients live ≥ 90 minutes from a treatment facility based on age at diagnosis, cancer site, cancer stage, race, and primary payer.

Results: There were 28,730 cases of invasive cancer diagnosed in Montana from 2011 to 2015. Of these, 26,569 cases received some form of treatment. Analysis is ongoing so no final results are available at this time. Final results will be presented.

Conclusion: Identifying gaps in the availability of cancer treatment by type and by patient characteristics will allow the Montana Cancer Coalition to better design interventions to improve the availability of treatment and improve the quality of life for patients and care givers during treatment.

4E1

SEER VIRTUAL TISSUE REPOSITORY INITIATIVE: CURRENT STATUS AND FUTURE GOALS**V Petkov¹**, A Van Dyke¹, S Hussey¹, A Wang¹, S Friedman¹, L Penberthy¹¹National Cancer Institute, Rockville, MD, United States

Background: Several SEER registries participate in research involving collection and use of biospecimens from community pathology laboratories. Building on this experience, SEER is in the process of establishing a Virtual Tissue Repository (VTR) Program, which will enable researchers to search de-identified SEER abstracts and pathology reports to select tumors for which SEER registries will provide the specimens and additional clinical data if needed.

Methods: To assess best practices, barriers, and overall feasibility, we initiated a VTR pilot study in 7 SEER registries. Information about sharing specimen for research was collected from pathology laboratories located in the registries' catchment areas. Two matched case-case studies were designed comparing patients with unusual and typical survival in early stage breast cancer (BC) and pancreatic ductal adenocarcinoma (PDAC). Specimens will be collected and shipped to a central molecular laboratory for tumor sequencing (Whole Genome/Exome and RNA). Detailed clinical information was abstracted for cases with available tissue. Diagnostic slides were digitized, and the images were transmitted to a central facility for digital pathology research.

Results: Pathology laboratories differed substantially on most of the examined parameters, not only between states but within a single state. The PDAC study included 261 survivors of > 5y and 522 patients that died < 2y. The BC study had 539 cases that died < 30 mos and 1,078 cases that survived > 5y. Due to higher than expected attrition rates, both studies required amendments to add more recent cases. Specimen attrition rates varied among registries (10% to 90%).

Conclusion: Our experience suggests that it is feasible to scale the VTR. The goal of the VTR pilot is to provide access to clinical and genomic data to the researchers. Plans on addressing the updated Common Rule and NIH Genomic Data Sharing policy need to be developed to allow sharing of data collected in the scaled VTR Program.

4E2

REQUESTING DIAGNOSTIC TISSUE SPECIMENS AT THE REGISTRY LEVEL**C Lefante^{1,2}**, E Peters^{1,2}, X Wu^{1,2}¹Louisiana Tumor Registry, New Orleans, LA, United States; ²Louisiana State University Health Sciences Center; School of Public Health, New Orleans, LA, United States

Background: The Louisiana Tumor Registry (LTR) sought to enhance its ability to support biospecimen research by facilitating tissue procurement of diagnostic specimens from pathology laboratories (path labs). Current participation in NIH and CDC funded projects motivated the LTR to establish best practice guidelines for working with pathology labs throughout the State of Louisiana.

Purpose: To streamline and improve tissue specimen acquisition at the central cancer registry level.

Approach: LTR participates in the NCI-SEER's Virtual Tissue Repository and the CDC's HPV Typing 2 study, both requiring the collection of diagnostic specimens. E-path reporting was used to identify cases and locate the owner of paraffin-embedded tissue samples, which can be separate from the location of the diagnosing physician and facility. The characteristics of path labs influenced our approach. We looked at large vs. small labs as well as the independent vs. hospital based.

Results: The initial request was met with challenges, including specimen storage time limits by lab, the number of sections a lab was willing to take from a single block, and demand for compensation for their time spent completing our request. Providing the labs adequate time to retrieve samples, timely payment, and eliminating delays in returning specimens were key to maintaining a positive working relationship with labs. With the HPV Typing 2 study, 12 of 15 labs contacted over a 10-month period provided the requested specimens by December 2017 with a 13th lab promising samples in January 2018. Thus, 86% of contacted labs responded favorably in a relatively limited amount of time.

Implications: In spite of the challenges, this undertaking has tremendous value to the LTR including enhancing our ability to support population-based biospecimen research, education and outreach on the existence and importance of cancer registries, and expanding the working relationship with pathology laboratories, and biobanks.

4E3

THE KENTUCKY CANCER REGISTRY: OUR JOURNEY TOWARDS PRECISION CANCER SURVEILLANCE**E Durbin**^{1,2}, I Hands^{1,2}, J Levens², B Davis², L Witt², J Jeong², J Mueller²¹Kentucky Cancer Registry, Lexington, KY, United States; ²Markey Cancer Center/University of Kentucky, Lexington, KY, United States

Background: Precision medicine endeavors to maximize therapeutic benefits for particular groups of patients based upon their genetic or molecular profiles. Expansive growth of molecular testing demonstrates a transformative change in cancer care. However, no data resource yet exists that characterizes tumor mutation burdens in the population, population scale benefits, or potential disparities in molecular testing.

Purpose: The purpose of this study was to develop and evaluate infrastructures, methods, and resources necessary to collect molecular report data, integrate with registry data, and to leverage this resource to support a molecular tumor board and precision medicine research.

Methods/Approach: KCR established a secure data feed of molecular report data from Foundation Medicine, Inc. (FM) from one reporting facility. XML reports detailing tumor mutations and the underlying binary sequence alignment map (BAM) files are securely transmitted on a daily basis. A statewide expansion of FM reporting is being negotiated. Reports are also being transmitted from a local sequencing facility with preparations underway to receive data from the Oncology Research Information Exchange Network (ORIEN).

Results: Molecular profile data has been received on over 800 cancer cases. KCR has developed software and methods to integrate molecular reports with registry data, electronic pathology reports, molecular tumor board data, and biospecimen inventory data. Web portals have been developed to provide data access to researchers.

Conclusions: KCR's experience indicates that the collection of molecular report data is highly feasible and practical for central registries. Lack of standardization for molecular reports emerged as a challenge that must be addressed. Collection of BAM files will require access to high capacity storage outside of typical registries. Initial feedback from researchers indicates the potential for KCR's approach to be highly impactful in research.

4E4

EXTRACT BREAST CANCER GENETIC MARKERS IN PATHOLOGY REPORTS USING NATURAL LANGUAGE PROCESSING**G Chennupati**¹, K Ganguly¹, B McMahon¹, S Thulasidasan¹, V Petkov², L Penberthy², XC Wu³, P Fearn², C Blaire⁴, T Bhattacharya¹¹Los Alamos National Laboratory, Los Alamos, NM, United States; ²National Cancer Institute, Bethesda, MD, United States; ³Louisiana Tumor Registry, New Orleans, LA, United States; ⁴Oakridge National Laboratory, Oakridge, TN, United States

Cancer is a serious pandemic causing one in eight deaths worldwide. In the U.S., SEER registries process a high volume of electronic pathology (e-path) reports to provide data for population-based research. The unstructured, non-uniform and increasing number of reports pose significant challenges in deducing insights from these reports. Manual information extraction is expensive, time consuming, and prone to human errors; therefore, registries seek automation. Genetic markers in e-path reports are a valuable source of information about the tumors, helping doctors determine cancer diagnosis and optimal treatment.

Here, we present a novel natural language processing (NLP) framework that predicts genetic markers from e-path reports using artificial intelligence techniques. The framework is modular in nature, where we can plug in state-of-the-art classifiers from both supervised and semi-supervised learning algorithms. Since manual labeling of e-path reports for NLP is labor intensive, the availability of labeled training data is limited. We discuss how we can employ a semi-supervised deep learning algorithm for situations in which we have access to a large corpus of unlabeled reports.

The experiments in the study use a corpus of 578 de-identified e-path reports that correspond to 7 different ICD-O-3 topography codes of breast cancer and some of which contain information about the ER, PR, and HER2 receptors. These reports originate from five different SEER cancer registries (NM, HI, KY, Seattle, CT). We use features extracted from the e-path reports in the form of semantic word embeddings to train multiple classifiers for genetic marker extraction. These embeddings help in identifying the locality of a word in a corpus. Further, by augmenting these features with embeddings trained from a biomedical corpus of oncology articles, we are able to achieve about 70% accuracy in the information extraction task. We shall also present preliminary results from a Recurrent Neural Network (RNN) with long short-term memory (LSTM).

4F1

AUGMENTING SMOKING HISTORY IN CANCER REGISTRY DATA THROUGH HEALTH ADMINISTRATIVE CLAIMS DATA**Q Chen**¹, E Tai², S Galloway², S Stewart², T Tucker¹, B Huang¹¹University of Kentucky, Lexington, KY, United States; ²Centers for Disease Control and Prevention, Atlanta, GA, United States

Background: Cigarette smoking status is an important factor for population-based cancer research. Smoking not only causes many cancers, but is also an indicator of comorbidity and a strong predictor of survival for cancer patients. Due to limited resources, smoking history is either not captured well or at all in population-based cancer registry data. In collaboration with the Centers for Disease Control and Prevention, we explored augmenting smoking history in the registry data utilizing health administrative claims.

Methods: Data from the Kentucky Cancer Registry (KCR) were linked with Medicare, Medicaid, and private health claims data. Utilizing the linked data, smoking history was augmented by identifying ICD and CPT codes of personal history of tobacco use or disorder, and smoking cessation and counseling. The data analysis was stratified by tobacco-related cancers (TRC) and non-tobacco-related cancers (nTRC). Inclusion of smoking status was compared between the original KCR data and the augmented data.

Results: For KCR data in year 2007-2011, there were 10,033 TRC and 13,670 nTRC cases identified. 5,829 (58.1%) smokers for TRC and 4,917 (40.0%) for nTRC were identified in the original KCR data. Through the health administrative claims, 3,505 (34.9%) cases with smoking history for TRC and 1,724 (12.6%) for nTRC were identified. The linkage resulted in 624 additional (9.7%) cases with smoking history for TRC and 551 (10.1%) additional cases for nTRC.

Conclusions: Health administrative claims data can improve smoking history in registry data. Augmented registry data provides better utilization of the registry data for cancer control and prevention research.

4F2

INVASIVE CANCER INCIDENCE ADJUSTED FOR REPORTING DELAY — UNITED STATES, 2000-2014**S Singh**¹, S Henley¹, J King¹, T Thompson¹, R Wilson¹, M O'Neil¹¹Centers for Disease Control and Prevention, Atlanta, United States

Background: Reporting delay, the period between initial case diagnosis and full reporting to a cancer registry, may underestimate true cancer incidence.

Purpose: To present cancer incidence adjusted for expected reporting delay.

Methods: Observed and delay-adjusted cancer incidence rates, age-adjusted to the 2000 U.S. standard population, were based on data from CDC's National Program of Cancer Registries and the National Cancer Institute's Surveillance, Epidemiology, and End Results program, covering 100% of the U.S. population in 2014 and 97% in 2000-2014. Composite delay factors were a weighted average of adjustment factors specific to cancer site, registry, age, race, ethnicity, and diagnosis year derived from multivariate modeling. Trends in rates during 2000-2014, quantified by annual percent change for a single period and average annual percent change (AAPC) over the whole period, were calculated using joinpoint regression.

Results: In 2014, 1,595,618 invasive cancers were reported to central cancer registries in the United States; after accounting for reporting delay, an estimated 1,666,460 cancers occurred. The observed age-adjusted incidence for all cancers was 436 per 100,000 persons; the delay-adjusted rate was 456, about 4% higher. Although the delay-adjusted count was higher in females (834,649) than males (831,812), the delay-adjusted rate was higher in males (493) than females (432). Among males, delay-adjusted rates were stable 2000-2008 then decreased 2.3% per year 2008-2014 (AAPC = -1.2%) while observed rates appeared to decrease more rapidly (AAPC = -1.4%). Among females, delay-adjusted rates increased at the same rate (0.1% per year) during 2000-2014 whereas observed rates were stable 2000-2009 then declined 2009-2014 (AAPC = -.1; $P = .1$).

Conclusion: Delay-adjusted rates may provide a more accurate view of recent cancer incidence trends, allowing more precise comprehensive cancer control and screening program planning and evaluation.

4F3

EVALUATION OF GEOCODING PROCEDURES IN THE NATIONAL PROGRAM OF CANCER REGISTRIES

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Background: Accuracy of geocoding is important for understanding the burden and distribution of cancer and for targeting public health actions. Knowing the “place” of disease is fundamental for evaluating exposure relationships, identifying access to care, and allocating resources.

Purpose: To evaluate existing geocoding procedures and discuss the implications of precise location data in cancer surveillance.

Methods: We analyzed geographic data submitted to the National Program of Cancer Registries (NPCR) in 2016 to evaluate the completeness (percentage with valid value) of census tracts data. A convenience sample of seven states shared how they geocode data, what quality checks they perform on the geocoded data, and how they use the geocoded information. Finally, to show the variability among geocoding systems, a random sample of publicly available school addresses was geocoded using three different programs and compared to satellite imagery for accuracy. Sensitivity of the three systems was estimated by the percent of correct addresses geocoded out of the total addresses.

Results: For the 1.4 million incident cancer cases in 2014, 93% had complete census tracts reported to NPCR. Of these, 95% of census tracts were assigned using a complete address for the patient. Quality checks of geocoded data varied by registry. Reported utility of geocoded data included epidemiologic analysis, modeling access to care needs, and assigning geographic units and apply census SES data. Sensitivity of the three geocoders applied to school addresses ranged from 80-90%; only 64% of school addresses were correctly identified by all three.

Conclusion: Understanding the importance of accurate geocoding, performing quality checks, and the variability in geocoding systems is essential to recognizing the geographic distribution of disease. Programs with the ability to focus on the quality and accuracy of geocoding results may have greater confidence in understanding the cancer burden in their region and therefore, may be able to allocate resources and implement prevention and treatment programs more efficiently and effectively.

4F4

OVERALL AND SPECIFIC CANCER MORTALITY RATES AMONG US AND FOREIGN-BORN PERSONS: UNITED STATES 2005-2015

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Background: From 1970 to 2010, the foreign-born population increased from 4.7% to 12.9% of the U.S. population. Historically, differences in cancer rates have been observed between U.S.-born and foreign-born individuals. However, there is limited comprehensive, up-to-date data on U.S. cancer rates by birthplace

Purpose: To compare cancer mortality rates among foreign-born and U.S.-born individuals in the U.S. from 2005-2014.

Methods: Population-based cancer mortality data were obtained from the CDC's National Center for Health Statistics. Utilizing data recorded on death certificates, individuals who were born in one of the 50 states, District of Columbia, U.S. territories, or born outside of the U.S. to at least one U.S. citizen were categorized as U.S.-born. All remaining cases were categorized as foreign-born. Annual population estimates were obtained from the U.S. Census Bureau's American Community Survey. Age-adjusted mortality rates and rate ratios for all cancer sites were calculated using SEER*Stat.

Results: A total of 5,670,535 deaths from malignant cancers were recorded in the U.S. from 2005-2014 and 10% of deaths occurred among foreign-born individuals. Overall, foreign-born individuals had a 23% lower rate of cancer mortality when compared to U.S.-born individuals (Rate Ratio [RR]: 0.77 [95% CI: 0.76-0.77]). Foreign-born individuals, compared to U.S.-born individuals, had significantly elevated rates for the following cancers: nasopharynx (RR: 2.24), Kaposi sarcoma (RR: 2.16), stomach (RR: 2.04), gallbladder (RR: 1.65), acute lymphocytic leukemia (RR: 1.45), liver and intrahepatic bile duct (RR: 1.42), thyroid (RR: 1.32), other biliary (RR: 1.13), and cervix (RR: 1.09).

Conclusion: Foreign-born individuals have higher rates of mortality for select cancers, including many infection-related cancers. Many of these deaths may be related to differences in access to prevention, screening and treatment services.

5A1

EVALUATING THE COMPLETENESS OF WHO GRADE FOR BRAIN AND CENTRAL NERVOUS SYSTEM TUMORS IN THE U.S., 2010-2014

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Background: WHO Grade used by the WHO Classification system to predict clinical behavior is a substitute for cancer staging of the brain and other central nervous system (CNS) tumors. It has been collected as Site-Specific Factor 1 (SSF1) by central cancer registries (CCR) in the United States (U.S.) since 2004 and a mandatory data item for cases diagnosed in 2011 and after for the NAACCR Call for Data. The completeness of WHO Grade based on the 18 SEER registries was evaluated and found the unknown rate was decreased from 61% in 2004 to 23% in 2011. However, the completeness of this data item for U.S. CCRs combined has not been evaluated.

Objective: This study evaluated the completeness of WHO Grade (SSF1) collected for all primary brain and other CNS tumors for both malignant and benign/borderline (BB) by 47 CCRs in the U.S.

Methods: Microscopically confirmed primary brain and other CNS tumors diagnosed between 2010 and 2014 were obtained from the CINA 1995-2014 Analytic File. Codes of SSF1 (WHO Grade) was examined. Summary statistics on unknown/missing values by demographic and geographic variables were examined.

Results: Of 89,089 malignant and 108,937 BB brain and CNS cases, unknown SSF1 rates were 16.8% and 50.3%, respectively. The percent unknown decreased over time from 22.0% in 2010 to 12.4% in 2014 for malignant and 56.6% to 45.3% in BB cases. The unknown rates were not consistent across registries, varying from 6.4% to 34.6% in malignant and 32.7% to 68.3% in BB cases.

Conclusions: Benign/borderline brain tumors had much higher unknown WHO Grade rate than malignant and unknown rates decreased over time for both BB and malignant brain tumors. The percentage of unknown SSF1 (WHO grade) varied by registry and BB tumors had the higher variance. CCRs could benefit from evaluating unknown rate(s) at the state level allowing them to work toward identifying challenges in their collection practices.

5A2

SUNSHINE, LOLLIPOPS, AND RAINBOWS: MOVING FORWARD OPTIMISTICALLY WITH THE COOPERATION AND COLLABORATION THAT ACHIEVED COLLECTION OF CNS BIOMARKERS

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Background: The Central Brain Tumor Registry of the United States (CBTRUS) championed the collection of biomarkers found in the 2016 WHO Classification of Tumors of the Central Nervous System (CNS) during the 2017 NAACCR Conference as an opportunity for cooperation and collaboration across disciplines. The spirit evoked by this opportunity resulted in the addition of CNS biomarkers to the new and revised site specific data items. Those histology/ biomarker classifications with new ICD-O-3 codes will be collected with the ICD-O-3 histology revisions.

Purpose: The incorporation of CNS biomarkers into collection practices starting in 2018 collection year necessitates changes to the CBTRUS histology grouping, which is based on 2000 WHO Classification of Tumors of the Central Nervous System. The current progress that CBTRUS has made in preparation of the changes to collection rules will be shown.

Results: Realignment of histologies in CBTRUS Histology Grouping (Table 2, 2017 CBTRUS Statistical Report) to correspond to the histology groupings found in 2016 WHO will be outlined. Integration challenges will be addressed as well as implementation in CBTRUS Statistical Reports starting with 2018 data on all primary brain and other CNS tumors.

Conclusions: Cooperation and collaboration by all disciplines involved with the collection and reporting of population-based data as demonstrated with the experience of CNS biomarker collection improve accuracy, completeness, and overall utility of cancer surveillance.

5A3

TRENDS IN MALIGNANT BRAIN AND CENTRAL NERVOUS SYSTEM TUMOR INCIDENCE BY SUBTYPE AMONG CHILDREN IN THE UNITED STATES, 1998-2013

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Purpose: Though rare, brain and other central nervous system (CNS) cancers are the leading cause of U.S. pediatric cancer mortality. Recent, subtype-specific incidence rate trends can yield hypotheses about risk factors, which are largely unknown. We used 39 NAACCR registries to assess recent changes in rates of pediatric malignant CNS cancer by age and subtype.

Methods: Malignant CNS tumors were grouped using a modified Central Brain Tumor Registry of the U.S. scheme. Age-standardized incidence rates and annual percent change (APC) in incidence rates during 1998-2013 were calculated for children aged 0-19 years overall and by age and major subtypes.

Results: Rates of CNS cancer overall (n = 28,006) did not change significantly from 1998 to 2013 (APC: 0.26, 95% confidence interval [CI]: -0.08, 0.60). There was a modest, but statistically significant increasing trend in rates of all CNS cancers combined in 0-4 year-olds (APC: 0.66, 95% CI: 0.01, 1.31), while rates among 5-19 year-olds did not significantly change. Rates of glioma increased by 0.72%/year (95% CI: 0.24, 1.20). Rates of low grade gliomas (19% of gliomas) decreased significantly (APC: -5.27, 95% CI: -6.34, -4.19), and other gliomas (56%) increased significantly (APC: 3.20, 95% CI: 2.26, 4.15), while rates of high grade gliomas (25%) remained stable.

Conclusions: Rates of CNS cancers overall remained stable during 1998-2013. We suspect modest increases in malignant glioma may be attributable to changes in classification as malignant vs. benign, but since benign cancers have only been registered since 2004, this cannot easily be explored. Strong declines in low-grade glioma rates and increases in other gliomas appear to be due to evolution in diagnosis, classification and coding rather than changes in exposure.

NOTES:

5B1

PROM (PATIENT REPORTED OUTCOME MEASURE) SURVEY SUGGESTS SOME MEN WITH PROSTATE CANCER MAY BE UNAWARE OF THEIR DIAGNOSIS

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Background: The Life After Prostate Cancer Diagnosis project is a survey of UK men with prostate cancer. Eligible men in England were identified using Public Health England (PHE) cancer registry data. Of 58,930 men who were sent a survey, 842 (1.4%) called a survey helpline or returned their survey, stating they had not had a prostate cancer diagnosis.

Method: Cancer registration officers checked records and fed back relevant information to treating clinical teams.

Results: Cancer Registry records confirmed that:

1. 93% DO have prostate cancer.
2. 78% with histopathological evidence.
3. 37 patients had their diagnosis changed after data submitted to the cancer registry.
4. 2% of queried cases had cancer registration or hospital data entry errors.
5. Patients aged 75+ accounted for 29% of the original survey but 51% of those querying their diagnosis

It was possible to allocate risk status to 700 patients (75 could not):

1. 39% low risk disease.
2. 40% intermediate risk disease.
3. 19% locally advanced disease.
4. 3% advanced (M1) disease.

76 hospitals provided additional information on 502 of these men.

Findings:

1. 91% of these men were told of their diagnosis by a doctor or nurse.
2. 68% attended follow-up for at least 1 year.
3. 13 patients where hospital did not know if the patient had been told.
4. 12 patients had NOT been told.

Conclusion: The number of queries was more than expected. Prostate cancer is somewhat unique amongst the major cancers in the use of monitoring strategies, and uncertainty on the aggressiveness of any tumor. However, more than half of patients who queried their diagnosis (61%) did not have low risk disease, and half were aged over 75. Clinical teams may need to be aware that some of their patients may not understand their diagnosis, with implications for these men regarding awareness of diagnosis, awareness of signs of disease progression, and accessing appropriate support for symptoms.

5B2

WEB COMPARED TO PAPER SURVEY RESPONSE OUTCOMES AMONG INDIVIDUALS DIAGNOSED WITH CANCER: ASSESSING THE FEASIBILITY OF WEB SURVEYS FOR OBTAINING PATIENT-REPORTED OUTCOMES

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Background: Cancer survivors face a multitude of consequences of their diagnosis and subsequent treatment. Registries offer a population-based resource for researchers seeking to understand survivors' experiences and health-related quality of life.

Purpose: As part of a multisite study to evaluate methods for collecting patient-reported outcomes through cancer registries, the Utah Cancer Registry designed an experiment to compare response rates to web and paper questionnaires. We also tested the impact of a brochure describing the registry on response rates.

Methods: We sampled recently diagnosed and long-term survivors of breast, prostate, colorectal, multiple myeloma, and ovarian cancers in Utah. We randomly assigned half of the sample to receive requests to respond to a web questionnaire, and the other half to receive requests to complete a paper questionnaire. We also randomly assigned only half of the individuals to receive the informative brochure. Up to four mailings were sent, followed by phone calls, to obtain responses.

Results: The overall response rate was 48.3%. There was no significant difference in response rate by mode, with web = 45.1% and paper = 51.4% (OR = 0.76, 95% CI: 0.53, 1.09). Regardless of the originally assigned mode, offering telephone response as an alternative to reluctant responders did little to increase response rates. The brochure did not significantly increase response rates overall: brochure = 49.1%, none = 47.5% (OR = 1.10, 95% CI: 0.77, 1.59), but it was somewhat effective for encouraging web response. Likelihood of a web response was more heavily influenced by factors such as sex and age than was paper response.

Conclusions: Despite long-observed trends of web surveys obtaining lower response rates than paper, we conclude that requesting web response, when initial contact is made through postal mail, is becoming a feasible option for obtaining patient-reported outcomes among cancer survivors.

5B3

USING BI-DIRECTIONAL REPORTING TO IMPROVE CLINICAL CARE R Rycroft¹, E Fields¹, J Lowery²

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Background: The Colorado Central Cancer Registry's (CCCR) Public Health Genomics Program is charged with increasing awareness of hereditary breast and ovarian cancer and Lynch syndrome through education, policy, and surveillance. Cancer registries contain much of the information needed to determine if patients meet criteria for referral to genetics. Finding patients who are at risk and/or test positive for these syndromes is important in determining screening schedules and preventive care, and informing family members of risk. We assessed the feasibility of using registry data to identify patients at increased risk for hereditary cancer.

Purpose: CCCR piloted a program of bi-directional reporting back to three hospitals with a list of patients that meet National Comprehensive Cancer Network (NCCN) criteria for referral to genetics.

Methods: The CCCR created an SAS program to assess NCCN criteria among hospital patients. The program evaluates all known information about cases regardless of reporting source. A list of patients meeting NCCN criteria is returned to the reporting hospital to either the genetic counselor or the tumor registrar. Hospitals reviewed the lists, determined patient disposition, and collected additional data on whether patients had been referred and/or received genetic testing. Hospitals provided feedback on ways to refine the process.

Results: About 10% of a hospital's cases each year meet NCCN criteria for referral to genetics. Preliminary results in one hospital indicate that as many as half of patients did not receive referral to genetics. For Lynch syndrome, the number was near 75%.

Conclusions: Cancer registry data can be a powerful tool to aid hospitals in improving patient clinical care. The bi-directional approach can be implemented as a one-time hospital quality improvement project, or as an ongoing service that central registries provide for hospitals to ensure that at-risk patients are identified.

NOTES:

[illegible]

5C1

PILOT LINKAGE OF THE COLORADO CENTRAL CANCER REGISTRY AND THE COLORADO ALL PAYER CLAIMS DATABASE**M Eguchi**¹, R Rycroft², M Coca Perrailon¹, C Bradley¹¹University of Colorado Cancer Center, Denver, CO, United States; ²Colorado Central Cancer Registry, Denver, CO, United States

Background: Registry-medical claims linkages such as SEER-Medicare have proven valuable for informing public policy. All payer claims databases (APCDs) were created to better assess health care quality and costs by aggregating claims from multiple payers. We tested the feasibility of linking the Colorado APCD to the Colorado Central Cancer Registry (CCR). The CCR-APCD database expands beyond the Medicare fee-for-service population in SEER-Medicare to add insured adults of all ages with Medicare managed care, Medicaid, and private insurance.

Purpose: Evaluate the feasibility of linking the Colorado APCD to the CCR and explore potential for registry enhancement and research.

Methods: Breast, colorectal, lung and bronchus, and prostate cancer cases diagnosed in 2010-2014 were linked to Colorado APCD claims from commercial plans, Medicare, and Medicaid, including pharmaceutical claims. Cancer cases were identified in APCD files using cancer-related diagnosis and procedure codes and linked using probabilistic linkage (Link Plus v3) to APCD based on first name, last name, birth date, sex, and Social Security Number if available. Likely matches were reviewed manually. We evaluated the percent of cases in the APCD compared to CCR (coverage) and compared insurance type between CCR and APCD at and after diagnosis. We will compare CCR treatment to procedures billed on the APCD claims and use the linkage to identify rural vs. urban disparities in diagnosis stage, treatment, and mortality.

Results: The linked dataset covers over 80% of insured CCR cases. APCD improved insurance status ascertainment by 31% for Medicaid patients over a year of follow up by better capturing the Medicaid enrollment after diagnosis.

Conclusions: We demonstrate the viability of augmenting registry data with claims from APCD, a model for other states as APCDs become more common. APCD has the potential to supplement CCR data to allow for research examining utilization, costs, and treatment over time.

5C2

LINKING CANCER REGISTRIES WITH CLAIMS DATA TO ENABLE COMMUNITY ONCOLOGY REPORTING**C Fedorenko**¹, K Kreizenbeck¹, S Schwartz², M Keitheri Cheteri³, T Janes², M Potts², S Ramsey¹¹HICOR, Fred Hutchinson Cancer Research Center, Seattle, WA, United States; ²Cancer Surveillance System, Fred Hutchinson Cancer Research Center, Seattle, WA, United States; ³Washington State Cancer Registry, Olympia, WA, United States

Background: There are numerous national initiatives aimed at measuring quality and cost in cancer care. Major limitations of these efforts include the need for extensive manual data abstraction or claims-only measures without clinical information. In response, the Hutchinson Institute for Cancer Outcomes Research (HICOR) initiated a process to characterize and report on cancer care in Washington (WA) state.

Methods: HICOR links records from the Cancer Surveillance System (CSS) (Seattle-Puget Sound SEER registry) and the WA State Cancer Registry (WSCR) with claims from four health plans: two large commercial insurers, and WA State Medicaid and Public Employees plans. Adult cancer cases diagnosed 2007-2016 are linked with claims using SSN, name, date of birth, zip code, and sex. Inpatient, outpatient, and pharmacy claims are extracted for linked individuals.

Results: The HICOR data repository to date includes 50% (122,897) and 42% (138,310) of all eligible CSS and WSCR patients, respectively. Of these patients, 56,903 (30%) tumors were diagnosed and 10,177 (6%) patients died while enrolled in a participating health plan. Essential registry elements include cancer site and extent of disease to permit matching of patients to care guidelines, and dates of diagnosis/death to distinguish phases of care. Claims allow for reports on care across a variety of care phases and clinics, as well as estimates of cost. Using the linked data, HICOR created an oncology informatics platform that allows payers and providers to create customizable metrics on cost and quality. The data infrastructure also facilitates an annual community report on value, cancer care delivery research, and is a convening point for an annual regional cancer care conference.

Conclusions: Creating a cancer registry-claims linked data resource allows for a variety of uses in the oncology community setting. A shared, transparent methodology moves regional efforts from measuring care to improving care.

5C3

LINKING BIG (FEDERAL) DATA TO STATE CANCER REGISTRY DATA FOR A POST-MARKETING DRUG SAFETY SURVEILLANCE STUDY: CHALLENGES AND LESSONS LEARNED**D Harris**¹, K Midkiff¹, A Gilsenan¹, E Andrews¹¹RTI Health Solutions, Research Triangle Park, NC, United States

Background: Postmarketing drug safety surveillance studies assessing an infrequent exposure and a rare cancer outcome require large study sizes and accurate exposure and outcome measurements to detect a small or moderate increase in risk. Linking data from multiple state cancer registries to a large prescription claims database is a potential solution, but cancer registries' willingness to participate and data privacy restrictions present unique challenges to this approach.

Objective: To describe approaches for cancer registry recruitment and data linkage between multiple state cancer registries and a cohort created from the Medicare Part D prescription claims data, and to describe challenges and lessons learned from the study.

Methods: Registries were recruited to identify eligible patients and to provide data for linkage with Medicare D data to a trusted third party. Registries provided either the patient 9-digit social security number (primary approach) or the last name, date of birth, sex, and zip code (alternate approach) for linkage.

Results: All 50 state cancer registries plus the District of Columbia were invited to participate. After 19 months of recruitment efforts, data from over 50% of registries, covering the majority of patients with the outcome of interest in the U.S. among patients aged 65 years and older, were included in the final study. The majority of participating registries used the primary linkage method and had a 95% match rate, and the registries that used the alternate method had an 87% match rate. Variation in data privacy policy by state determined which linkage method, if any, could be used.

Conclusions: Linking state cancer registry data with a large pharmacy claims database can be an effective way to study medication exposure and rare cancer outcomes. However, navigating data privacy restrictions and linkage requirements across states and the federal government can make linkage between databases a difficult and resource-intensive process.

5C4

INVESTIGATING DISPARITIES IN CANCER BY LINKING THE CANADIAN CANCER REGISTRY TO SURVEY AND ADMINISTRATIVE DATABASES: A COLLABORATION BETWEEN THE CANADIAN PARTNERSHIP AGAINST CANCER AND STATISTICS CANADA**J Tung**¹, J Chadder¹, C Louzado¹, S Bryan², Y Decady², Y Sung², R Rahal¹¹Canadian Partnership Against Cancer, Toronto, Ontario, Canada; ²Statistics Canada, Ottawa, Ontario, Canada

Background: The Canadian Partnership Against Cancer (the Partnership) reports on pan-Canadian system performance across the cancer control continuum, including how sociodemographic disparities create barriers in access and utilization of cancer control services. This has been done using mostly ecological data, which does not contain the individual-level information required to identify the extent of these disparities. Therefore, the Partnership collaborated with Statistics Canada (STC) to build individual level datasets that will allow researchers to investigate the relationship between sociodemographic factors, cancer outcomes, and treatment patterns in Canada.

Methods: The record linkage was conducted at STC within the Social Data Linkage Environment. Data from the CCR were linked to the Discharge Abstract Database (DAD), the National Ambulatory Care Reporting System (NACRS), and the Canadian Vital Statistics Death Database (CVSD) to obtain treatment information and death outcomes. To obtain sociodemographic information the following datasets are also being linked: T1 Personal Master File (income), Immigrant Landing File (immigrant status, class and category) and the Census Long Form (education and geography). Linkage of all datasets is expected to complete by the end of January 2019.

Results: For the first time in Canada, record-level linkage of national cancer registry data with key datasets containing sociodemographic information will be available for exploratory analysis. The challenges with linkage and data limitations will be discussed, as well as the application of these linked databases to answer current disparities-related research questions.

Conclusion: This initiative illustrates the value of collaboration between data custodians and health researchers as well as how linkage of existing datasets can leverage the full potential of available data, and broaden cancer research in supporting efforts to create a more equitable cancer control system.

5D1

NOT JUST A PRETTY PICTURE – THE U.S. CANCER STATISTICS DATA VISUALIZATION TOOL**S Singh¹**, L Pollack¹, M O'Neil¹, A Kolli¹, V Benard¹, L Richardson¹, M Wu¹¹Centers for Disease Control and Prevention, Atlanta, GA, United States

Background: The CDC's National Program of Cancer Registries (NPCR) works to disseminate cancer surveillance data to multiple audiences in accessible, discoverable, and usable formats. To this end, CDC released the official federal cancer statistics, *U.S. Cancer Statistics (USCS)*, in a data visualization tool available at www.cdc.gov/cancer/dataviz. We made further enhancements to the online tool since its initial release in 2017.

Purpose: We describe the process and enhancements made to the USCS data visualization tool's content, graphical displays, and sharing capabilities.

Approach: CDC partnered with the Agency for Toxic Substances and Disease Registry's Geospatial Research, Analysis, and Services Program to further work initiated by a group of cancer registrars, program planners, epidemiologists, computer programmers, and communication specialists to improve the visual presentation of USCS cancer incidence and mortality data. We conducted usability testing and implemented changes to the website's layout and added content, including county-level data, survival data, and prevalence estimates.

Results: New features include county statistics, survival, prevalence, Puerto Rico data, and tobacco-, alcohol-, and obesity-related cancers data displays. The tool was also enhanced to better display on mobile devices. Data displays on national and state incidence, mortality and trends are available as maps and bar charts with interpretive text when users scroll over each graphic. Users can customize displays of overall and cancer-specific statistics, download data tables, and share each page via social media.

Conclusions: Surveillance data is fundamental to measure progress and target action. CDC's interactive USCS data visualization tool is designed to make cancer data more accessible and usable to multiple users, including the general public, media, policy makers, and planners. We will continue to improve the tool's accessibility and usefulness in order to facilitate the interpretation and sharing of cancer data.

5D2

ON THE FLY ANALYSIS AND VISUALIZATION OF CANCER DATA USING INTERACTIVE BUSINESS INTELLIGENCE DASHBOARD: THE PUERTO RICO CENTRAL CANCER REGISTRY EXPERIENCE**CR Torres-Cintrón¹**, O Centeno-Rodríguez¹, Y Román-Ruiz¹, D Zavala-Zegarra¹, G Tortolero-Luna^{1,2}¹Puerto Rico Central Cancer Registry, San Juan, Puerto Rico; ²UPR-Comprehensive Cancer Center, San Juan, Puerto Rico

Background: Data quality and decision making increasingly relies on how data is managed and visualized. During the last decade, the Puerto Rico Central Cancer Registry (PRCCR) has been improving its data quality and completeness using different sources of information. Traditionally, the process of data analysis has required a specialized staff in the area of statistics and/or systems. This limited the rest of the staff to depend on these specialized resources. In modern registries, it is essential to implement tools that can provide quick responses to questions regarding the database to assist in the evaluation of data quality and completeness and to determine the feasibility of a research project. The PRCCR database contains a significant number of inter-related variables from different sources of information such as health insurance claim records, death certificates, pathology reports, and population files, among others. With a new visual layer of abstraction, we can improve our ability to understand and assess the PRCCR database.

Objective: To provide an efficient tool to monitor, analyze, visualize, and evaluate cancer data to answer unplanned requests considering different selection criteria.

Methods: Several visualization tools were evaluated. Microsoft PowerBI™ (PBI) was the tool that best met our requirements and economic constraints. A model was built in PBI importing a subset of the PRCCR database. Population tables were incorporated into the model, as well as tables related to pathologies, death certificates, and claims. Several windows were designed with different purposes to allow users interactively obtain instantaneous responses.

Results/Conclusion: This powerful tool helps PRCCR staff evaluate inconsistencies, outliers, and share insights of its databases with researchers in a fast, easy, and professional way. This is an ongoing project that will continue to grow to fulfill PRCCR needs. Actions can be taken to stimulate PBI use among other cancer registries.

NOTES:

[illegible]

5E1

KEEP YOUR HEAD OUT OF THE CLOUDS: COMPARING CUTANEOUS HEAD AND NECK MELANOMAS BETWEEN A MOUNTAINOUS AND A COASTAL POPULATION**A Anderson-Mellies¹, M Cockburn¹, R Rycroft², M Rieth¹**¹University of Colorado Cancer Center, Aurora, CO, United States; ²Colorado Department of Public Health and Environment, Denver, CO, United States**Background:** Cutaneous melanomas of the head and neck are common and are associated with chronic patterns of sun exposure. Population-based studies of geographic differences in the anatomic site of melanomas are limited.**Purpose:** Describe the anatomic site distribution of invasive cutaneous melanoma between a mountainous population compared to a coastal population with similar ultraviolet levels.**Methods:** Population-based incidence data for all non-Hispanic white patients diagnosed with invasive cutaneous melanoma from 2004-2014 in Colorado (n = 11,575) and Los Angeles County (LA), California (n = 12,230) were used to estimate the distribution and age-adjusted incidence rates of invasive cutaneous melanoma by anatomic site.**Results:** Colorado males had a higher proportion of head and neck melanomas than LA males ($p < .001$), as did Colorado females compared to LA females ($p < .001$). The AAIR for head and neck melanomas in Colorado was 10.9 per 100,000 males (CI: 10.4-11.3) and 3.5 per 100,000 females (CI: 3.2-3.7). The incidence of head and neck melanomas was significantly higher than LA males (9.8, CI: 9.4-10.3) and females (2.7, CI: 2.5-2.9), and appeared to be predominately attributable to significantly elevated rates of melanomas of other parts of the face, compared to those of the eyelid, ear, scalp, and neck.**Conclusion:** Coloradans have a higher AAIR of cutaneous head and neck melanomas than those from LA, which is driven by a higher incidence of melanomas on other parts of the face rather than less consistently sun-exposed head and neck sites. This suggests more chronic sun exposure of the face in Colorado, where exposures are likely to occur during year-round outdoor activities in mountainous areas, rather than while sunbathing on a beach. This emphasizes a need to promote year-round sun protective behaviors, particularly of the face during seasons and activities (e.g., skiing) not commonly associated with sunburns.

5E2

POOR PROGNOSIS FOR THIN ULCERATED MELANOMAS AND IMPLICATIONS FOR A MORE AGGRESSIVE APPROACH TO TREATMENT**M Hawkins¹, M Rieth^{1,2}, M Eguchi¹, M Cockburn^{1,3,4,5}**¹University of Colorado Cancer Center, University of Colorado, Aurora, CO, United States; ²Department of Medicine-Bioinformatics, School of Medicine, University of Colorado, Aurora, CO, United States; ³Department of Dermatology, School of Medicine, University of Colorado, Aurora, CO, United States; ⁴Department of Preventive Medicine, Keck School of Medicine of the University of Southern California, Los Angeles, CA, United States; ⁵Department of Dermatology, Keck School of Medicine of the University of Southern California, Los Angeles, CA, United States**Background:** Clinical guidelines for the treatment of melanoma are based largely on the behavior of thicker (more lethal) tumors and as a result, little is known about survival differences among patients with thinner tumors, which are proportionately much more common than thick melanomas.**Purpose:** To investigate the variability in survival for AJCC stage T1 thin melanoma tumors, defined as tumors less than 1 mm at diagnosis.**Methods:** This population-based series included 84,923 non-Hispanic white patients diagnosed with cutaneous melanoma between 1994 and 2013 from the California Cancer Registry. Survival outcomes, stratified by tumor thickness, ulceration, and nodal involvement, were estimated using the Kaplan-Meier Method**Results:** Survival for patients with thin ulcerated tumors was as poor as was experienced by patients with stage II tumors, who are currently treated more aggressively. At 12 months, patients with thin ulcerated tumors had approximately 6% lower survival rate (92.5%, 95% CL: 90.6% - 93.9%) compared to patients with thin non-ulcerated tumors (98.2%, 95% CL: 98.0% - 98.3%). At 24 months, this survival difference in thin ulcerated and non-ulcerated tumors increased (85.2% [95% CL: 82.8%-87.4%], 96.1% [95% CL: 95.8% - 96.3%]; respectively) and continued to increase over 2-fold by 60 months (75.5% [95% CL: 72.1% - 78.5%], 88.6% [95% CL: 88.2% - 89.0%]; respectively).**Conclusion and Implications:** These data imply that tumors less than 1 mm thick at diagnosis should be aggressively treated if they have evidence of ulceration. While TNM staging separately classifies these tumors (T1b), there has to date been no data distinguishing survival or treatment approach compared to other T1 tumor types. The close overlap of survival curves implies that T1b tumors should be treated similarly to Stage IIA and above tumors, with more aggressive treatment, taking advantage of improvements in adjuvant therapy.

5E3

COMPARISON OF CHARACTERISTICS, TREATMENT PATTERNS AND SURVIVAL OUTCOMES OF PRIMARY GI MELANOMA CASES TO CUTANEOUS MELANOMA AND GI CARCINOMA (SEER: 1973-2014)

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Background: The treatment of primary gastrointestinal (GI) melanomas poses a challenge to clinicians because there is insufficient knowledge about the disease due to its rarity. The purpose of this study is to compare characteristics, treatment patterns, and survival outcomes of primary GI melanoma cases to cutaneous melanoma and GI carcinoma cases.

Methods: A matched analysis was performed using Surveillance, Epidemiology, and End Results data from 1973-2014. Primary GI melanoma cases were matched 4:1 to both cutaneous melanoma and GI carcinoma cases on age at diagnosis, sex, year of diagnosis, stage, and GI cancer sites for GI carcinoma cases. Chi square tests were used to detect differences in tumor characteristics and treatment by cancer type. Cox proportional hazards regression was used to determine cancer-specific survival (CSS) prognostic factors.

Results: 722 cases of primary GI melanoma were matched to 2,892 and 2,876 cases of cutaneous melanoma and GI carcinoma, respectively. The most common sites for GI melanoma were anus (48%) and rectum (35%). 80% of localized and regional stage GI melanoma cases received surgery only and ~10% received surgery and radiation, which was more similar to treatment for cutaneous melanoma than for GI carcinoma, which had higher rates of radiation. After controlling for patient, tumor, and treatment characteristics, GI melanoma had a hazard ratio of 2.85 (CI: 2.54-3.19) relative to cutaneous melanoma and GI carcinoma. Among GI melanoma cases, older age, later stage, positive or unknown lymph node status, and treatment with radiation only (vs. surgery only) were associated with greater risk of death in the CSS model. There was no survival difference between those who received surgery only vs. surgery and radiation.

Conclusions: GI melanoma patients had the poorest survival, and are predominantly being treated with surgery only. Future studies should explore how treatment can be optimized for primary GI melanoma patients.

5E4

MELANOMA AMONG BLACKS IN THE UNITED STATES

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Background: Melanoma is one of the top 10 most commonly diagnosed cancers in the United States (U.S.) and is increasing. Few studies have examined melanoma among black populations due to lower risk of diagnoses compared to non-Hispanic whites (NHWs). However, blacks are often diagnosed at a later stage, have different predominant histology types, and have poorer survival compared to NHWs. We examined melanoma incidence and survival among black U.S. populations by age, stage at diagnosis, anatomic site, and histology.

Methods: We examined population-based cancer registry incidence data from the Centers for Disease Control and Prevention's National Program of Cancer Registries (NPCR) and from the National Cancer Institute's Surveillance, Epidemiology, and End Results program, covering 99.1% of the U.S. population for the years 2010-2014. Cases were limited to non-Hispanic and Hispanic black populations, except when non-Hispanic whites were used as a comparison group. Survival data were from 34 NPCR program participating states.

Results: From 2010-2014, melanoma incidence rates increased with increasing age, with the highest rates among males age 65 and older (5.4 per 100,000). Half of all melanomas were diagnosed at a localized stage. Lower extremities were the most commonly diagnosed anatomic melanoma site (47.2%). Among cases with a specific histology given, the most common were acral lentiginous melanoma (16.1%). From 2001-2013, the overall relative 5-year melanoma survival among blacks was 67%, compared to 90.4% among NHWs. Survival decreased with age and was poorer among males.

Conclusion: Although incidence of melanoma is relatively rare among black populations, survival rates lag behind that of NHW populations. Improved education of acral lentiginous melanoma histology among blacks and increased medical surveillance of this histology are needed due to its atypical presentation, which is not adherent to "ABCDE" guidelines traditionally used to identify melanoma.

CONCURRENT SESSION 5

Thursday, June 14

1:30 pm - 3:00 pm

BRIDGE SESSION - RACHEL CARSON

F

5F1

IDENTIFY CANCER MISDIAGNOSES FASTER BY UTILIZING IBM WATSON EXPLORER, A NATURAL LANGUAGE PROCESSING TOOL

M Induni¹, D Rodriguez¹

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Background: Misdiagnosis or late diagnosis of certain cancers, like non-muscle-invasive bladder cancers when adequate muscle sampling is not done at the time of resection, could lead to increased mortality among patients according to a research study conducted by Chamie et al. Presently, it takes too long to identify misdiagnoses as the analysis is manual or at best semi-automated, making it labor intensive. The system could then send alerts communicating the possible issue to the attending physician, surgeon, and pathologist. In the recent years, with the advent of machine learning and artificial intelligence, natural language processing technologies, particularly the IBM Watson Explorer, has come of age and can be trained to analyze and interpret all the data, including unstructured text and images.

Purpose: Instantaneously identify misdiagnosed non-muscle-invasive bladder cancer utilizing Watson Explorer Advanced Edition (WEX AE) and relay the misdiagnosis to an alert system.

Methods: IBM Watson Explorer Advanced Edition (NLP engine) version 11.0.1 was used to crawl abstracted text and pathology report data from the California Cancer Registry. The annotators of the rules engine were tuned after appropriate guidance from cancer epidemiologists and certified tumor registrars. It was followed by configuration of data collection, parsing, and indexing with Watson's Text Analysis Engine.

Results: Preliminary tuning of the annotators of IBM Watson appear to show instantaneous identification of muscle-invasive versus non-muscle invasive bladder cancer cases from pathology reports, and the muscle sampling information, with high accuracy.

Conclusions: Potential misdiagnoses have been identified using IBM Watson, and a comparison to the manual review has proven automation may be more accurate and cost effective for cancer registry programs.

5F2

A NEW CANCER RESEARCH DATA SOURCE: NPCR AND SEER PUBLIC USE DATABASE — 2001-2014

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Background: Together, the CDC's National Program of Cancer Registries (NPCR) and NCI's Surveillance, Epidemiology, and End Results (SEER) program collect high-quality cancer incidence data on 100% of the U.S. population. Researchers can now analyze information on several million de-identified cancer cases using the NPCR and SEER public use database.

Objective: Using this new data source, we analyzed cancer incidence by selected characteristics and average annual percent change (AAPC) of leading cancers.

Methods: We used the NPCR and SEER Incidence-U.S. Cancer Statistics Public Use Database to assess invasive cancers diagnosed in 2014 in all 50 states and Washington, DC. AAPC was calculated among the 48 central cancer registries meeting publication criteria from 2001-2014 using JointPoint regression

Results: In 2014, a total of 1,539,896 invasive cancers were reported in the U.S. Among persons aged <20 years, 14,565 cancer cases were reported. The age-adjusted annual incidence for all invasive cancers was 421 per 100,000 persons. Cancer incidence rates were higher among men (452) than women (401) and ranged by registry from 359 to 499 per 100,000 persons. By cancer site, rates were highest for female breast (123 per 100,000 women), prostate (93.9 per 100,000 men), lung and bronchus (56.2), and colorectal (37.8) cancers. From 2001 to 2014, incidence rates significantly decreased an average of 4.3% per year for prostate, 2.8% per year for colorectal, and 1.4% per year for lung and bronchus cancer.

Conclusion: While progress is being made, further work remains in preventing and controlling cancer. Researchers can now analyze trend and state-specific cancer incidence for 100% of the U.S. population. This public use data source also allows researchers to investigate demographic and tumor identification characteristics (e.g., histology, behavior, and stage) of patients diagnosed with rare cancers. The database will be updated annually: www.cdc.gov/cancer/public-use.

[illegible]

NAACCR YOUNG TALK

Tuesday, June 12

10:05 am - 10:25 am

NYT1

DOING MORE WITH LESS: MEDICAID ADMINISTRATIVE CLAIMING

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Medicaid Administrative Claiming (MAC) provides reimbursement to public health agencies for administrative activities that directly support efforts to identify and enroll eligible clients into Medicaid, to bring them services covered by Medicaid, to remove barriers to accessing Medicaid services and to reduce gaps in Medicaid services. Public health agencies and Medicaid share a focus on improving access to health care for persons of low income. The Ohio Department of Health (ODH) initially established MAC within programs at the state and local levels that either 1) directly provided medical, dental or mental health services to assist low income Ohioans in enrolling in Medicaid and accessing Medicaid-covered services or 2) funded other entities to deliver these services. Because of urging by Ohio's Medicaid Program, ODH programs involved with population-based data collection and analysis were subsequently added as MAC participants. Ohio Medicaid indicated that population-based data are necessary to effectively plan for the delivery of health care services to the Medicaid population; therefore, activities related to these efforts are MAC-eligible. MAC now provides an additional revenue source for the Ohio Cancer Incidence Surveillance System (OCISS). OCISS will outline the process of developing an implementation plan to participate in MAC, including identification of staff eligible to participate; provide information on the time study that must be completed each quarter; demonstrate the information system used in Ohio to capture time study results; and outline the process for reimbursement, including how reimbursement is determined. OCISS has participated in MAC since 2012; annual reimbursement has ranged from \$25,000 to \$75,000 depending on the number of staff who are eligible to participate. MAC revenue is flexible -- there are no restrictions on how the monies are used or the timeframe within which they must be spent.

NAACCR YOUNG TALK

Tuesday, June 12

3:05 pm - 3:25 pm

NYT2

AUTOMATED CASE IDENTIFICATION AND CODING AT THE CALIFORNIA CANCER REGISTRY

J Patrick¹

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Background: The CCR is under pressure from multiple factors to improve its efficiency and so has looked to automated methods to perform case identification and coding functions.

Purpose: This project used the methods of Statistical Natural Language Processing (SNLP) to perform automated case identification and coding for the 5 core attributes (Site, Histology, Grade, Behaviour and Laterality).

Methods: The solution consists of a processing pipeline of a classifier to separate histopathology reports from genetics and immunohistochemistry reports, then a reportability classifier to separate reportable, non-reportable, and unusable documents.

A Semantic Entity Recognition (SER) engine identifies entities in the texts that are required to complete the coding correctly. It has been trained on 5000 records with 117,000 SERs manually annotated using 34 semantic classes or tags.

Coding is performed by an inductive inference engine which uses the SERs to identify codes for all attributes.

Results: The pathology classifier achieved 98.5% accuracy. The reportability classifier has 98.2% accuracy with False Positives of 1.8%. The SERS tagging has an accuracy of 99.5% for self-testing and 96% for 10-fold cross validation. The coding to ICD O3 has an overall accuracy of 97.78% but with up to 100% for certain tumour streams. The CCR's independently evaluated the accuracy to be 95% for reportability and 93% for coding.

Conclusion: Case identification is now fully automated at the CCR. Currently 72% of reports are automatically coded hence reducing that load on manual processing with a concomitant reduction in cost. Reportability and coding accuracy will be improved by 40-80%.

The technology opens opportunities to significantly increase the cases identified for Rapid Case Ascertainment and so reduce delays in recruiting patients into clinical trials as well as increase the number of available patients, particularly for rapidly developing cancers.

NOTES:

Conclusion: NLP can accurately extract AJCC TNM stage from text for a majority of cases. Performance of ML using NLP outputs and CS was promising but will need to be refined in order to achieve accuracy needed by central cancer registries.

[illegible]

P-01

MATCHPRO - NEW PLATFORM FOR PROBABILISTIC RECORD LINKAGE (OR TEACHING AN OLD DOG NEW LINKAGE TRICKS) **R Pinder¹**

¹USC School of Medicine, Los Angeles, CA, United States

Probabilistic record linkage software available to cancer registries has changed over time. Some old standard software solutions are no longer available to acquire, have outlived their usefulness, or are not user friendly. Fortunately, the field has broadened in the past year with the introduction of MatchPro. Developed by IMS and SEER specifically for cancer registry purposes, this exciting new software has undergone extensive testing, and user training is now becoming available. It is likely that numerous other resources at NAACCR 2018 @ Pittsburgh will be presented for us all to learn more!

This poster will describe a 4-month exploration into using the new system, with several head-to-head comparison linkage projects documented to demonstrate the new software. First off, how does the probabilistic methodology used in MatchPro compare to an old industry standard, AutoMatch? Secondly, what is the user experience as a true “old dog” in the field transitions to this new system?

As the presenter is involved in the current beta testing of the software, a sidebar portion of the poster (hopefully) will include collected tips, tricks, and best practices submitted by the group using the new software.

P-02

AGREEMENT BETWEEN SELF-REPORTED AND TUMOR REGISTRY-RECORDED CANCER AMONG ALASKA NATIVE PEOPLE

S Nash¹, G Day¹, G Zimpelman¹, V Hiratsuka², K Koller¹

¹Alaska Native Tribal Health Consortium, Anchorage, Alaska, United States; ²Southcentral Foundation, Anchorage, Alaska, United States

Background: Reliance on self-reported health status information as a measure of population health can be challenging. A recent study comparing self-report and medical record outcomes among Alaska Native (AN) people showed cancer was the most accurately reported chronic disease among this population. The central cancer registry may provide an alternative metric against which to assess the validity of self-reported health outcomes.

Purpose: To assess agreement between self-reported and tumor registry-recorded cancer outcomes in a cohort of AN people

Methods: This study linked data from the Alaska Education and Research Towards Health (EARTH) cohort, with cancer diagnoses recorded by the Alaska Native Tumor Registry (ANTR). Between 2004-2006, 3,824 AN participants were recruited into the EARTH cohort. Data collected from each participant included demographic information and medical history. We calculated agreement using sensitivity, specificity, positive predictive value, negative predictive value, and kappa.

Results: Of 140 Alaska EARTH participants who self-reported a history of cancer at enrollment, 100 were matched to records in the ANTR. Self-report was more specific than sensitive. Sensitivity ranged from 40% (stomach cancer) to 100% (prostate cancer), whereas specificity was greater than 98% for all cancer sites examined. Kappa was typically high, but was greater among female breast, and prostate cancers ($k = 0.86$ for both sites), relative to lung, colorectal, and stomach cancers ($k = 0.57-0.67$). Agreement varied by sex, age, educational attainment, and rural/urban residence.

Conclusions: Although there were variations by cancer site and demographic factors, agreement between self-reported and tumor registry-recorded cancer outcomes was high for this cohort of AN people. This may reflect the quality of care within the Alaska Tribal Health System, which places high value on patient education, patient-provider relationships, and health literacy.

P-03

MISSED CANCER CASES FROM TEXAS HOSPITAL INPATIENT/OUTPATIENT DATA AND DEATH CERTIFICATE FILES: COMBINING PREVIOUSLY SEPARATE PROCESSES

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¹Texas Cancer Registry, Texas Department of State Health Services, Austin, TX, United States

Background: To identify missed cancer cases and improve case completeness, the Texas Cancer Registry (TCR) conducts annual linkages with the Texas Mortality File and the Texas hospital inpatient and outpatient discharge data. Historically, these linkages have been separate processes, resulting in two different follow-back lists provided to each reporting facility, and potentially increased workload and duplication of efforts for TCR and reporting facility staff.

Purpose: Conduct a pilot study to: (1) combine previously separate death clearance and case finding processes to reduce number of follow-back lists sent to each reporting facility and streamline internal operations, and (2) enhance case completeness.

Methods: The TCR conducted a series of linkages, including person- and tumor-level linkages between TCR cases and the 2015 Texas mortality file; a linkage between death certificate-identified cases and 2014-2015 inpatient/outpatient data (to identify facility information); and a linkage between all TCR cases and 2015 inpatient/outpatient data to identify missed cancer cases. Potential missed cases identified from all linkages were combined, and individual facility lists of cases were provided to 501 facilities.

Results: The evaluation of the pilot study is underway. A final linkage will be conducted, in addition to a review of returned facility lists, to evaluate effectiveness. The total number of returned cases will be generated, and reasons cases were not reportable will be quantitatively summarized.

Conclusions: The pilot study demonstrated the feasibility of combining previously separate, labor-intensive processes, but it also identified a number of areas for improvement, including the importance of minimizing delays between conducting linkages and providing facilities with case listings. Central registries may benefit from similar initiatives to consolidate different case finding activities to decrease workload for registry staff and reporting facilities.

P-04

DOING LESS WITH MORE! FINDING CREATIVE SOLUTIONS FOR FILE STORAGE AND PROCESSING OF MEANINGFUL USE CDA FILES

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¹Westat, Rockville, MD, United States

Background: Westat is experiencing an increase in volume and velocity in data received from facilities participating in Meaningful Use (MU) reporting to the Maryland Cancer Registry. This translates to an increase in file storage needs and processing time. Data processing is a mix of manual and automated steps, which include the use of CDC RegistryPlus™ applications.

Purpose: Westat sought to further automate and streamline the data processing of submissions from facilities reporting cancers as HL7 CDA documents.

Methods: The current architecture and data flow were analyzed to determine candidate processing steps to streamline and refactor. The current process stores the CDA files on a file system awaiting processing by the eMaRC Plus application. Files are manually logged, copied to new locations, loaded, and exported from eMaRC Plus. The proposed modification involves implementing a data processing pipeline using discrete services to fully automate the receipt and logging of files, checking for duplicates, checking for matches to existing records already in the CRS database, performing eMaRC processing, and extracting data from the files for reports and validation. eMaRC is wrapped as a service within the automated processing pipeline. We will present comparisons in cost and processing time before and after implementation.

Results: Anticipated results include a decrease in both storage and time spent on manual data processing steps, thereby reducing costs associated with person-hours spent on data management. Improved efficiency in processing files will allow for attention to other areas, including evaluating quality indicators of the data and more immediate feedback to reporting facilities.

Conclusions: With increased demands placed on central cancer registries as a result of large amounts of MU files, it is important to evaluate current processes for data management improvements that can lead to reduced costs and increased workload efficiency.

P-05

COLLECTION OF ACTIVE FOLLOW-UP DATA IN AN NPCR REGISTRY: A REVIEW OF THE PATIENT-CENTERED OUTCOMES PROJECT AT THE NEW HAMPSHIRE STATE CANCER REGISTRY

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Background: The New Hampshire State Cancer Registry is one of five NPCR registries that participated in the CDC's Patient Centered Outcomes (PCO) project. The purpose of PCO was to continue the follow-up of year 2011 breast and colorectal cancers that had additional data collected for comparative effectiveness research. Follow-up included active assessment of vital status, disease recurrence, disease progression, and additional treatment.

Purpose: To share experience and results of the PCO project in NH and consider the feasibility of obtaining current follow-up information on cancer patients.

Methods: During 2014-2017, we attempted to follow-up 100% of the cases every year by performing regular, periodic reviews of medical records at NH reporting facilities; a mixture of active and passive follow-up was conducted for cases reported by non-NH sources. Throughout the project period, we assessed our data collection efforts to ensure we had a minimum of 36 months follow-up post diagnosis after year 1 of the project, 48 months after year 2, and 60 months after year 3 when the PCO project ended. We analyzed the percentage of cases that had follow-up information from active review over the project period.

Results: There were a total of 2,122 NH breast and colorectal cancers diagnosed during 2011. Our final 2017 data submission showed that we obtained 60-month follow-up for 89% of cases, including those who died or who had a documented recurrence; 94% had ≥48 months of follow-up; and 95% had ≥36 months of follow-up. Active follow-up during fiscal year 2016-2017 was accomplished for 96.2% of cases.

Conclusion: Follow-up data are important to evaluate cancer survival and outcomes. This review shows that longitudinal follow-up is feasible with a rigorous schedule of active follow-up.

P-06

CAN THE CCR LEVERAGE NLP FOR QUALITY CONTROL ACTIVITIES?

S Wood¹

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Background: As the California Cancer Registry (CCR) moves more and more towards automatic processes to link and consolidate data, we need to identify new methods for quality control activities. Previously, all incoming hospital abstracts uploaded into Eureka (CCR's Database Management System) were "visually edited" to ensure that all coded values were supported by the incoming text related to the diagnosis. The sheer volume of data makes it impossible to manually perform this method of quality control on all cases. In automating tumor linkage, we have found that while some cases are linked properly based on the coded data, further analysis suggests a different outcome as the cases can be incorrectly coded based on the text and require a different outcome.

Purpose: This study will be used to identify the feasibility of using an open source NLP tool for quality control purposes, specifically to help us identify whether a new case abstract is indicative of metastatic disease and whether this affects the automation that has been applied to the case.

Methods: I intend to research a few different NLP products to see which might be the best fit for my intended analysis. With the help of one of our CTRs, I plan to identify a set of cases that we have flagged as problematic based on basic text searches. From this group I aim to train the NLP tool on examples of positive and negative text for metastatic disease and apply this to an additional set to verify.

Results/Conclusions: The results that will be compared against our basic, but tedious, text search query that was created by scouring the data to identify and differentiate between the terms that confirm or negate the indication of metastatic disease. From this exercise and analysis, I hope to have a clearer picture of how we can advance and succeed with future quality control methods.

P-07

IMPLEMENTATION OF NATURAL LANGUAGE PROCESSING APPLIED TO PATHOLOGY REPORTS

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¹California Cancer Reporting and Epidemiologic Surveillance Program, Sacramento, CA, United States

Background: Annually, over 200,000 path reports are received at the California Cancer Registry (CCR) electronically, referred to as “e-path” reports. Regional staff manually read each path report to determine reportability and then classify each reportable tumor in the database in terms of histology, site, grade, laterality, date of diagnosis and behavior. This averages out to about 8,166 staff hours. The CCR entered into a contractual agreement with a natural language processing (NLP) analytics company, Health Language Analytics Global (HLA-G) for a pilot project to develop a solution to auto-receive narrative e-path reports from the CCR, apply their natural language processing solutions, and auto-screen and classify the reports per California standards.

Methods: The development of the NLP tool has been ongoing for the last 18 months. In January of 2018, the algorithm results for single specimen/single organ and multiple specimen/single organ achieved an accuracy rate of greater than 90% and were integrated into the central registry database.

Results: This poster will outline final accuracy rate achieved, the actual number of path reports processed since the implementation of this NLP tool, the number reportable, the percentage of cases that were single specimen/single organ and multiple specimen/single organ, and the number requiring manual review. The poster will also highlight plans for expansion of this work effort.

Conclusion: Applying NLP tools to electronically transmitted data is an excellent mechanism for reducing some of the manual work associated with pathology report review associated with determining reportability as well as assignment of appropriate codes for specified data fields at a high rate of accuracy. The poster will include possible expansions of this tool in areas such as recurrence, biomarkers, and genetics.

P-08

SCAN 360

L Bouzoubaa¹, R Balise^{1,2}, O Picado¹, G Abranches¹, E Kobetz¹

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Background: Effective summaries and visualizations of epidemiologic data are critical to support lay and professional audiences. While cancer occurrence and risk factor data are meticulously gathered throughout the country, very few states have tools to help users rapidly and accurately detect patterns.

Purpose: SCAN 360 is an interactive web-based platform that describes the burden of adult and pediatric cancers and risk factors throughout the state of Florida for the years 2010-2014. The website allows users to visualize local cancer patterns alongside socioeconomic factors, health habits, environmental exposures, and health risks for various geographic levels through interactive tables and graphics.

Methods: This tool displays dynamic numeric summaries and novel visualizations by county and for custom regions. Summaries include: overall and race-specific, age-adjusted incidence/mortality, percent of cancers diagnosed at late stage, demographic characteristics, rates of various cancer screenings, distribution of cancer by age and race, and frequency of histological variants. Differences in incidence and mortality rates between races in an area of interest can be compared against the rest of Florida and the United States with confidence intervals and adjusted p-values. Other tools identify both clinically meaningful and statistically significant differences.

Results: In addition to numeric summaries, SCAN 360 visualizes data through the uses of bar graphs, choropleth maps, scatterplots, and “stoplight” comparison plots, as well as brand new visualizations. The use of these graphics provides the user a clear understanding of cancer in the designated population.

Conclusions: There is currently a pressing need for a user-friendly tool that is designed to capture the burden of cancer for the state of Florida. SCAN 360 is not only advantageous for researchers, but for policy makers and the public alike.

P-09

ENHANCEMENT OF THE METRO CHICAGO BREAST CANCER REGISTRY (MCBCR) THROUGH DATA LINKAGES**T Dolecek**¹, F Dabbous², A Hughes¹, T Macaro¹, N Alsheil², G Rauscher¹¹University of Illinois at Chicago, Chicago, Illinois, United States; ²Advocate Health Care, Downers Grove, IL, United States

A 2010 Agency for Health Research and Quality grant to the University of Illinois at Chicago funded the Metropolitan Chicago Breast Cancer Registry (MCBCR) for the purpose of comparing the effectiveness of screening and diagnostic imaging breast cancer procedures. Since then, MCBCR has been funded as a registry of the national Breast Cancer Surveillance Consortium (BCSC). MCBCR includes data on women receiving breast imaging procedures at Advocate Health Care (AHC), the largest health system in Illinois.

The MCBCR has linked the AHC imaging data to breast cancer cases in all Advocate Hospital Tumor Registries and the Illinois State Cancer Registry, identifying more than 30,000 women diagnosed during years 1986-2014. Detailed information on clinical findings, demographics, and health insurance are collected on these women at patient registration from each encounter. Additionally, various linkages have enhanced the utility of the MCBCR data set. Breast cancer cases have been linked to the National Death Index to determine vital status, date and cause of death.

Two sub-studies are underway. The first involves the creation of a biospecimen collection on 800 patients diagnosed with breast cancer for the purpose of studying factors contributing to racial disparities in outcomes including survival. Latent periods for cancer may span decades, making an individual's place of residence at diagnosis less relevant than where they lived prior to diagnosis. Therefore, the second substudy is a linkage of patients to their residential history information obtained through LexisNexis on approximately 40,000 women (breast cancer cases and controls). This linkage of residence histories will enable subsequent linkages to available social and environmental data related to air pollution, food deserts, crime, socioeconomic disadvantage and health care accessibility. Details on the MCBCR linkages and preliminary research findings will be presented.

P-10

ENHANCING THE COMPLETENESS OF BIRTHPLACE DATA THROUGH LINKAGE TO DEATH CERTIFICATE DATA: AN ASSESSMENT FROM THE CALIFORNIA CANCER REGISTRY DATABASEK Davidson-Allen¹, C Moody², D Padmanaban², **A Sipin**³, K Ziegler⁴¹Cancer Prevention Institute of California, Fremont, CA, United States; ²California Cancer Registry, Sacramento, CA, United States; ³Los Angeles Cancer Surveillance Program, Los Angeles, CA, United States; ⁴Cancer Registry of Greater California, Sacramento, CA, United States

Background: Birthplace is a strong predictor of cancer risk with the potential to reveal new insights into etiology and prevention. In our commitment to providing high-quality data to support cancer surveillance and population-based research, the Cancer Prevention Institute of California, the Los Angeles Cancer Surveillance Program, and the Cancer Registry of Greater California, who make up the Regional Registries of the California Cancer Registry (CCR), conduct an annual linkage between the California Department of Vital Statistics and the statewide cancer registry database. This linkage initiates the death clearance process, utilizing death certificates to enhance the data quality of vital status information in the statewide database and capturing unreported cancer cases.

Purpose: Historically, capture of birthplace data from traditional cancer reporting sources has been a challenge, but leveraging death data through the Vital Statistics linkage will allow us to enhance patient sociodemographic data for surveillance and research.

Methods: Our approach involves conducting a death record linkage of cancer patients diagnosed in 2010-2015 in California. The regional registries will assess increases in birthplace completeness before and after linkage, determine rate of agreement, and discuss how characteristics of patients and tumors differ between those who have birthplace in both files versus those missing birthplace from the CCR.

Results: Findings from the linkage will be presented.

Conclusions: Findings will assess the value of increasing birthplace data completeness through data linkage. With an increasing population of immigrants in California and nationwide, and variabilities in sociodemographic factors and healthcare access between U.S.-born and foreign-born populations, birthplace data are critical for enabling surveillance among immigrant populations and for identifying disparities and novel cancer patterns to target interventions and research agendas.

P-11

API ERRORS ON CENTRAL REGISTRY LEVEL: SUCCESSFUL OR IS THERE A DISCONNECT?**J Mazreku¹**, D Hansen¹¹California Cancer Registry, Sacramento, CA, United States

Background: NPCR and SEER implemented separate derived TNM fields as part of the 2016 Data Item Changes. A total of 11 fields were implemented only at the central registry level. This central registry only implementation was a change in process compared to the Collaborative Staging (CS) algorithm. The CS Derived fields were implemented at both the facility and central registry levels. This meant that the facilities were required to clear CS errors prior to completing or updating admission records. This allowed for consistent data quality between facilities and central registries. This consistency has been lost with the move away from CS collection.

Purpose: The California Cancer Registry (CCR) is concerned about inconsistent data quality between facilities and central registries due to the implementation change. Additionally, the effectiveness of API errors has been questioned since if they are not being relayed to those who code the abstracts initially.

Method/Approach: While preparing data for submissions, we saw a high number of API errors, 17,322 combined SEER and NPCR for our 2016 data. Since it was not possible to manually review all of these cases, the CCR set out to develop automated fixes to first target the programming issues within the California software system, Eureka, along with resolving as many NPCR API errors as possible. Through automation efforts we were able to initially clear a total of 15,574 API errors for both SEER and NPCR without losing the integrity of the data.

Results: The burden to correct data has been transferred to central registries. Facilities are losing out on receiving coding feedback in the form of API errors. Additionally, the impact of the APIs seem to be diminished due to the fact that automation has assisted greatly in clearing the API errors.

Objective: The objective of this poster is to challenge the purpose of the derived fields and their corresponding APIs only being implemented at the central registry level.

P-12

OPPOSING TRENDS IN HPV-ASSOCIATED CANCERS IN MASSACHUSETTS: CERVICAL AND OROPHARYNGEAL CANCERS FROM 2006-2015E Cook^{1,2}, **S Gershman²**, J Kim¹, R Tamimi^{1,3}, JM Klevens⁴, M Holmes^{1,3}

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Purpose: Human papillomavirus (HPV) is the most common sexually transmitted infection in the United States and persistent infections with a high risk type of HPV can cause multiple types of cancer. Vaccinations for HPV are available, yet uptake in Massachusetts and the United States has been slow. This study aims to understand trends in the incidence and mortality of cervical and oropharyngeal cancers in Massachusetts and estimate the percent attributable to HPV.

Methods: From 2006-2015, the Massachusetts Cancer Registry recorded 3,895 incident cases of oropharyngeal cancer and 1,931 incident cases of cervical cancer. Mortality data were obtained from the Massachusetts Registry of Vital Records and Statistics from 2006-2015. Rates were age-standardized to the 2000 United States population and trends were assessed using joinpoint regression.

Results: While the incidence rate of cervical cancer (5.2 per 100,000) decreased by 1.6% annually ($p = 0.03$), the incidence rate of oropharyngeal cancer among males (8.2 per 100,000) increased by 2.8% annually ($p = 0.002$). Mortality rates for both cancers decreased from 2006-2015 without statistical significance. Of the estimated 440 HPV-attributable cases of oropharyngeal and cervical cancer diagnosed each year, 420 cases (95%) were estimated to be attributable to HPV genotypes currently covered by the HPV vaccine.

Conclusion: The rising incidence rate of oropharyngeal cancer in men, and the decreasing but relatively high incidence rate of cervical cancer in women, highlight the need for further screening and HPV vaccination in Massachusetts.

P-13

CAN A NAME REDUCE THE RISK OF CANCER?

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Background: The availability of identifiable information for data linkage varies by study or data source, and registries are not always sure how lack of certain variables will impact study results. The National Lung Screening Trial (NLST) became a natural experiment when some study sites were able to release participant names for linkage while others were not.

Purpose: Does the availability of name for data linkage appreciably change the incidence rates or relative risk of lung cancer when Social Security Number (SSN), date of birth, and sex are available? Additionally, how do rates compare to active follow-up as the gold-standard?

Methods: The NLST is a randomized trial that recruited approximately 54,000 men and women aged 55-74 years between 2002 and 2004. Active follow-up was conducted through 2009 with cancer registry linkage data covering the same time-period. We calculated incidence rates and relative risks (RR) by study arm and smoking years for: (1) lung cancer cases identified through active follow-up, (2) linkage with name, and (3) linkage without name.

Results: The study population included 3,174 (27.5%) participants with name available and 8,353 (72.5%) without. Between 2002 and 2009, there were 1,239 lung cancers diagnosed, with 923 (74.5%) identified by both the study and registry. The incidence rate for active follow-up was 545.5 (per 100,000) which was higher than rates from linkage with name (466.4) and no name (431.1). Relative risks for smoking years and lung cancer varied up to 18% between active follow-up and linkage results, regardless of name availability. Patterns of associations were similar for all modes but associations were attenuated towards the null without name.

Conclusions: As expected, incidence rates were lower through linkage. However, because availability of name was nondifferential, relative risks were similar but attenuated towards the null.

P-14

TRENDS IN THE INCIDENCE OF OVERWEIGHT- AND OBESITY-ASSOCIATED CANCERS IN TEXAS

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Background: Excess body weight is associated with 13 types of cancer, which together represented 40% of 1.6 million cancers diagnosed in the U.S. in 2014 (Steele *et al.* 2017). Although not all of these cases are due to being overweight, body weight is a key modifiable risk factor. Increased awareness of the link between body weight and cancer risk is important due to high and increasing rates of obesity.

Purpose: To quantify rates and trends of overweight/obesity-associated cancers in Texas from 2005-2014, and compare to national data. To share different methods used by the Texas Cancer Registry (TCR) to disseminate these results to increase public awareness, and guide research, policy, and initiatives to encourage healthy lifestyles.

Methods: TCR data were used to quantify incidence rates and the percentage change of overweight/obesity-associated cancers diagnosed in Texas from 2005-2014.

Results: 41% of cancers diagnosed in Texas in 2014 were at overweight/obesity-associated cancer sites. Overall, overweight/obesity-associated cancers increased from 2005-2014 (after excluding colorectal cancer, as incidence may decline due to screening). Liver, thyroid, pancreatic (females only), and endometrial cancers increased, while colorectal cancer, post-menopausal breast cancer, ovarian cancer, and esophageal adenocarcinoma (males only) decreased. Results were similar to those from the overall U.S. population but showed some differences. Results varied with sex, age, and race/ethnicity.

Conclusion: Overweight/obesity-associated cancers are common and increasing in Texas. Results will be disseminated as different data products (e.g., brief report, tables, plots, and slides) through the TCR website, which is a useful resource for the general public, researchers, and policy makers.

Reference: Steele CB, et al. *Vital Signs: Trends in Incidence of Cancers Associated with Overweight and Obesity, United States, 2005-2014.* MMWR Morb Mortal Wkly Rep 2017;66:1052-1058.

P-15

HUMAN SUBJECTS PROTECTION AND CANCER SURVEILLANCE RESEARCH: REVISED REGULATIONS, EXPANDED OPPORTUNITIES

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Background: On January 19, 2017, the U.S. federal government issued revisions to the Common Rule under which scientists who receive federal funding conduct research involving human subjects (Federal Policy for Protection of Human Subjects, 82 Fed Reg 7,149 (2017) (to be codified at 45 CFR 46)). The revised Common Rule will enhance the efficiency of activities including cancer surveillance, and research that uses cancer registry data.

Subject to the Common Rule, cancer registration and surveillance are evidence-based responses to the demands of the citizenry that cancers be counted. Population-based cancer data enable scientific findings that range from genetic markers to identification of behavioral and environmental factors that influence who gets cancer and why. These findings are made possible through research studies conducted to respect and protect the interests of research participants and especially cancer patients about whom identifiable data are accessed and used.

Purpose: The revised Common Rule offers an opportunity to reflect on the risks associated with research involving cancer registry data and the adequacy of human subjects protections.

Approach: The revisions to the Common Rule were analyzed by persons with expertise in research, human subjects protection, and regulatory compliance and interpreted with respect to the data release and research functions of SEER Program cancer registries in California.

Results/Conclusions: Several important revisions to the Common Rule in relation to cancer registry research were highlighted. These include: (1) the definition of public health surveillance activities; (2) the single IRB review requirement when more than one institution in the U.S. is engaged in multi-sited research subject to the Common Rule; (3) the expansion of exemption categories applicable to protocols using survey and interview procedures, and aggregated, de-identified data.

P-16

CHARACTERISTICS AND SURVIVAL OF CHILDREN WITH ACUTE LEUKEMIA WITH DOWN SYNDROME OR OTHER BIRTH DEFECTS IN NEW YORK

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Introduction: Children with Down syndrome (DS) have an increased risk of developing acute lymphocytic leukemia (ALL) and acute myeloid leukemia (AML). Leukemias among DS children have been studied extensively; however, these studies were mainly based on clinical trials or institutional reports. The purpose of this study was to link population-based cancer and birth defect data to evaluate the characteristics and survival of children with acute leukemia according to the presence of DS or other birth defects.

Methods: ALL and AML cases diagnosed between 1983 and 2012 among children aged 0-14 years were obtained from the New York State Cancer Registry. Birth defect status (DS, other birth defects, or no birth defect) was determined by linking with birth defect data reported to the New York State Congenital Malformations Registry. Associations between birth defect status and demographic characteristics were evaluated using contingency table analysis. Ten-year overall survival was calculated by birth defect status. Cox proportional hazard regression analysis was also performed to assess the effect of birth defect status on survival adjusting for confounding variables.

Results: Among 2,941 ALL children, 1.6% had DS, 3.8% had other birth defects, and 94.5% had no birth defect. No significant associations were observed between birth defect status and demographic characteristics evaluated. 10-year survival rates were relatively high, ranging from 81.5% for children with DS to 86.1% for children without a birth defect. Among 563 AML children, 11.0% had DS, 6.0% had other birth defects, and 83.0% had no birth defect. Children with DS were more likely to be diagnosed at a younger age and showed the highest 10-year survival (79.3%).

Conclusion: This study revealed comparable survival regardless of the presence of DS or other birth defects among ALL children. However, AML children with DS showed superior survival compared to children with other birth defects or no birth defect.

P-17

BLACK-WHITE DISPARITIES IN COLORECTAL CANCER TREATMENT, 2000–2007**A White**¹, LM Lines², MT Halpern³, LJ Patterson⁴, TB Richards¹, J Li¹¹Centers for Disease Control and Prevention, Atlanta, GA, United States; ²RTI International, Waltham, MA, United States; ³RTI International, Durham, NC, United States; ⁴University of Pennsylvania, Philadelphia, PA, United States**Background:** Prior studies have documented racial/ethnic disparities in colorectal cancer (CRC) treatment. The objective of this study was to determine whether black-white differences in treatment persist.**Methods:** We used Surveillance, Epidemiology, and End Results registry data linked with Medicare claims to identify Medicare beneficiaries aged >66 years diagnosed 2000–2007 with American Joint Committee on Cancer stages I–III CRC. We evaluated black-white differences in non-receipt of minimum treatment based on the National Institutes of Health 1990 Consensus Conference recommendations for adjuvant therapy for patients with CRC; and also differences in non-receipt of an enhanced level of treatment, based on the 2007 National Comprehensive Cancer Network guidelines. We estimated adjusted odds ratios (AOR) and 95% confidence intervals (CI), controlling for year of diagnosis, sociodemographic and clinical characteristics, and treatment setting.**Results:** Among 37,958 colon cancer patients, black patients had higher odds of non-receipt of minimum treatment (compared with whites) only among those with stage III disease (aOR 1.43; CI: 1.18–1.74). However, black patients had significantly higher odds of non-receipt of enhanced treatment regardless of stage (aORs Stage I, 1.35; CI: 1.05–1.75; Stage II, 1.56; CI: 1.26–1.93; and Stage III, 1.45; CI: 1.13–1.86). Among 11,389 rectal cancer patients, black patients had higher odds of non-receipt of minimum treatment (compared with whites) only if they had stage III disease (aOR = 1.56; CI: 1.02–2.40). No significant differences were present in the odds of non-receipt of enhanced treatment.**Conclusions:** Black-white disparities persisted in 2000–2007 in receipt of guideline-concordant CRC treatment.

P-18

BREAST CANCER IN YOUNG WOMEN AGES 20-39 IN THE UNITED STATES**C DeSantis**¹, J Ma¹, A Jemal¹¹American Cancer Society, Atlanta, GA, United States**Purpose:** To provide contemporary, comprehensive statistics for breast cancer in young women in the United States.**Methods:** Using data from the North American Association of Central Cancer Registries, we describe breast cancers diagnosed in women ages 20–39 and analyze incidence trends from 1997 to 2014 by race/ethnicity and stage at diagnosis. Stage was imputed for those with missing information by distributing cases proportionally according to survival statistics. We also examine trends in survival and mortality.**Results:** Among women ages 20–39, non-Hispanic (NH) blacks have the highest breast cancer incidence and mortality rates of any racial/ethnic group in the United States. More than half of the patients were diagnosed at regional/distant stages in every racial/ethnic group except Asian/Pacific Islanders (API). During 1997–2014, overall incidence rates increased slightly among NH white (0.3% per year) and API (0.9% per year) women, largely driven by increases in local stage disease. Incidence also increased for distant-stage disease in NH whites (3.4% per year), NH Blacks (3.6% per year), and Hispanics (2.7% per year). In contrast, rates decreased sharply for unstaged disease among all groups; however, imputing stage at diagnosis attenuated, but did not fully remove, the increasing trends for local- and distant-stage diseases. Breast cancer death rates among young patients decreased in all racial/ethnic groups, with NH Black women showing the steepest declines over the last decade. Likewise, there were significant improvements in 5-year survival for all groups during 1992–1996 to 2007–2013, with the largest increases (10% or more) for patients diagnosed with regional- or distant-stage disease.**Conclusion:** Incidence rates of local and distant-stage breast cancers continue to increase in young women even after accounting for the sharp declines in rates of unstaged disease. Future studies should examine reasons for the increasing trends.

P-19

PROGNOSTIC MULTIGENE TESTING IN BREAST CANCER: PATTERNS, DISPARITIES, AND OPPORTUNITIES FOR ADVANCING STANDARDIZED PATIENT CARE

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Background: The decision to give adjuvant chemotherapy to patients with hormone receptor positive early stage breast cancer is controversial given the overall good prognosis with local therapy (surgery and radiation) plus hormonal therapy alone. In 2004, the 21-gene RT-PCR assay recurrence score (Oncotype) was developed to stratify early stage patients into categories of high, low, and intermediate recurrence rates considering treatment with local and hormonal therapy alone. This was incorporated into the NCCN guidelines in 2008. We sought to compare NCCN guidelines to actual practice patterns.

Methods: By retrospective review, data were examined from eight state registries participating in the National Program of Cancer Registries' Comparative Effectiveness Research program: Alaska, Colorado, Florida, Idaho, Louisiana, North Carolina, New Hampshire, and Rhode Island. These were then compared to NCCN guidelines for prognostic multigene testing.

Results: Of the 28,372 cases examined, 18.6% were classified as carcinoma *in situ*, 39.6% were stage I, 24.3% were stage II, 9.1% were stage III, 4.9% were stage IV, and 3.6% were unknown stage. The overwhelming majority of cases, 75.5%, were estrogen receptor (ER) or progesterone receptor (PR) positive, while 15.7% were ER and PR negative, and 8.8% were hormone receptor unknown. Approximately 40% of cases were human epidermal growth factor receptor 2 (HER2) positive, and the remaining 60% were HER2 negative or unknown. Approximately 72% of patients were node negative or had unknown nodal involvement, while the remaining 28% had at least micro-metastatic nodal disease. Invasive ductal carcinoma was the most common histology accounting for 71.4% of cases examined. Median age was 62. Data analysis for the use of prognostic multigene testing in relation to NCCN guidelines, race, age, and the above clinical factors is ongoing and will be presented at SABCS 2017.

Conclusion: The purpose of this study is to examine the factors associated with the use of prognostic multigene testing according to the NCCN guidelines, including personal and clinical factors. By identifying practice patterns we can then address disparities and opportunities for advancing standardized quality patient care.

P-20

AN ASSESSMENT OF COMORBID HEALTH CONDITIONS AMONG INCIDENT CANCER DIAGNOSES WITHIN THE VIRGINIA CANCER REGISTRY, 2005-2014

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Background: Comorbidity, race, and age are known to impact cancer development and receipt of cancer therapy and survival. Patients with comorbid conditions often require a heightened level of coordination to manage their diseases effectively. According to the National Cancer Institute, the top four incident cancers, lung, colorectal, breast, and prostate, have rates of comorbidity at 52.9%, 40.7%, 32.2%, and 30.5%, respectively. In order to gain an understanding of comorbidity prevalence among cancer patients in Virginia, the Virginia Cancer Registry (VCR) conducted an analysis on comorbidity and incident cancers.

Methods: The VCR identified 10 years of incident lung, colorectal, breast, prostate, and all-sites cancer cases from the VCR live cancer database from January 1, 2005 through December 31, 2014. Among the incident cancer cases, hospital-level data were used to identify comorbid health conditions. Percentages were computed for each comorbidity associated with the selected cancer sites.

Results: The top three comorbid health conditions among all sites cancer in Virginia were hypertension (22.3%), hyperlipidemia (12.7%), and type II diabetes mellitus (11.9%). Among the selected cancer sites, the previously listed conditions were also common. Additionally, breast and prostate cancers also had high percentages of esophageal reflux, while chronic airway obstruction was common with lung cancers.

Conclusions: Understanding the prevalence of comorbidities among cancer cases in Virginia is extremely important and in all cancer sites, chronic diseases were the top comorbid conditions. As a result of this study, a table of comorbidity percentages related to each cancer site was created and is publicly available on the VCR website. Local hospitals, clinics, state and local agencies/programs, and researchers are encouraged to access this information and use it as a tool for cancer surveillance, research, and promoting health to all Virginians.

P-21

RECENT TRENDS IN CHILDHOOD CANCER INCIDENCE IN CANADA (2001-2014): REPORT FROM THE CANCER IN YOUNG PEOPLE IN CANADA (CYP-C) SURVEILLANCE PROGRAM

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Background: Childhood cancer incidence may be increasing in Canada and other countries.

Purpose: To describe recent population-based incidence trends in childhood cancer in Canada.

Methods: The Cancer in Young People in Canada (CYP-C) surveillance system was used to estimate annual age-standardized incidence rates (ASIRs) from 2001 to 2014 among children aged 0-14 years by sex, age and region for the diagnostic groups of the International Classification of Childhood Cancer (ICCC). Trends were examined by annual percent changes (APCs) using Joinpoint regression and compared with trends observed in the Canadian Cancer Registry (CCR).

Results: Statistically significant APCs in ASIRs were observed with a 0.7% increase observed from 2001 to 2014 for all cancers combined, driven mainly by the increase in leukemia (1.3%), especially among females (1.8%). The largest increase in all cancers combined was observed in 10-14 year olds (1.6%). Regionally, APCs of 1.6% for all cancers were observed in Ontario and British Columbia. Leukemia incidence increased among those aged 10-14 (2.9%), and in Ontario (3.0%) and Atlantic region (3.1%). Though rarer, greater increases were observed in rates of soft tissue sarcomas among children aged <1 (5.2%) and in British Columbia (6.7%). There were also increases for intracranial and intraspinal germ cell tumors in all children (3.9%), osteosarcomas in females (3.9%), thyroid cancer in children aged 10-14 (6.7%), and nephroblastoma (2.3%) and ependymomas (3.1%) in Ontario. Similar results were obtained using CCR data with age-related differences related to location of care.

Conclusions: Increasing childhood cancer incidence trends may reflect the changes in demographics and/or etiological exposures. Comparing results from independent surveillance systems can help to reveal artefacts of changes in cancer diagnosis, coding and reporting. The results may inform etiologic research and development of public health policy and programs.

P-22

TRENDS IN INCIDENCE AND MORTALITY OF LIVER CANCER IN NEW JERSEY RESIDENTS

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Background: Liver cancer incidence and mortality rates are increasing across the United States. Each year there are about 672 new cases of liver cancer diagnosed among New Jersey (NJ) residents and 430 deaths attributable to this disease.

Purpose: To describe the trends in liver cancer in NJ residents.

Methods: Data were obtained from the NJ State Cancer Registry. Age-adjusted liver cancer incidence and mortality rates from 1979-2014 were calculated using SEER*Stat, and the JoinPoint Regression Program was used to estimate annual percent change (APC) in rates and changes in time trends.

Results: The incidence of liver cancer increased significantly in NJ men and women, with a larger increase in men until 2004 (females, 1990-2014: APC = 2.6; males, 1990-2004: APC = 4.1, 2004-2014: APC = 1.6) Asian or Pacific Islander (API) males maintained the highest incidence from 1991-2009. After 2009, Black males had the highest incidence, which continued to increase (APC = 3.3). White residents consistently had the lowest incidence of liver cancer. From 1990-2014, Hispanic males and females had higher liver cancer incidence than Non-Hispanic males and females. Liver cancer mortality rates from 1979-2014 were higher among males than females, but rates continued to rise for both. API males (APC = -1.1) and females (APC = -1.2) were the only groups that experienced a decrease in mortality from 1991-2014.

Discussion: Liver cancer is largely associated with modifiable risk factors such as hepatitis B or C infection, cirrhosis, obesity, type II diabetes, heavy alcohol use, and cigarette smoking. Therefore, liver cancer rates may be attenuated by addressing these factors.

Conclusion: From 1979-2014, NJ men and women both showed an increase in the incidence of liver cancer. This trend held for all racial and ethnic groups analyzed except for API males and females and Hispanic females.

P-23

INCIDENCE OF CANCER IN ADOLESCENT AND YOUNG ADULTS IN PUERTO RICO: A DESCRIPTIVE AND COMPARATIVE STUDY

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Background: Adolescents and young adults (AYA) with cancer are a particularly vulnerable group. Previous studies have suggested that compared with older adults and children, AYA are more likely to experience delays in diagnosis or treatment, have different survival patterns, have greater difficulty maintaining education and employment positions, and have more psychosocial problems.

Aim: To describe cancer incidence rates and trends in AYA living in Puerto Rico (PR) and compare with other races in the United States.

Methods: Data on 10,806 eligible patients aged 15-39 years old with a cancer diagnosis during the period 2000-2014 were included. Cancers among AYA were classified using SEER AYA Site Recode/WHO 2008.

Results: During the period 2000-2014, 7,189 (66.5%) women and 3,617 (33.5%) men were diagnosed with cancer in PR. For the same period, the average annual age-adjusted incidence rates for AYA was 76.6 per 100,000 women and 39.9 per 100,000 men. Females in PR had the second higher incidence rate of cancer (77 per 100,000) when comparing with U.S. ethnic groups. However, among men, Puerto Ricans has the lowest incidence rate (39.9 per 100,000). Joinpoint regression analyses showed a statistically significant increase of all malignant cancer sites incidence in 2000-2014 period (AAPC 3.7%). Five cancers in AYA showed an average annual percent change (AAPC) that exceeded 3% (NHL, testicular, melanoma, cervix and uterus, and colorectal cancers). Whereas, for thyroid, renal and acute lymphoid leukemia the AAPC exceeded 8%. Ovarian cancer, among females 35-39 years, was the only malignancy showing a significant decrease (AAPC = - 6.8%).

Conclusions: This study shows significant differences of AYA cancers sites by sex, age and racial/ethnic group. Further studies on AYA population in PR and the U.S. are required to understand specific-cancer site patterns.

P-24

RISK OF SUBSEQUENT INVASIVE CANCERS AMONG CERVICAL CANCER SURVIVORS IN NEW JERSEY, 1990-2015

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Background: Cervical cancer survivors (CCS) may have increased risk for subsequent primary cancers associated with human papillomavirus (HPV) and cigarette smoking.

Purpose: To evaluate the risk of developing subsequent invasive cancers by cancer site, race/ethnicity, and age group in New Jersey (NJ) CCS.

Methods: A cohort of 10,646 NJ women diagnosed with invasive cervical cancer from 1990-2015 was identified from the NJ State Cancer Registry. Standardized incidence ratios (SIR) for invasive cancers and 95% confidence intervals (CI) were calculated using the Multiple Primary-SIR session of SEER*Stat.

Results: Compared to the general NJ female population, risk of all subsequent cancers was significantly elevated in non-Hispanic white (NHW): SIR = 1.3, 95%CI 1.2-1.4; black (NHB): SIR = 1.6, 95%CI 1.4-1.8; and Hispanic CCS: SIR = 1.5, 95%CI 1.2-1.7; but not in Asian/Pacific Islanders (NHAPI): SIR = 1.2, 95% CI 0.7-1.8. For the HPV-associated cancers, the risk of vaginal cancer was significantly elevated in NHW, NHB, NHAPI and Hispanic CCS (SIR = 25.5, 95%CI 14.9-40.9; SIR = 19.7, 95%CI 7.2-42.8; SIR = 53.9, 95%CI 6.5-194.8; SIR = 22.8, 95%CI 6.2-58.3), as was the risk for vulvar cancer in NHW (SIR = 3.5) and anal cancer in NHW (SIR = 3.2) and NHB CCS (SIR = 8.4). NHW, NHB and Hispanic CCS had significantly increased risk of lung cancer (SIR = 2.2, 95%CI = 1.8-2.5; SIR = 2.4, 95%CI = 1.7-3.3; SIR = 4.0, 95%CI = 2.6-5.9). Increased risks for other smoking-associated cancers were observed, including cancers of the larynx (NHW), esophagus (NHB) and urinary bladder (NHW, NHB). The risk of lung cancer was significantly elevated in NHB CCS diagnosed at screening age (SIR = 3.0) but not in NHB diagnosed at age 65 or older.

Conclusions: Our findings support the importance of continued surveillance of cervical cancer patients and promotion of HPV prevention and smoking cessation programs throughout the survivorship continuum.

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FEMALE BREAST, CERVICAL AND COLORECTAL CANCER SURVIVAL IN MISSOURI, 1996-2014**Y Yoshida**^{1,2}, C Schmaltz^{1,2}, E Simoes^{1,2,3}, J Jackson-Thompson^{1,2,3}¹Missouri Cancer Registry & Research Center, Columbia, MO, United States; ²Department of Health Management and Informatics, University of Missouri-Columbia, Columbia, MO, United States; ³MU Informatics Institute, University of Missouri-Columbia, Columbia, MO, United States**Background:** Population-based survival provides an indicator of the effectiveness of screening, early diagnosis and treatment. Female breast cancer (FBC), cervical cancer (CC), and colorectal cancer (CRC) survival have not been well described in Missouri (MO).**Aim:** Evaluate 5-year relative survival (RS) for FBC, CC, and CRC in MO.**Methods:** Survival data from the Missouri Cancer Registry were obtained for cases diagnosed 1996-2014. Using SEER*Stat, we analyzed 5-year RS rates with follow-up through 2015 by year of diagnosis, stage, age, race, geographical region, and metro v. non-metro status. Assessments were made by comparing confidence intervals.**Results:** From 1996-2014, FBC RS was 87%, slightly lower than the SEER-13 rate of 90% (1996-2013). For the same period, CC RS was 66%, lower than the SEER rate of 70%. CRC RS was 62%, also lower than the SEER rate (65%). CC RS rates were consistent over the years; there was a small possible increase in FBC and CRC RS over 1996-2010. RS rates for localized FBC, CC, and CRC were 98, 92, and 88%, respectively. Late stage (regional and distant) RS rates were 73, 44, and 48% for the three cancers, respectively. Among age groups, individuals <40 had the lowest FBC RS rate (83%), while individuals ≥65 had the lowest CC and CRC RS rates (45 and 59%, respectively). Compared to other racial groups, blacks had the lowest RS rates for all three cancers (79, 58, and 55% for FBC, CC, and CRC, respectively). St. Louis City had the lowest RS rates for all three cancers among the examined regions (82, 59, and 55% for FBC, CC, and CRC, respectively). For FBC and CRC, metro areas had higher RS rates than non-metro areas (88 vs. 85% and 63 vs. 60% for FBC and CRC, respectively). CC RS rates were similar in non-metro and metro areas (67 vs. 66%).**Conclusions:** Prognostic and demographic variations exist in FBC, CC and CRC survival. Trends and patterns presented may help inform patients, healthcare providers and policy makers the survival of these three major cancers in MO.

P-26

STAGE AT DIAGNOSIS BY HEALTH INSURANCE STATUS AMONG ADOLESCENT AND YOUNG ADULT CANCER PATIENTS IN CALIFORNIA**Y Chen**¹, F Maguire¹, C Morris¹, A Parikh-Patel¹, K Kizer¹, T Keegan²¹California Cancer Reporting and Epidemiologic Surveillance Program, University of California Davis Health, Institute for Population Health Improvement, Sacramento, CA, United States; ²Center for Oncology Hematology Outcomes Research and Training (COHORT) and Division of Hematology and Oncology, University of California Davis School of Medicine, Sacramento, CA, United States**Background:** Lacking health insurance or having public health insurance is associated with diagnosis at a later stage among adolescent and young adult (AYA) cancer patients. However, prior studies have been unable to distinguish patients who were uninsured from those who became insured at the time of diagnosis through emergency Medicaid coverage. Patients enrolling at diagnosis represent a particularly vulnerable group that may have poor access to care. This study describes stage at diagnosis and patient characteristics by health insurance type at cancer diagnosis.**Methods:** We identified AYA patients (ages 15-39) with 12 major cancers diagnosed from 2005 to 2014 using California Cancer Registry data. This cohort was linked to Medicaid enrollment files to determine continuous enrollment (≥5 months) or enrollment at the time of cancer diagnosis. Other types of insurance were determined from registry data.**Results:** Among 64,281 AYA cases, 13% had continuous Medicaid, 10% had Medicaid at diagnosis, 65% had private insurance, 3% were uninsured, and 9% had other/unknown insurance. More patients with Medicaid at diagnosis (38%) were diagnosed at a late stage (AJCC stage III/IV), than those with continuous Medicaid (33%), private insurance (30%), or uninsured (30%). Both Medicaid at diagnosis and the uninsured had more patients that were male (49%, 59%), 20-29 years old (36%, 44%), and unmarried (70%, 69%), compared to continuous Medicaid (32% male, 28% age 20-29, 67% unmarried) and private insurance (37% male, 29% ages 20-29, 46% unmarried). Medicaid at diagnosis, continuous Medicaid, and the uninsured had more Hispanic patients (55%, 54%, 52%) than the privately insured (25%). All differences were significant.**Conclusions:** Patients with Medicaid at diagnosis had later stage disease than the other insurance categories and similar patient characteristics to the uninsured with more young, Hispanic, unmarried men. This group of patients warrants further attention.

P-27

THREE-YEAR RELATIVE SURVIVAL FOR GYNECOLOGIC CANCERS IN PUERTO RICO & USA ETHNIC GROUPS: 2007-2011

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Background: Comparative gynecologic cancer survival estimates are limited for U.S. Hispanics (USH) and Puerto Rico (PR) populations.

Objective: To estimate and compare 3-year relative survival for ovarian, uterine, and cervical cancers in PR and U.S. ethnic groups.

Methods: Data were obtained from the PR Central Cancer Registry database and Surveillance, Epidemiology, and End Results (SEER) Program. Three-year relative survival and 95% confidence intervals (CI) were estimated based on cases diagnosed between 2007 and 2011. Survival estimates were calculated for non-Hispanic Whites (NHW), non-Hispanic Blacks (NHB), USH, and PR.

Results: The total number of cases included from PR were: 623 ovarian cancers, 1,122 cervical cancers, and 2,096 uterine cancers and from the US: 21,963, 14,082, and 46,336 cases, respectively. Women with ovarian cancer in PR had a 3-year relative survival of 53.3% (CI 49.2-57.3) similar to that of NHW (57.6%; CI 56.8-58.4); whereas the highest survival rate was observed in USH (63.3%; CI 61.4-65.0) and the poorest among NHB (46.6%; CI 44.4-48.9). For cervical cancer the 3-year survival rate was lowest among NHB (62.6%; CI 60.4-64.7) followed by PR (68.7%; CI 65.8-71.5). Higher survival rates from cervical cancer were observed for USH (76.5%; 95% CI 75.0-78.0) and NHW (72.9%; CI 71.9-73.9). Finally for uterine cancer, the lowest 3-year survival rate was observed among NHB (66.9%; CI 65.5-68.3); whereas, the highest was among NHW (87.2%; CI 86.8-87.6) followed by USH (85.4%; CI 84.4-86.4) and PR (81.7%; CI 79.8-83.5).

Conclusion: For all cancer sites, survival rates decrease with age and stage at diagnosis. Three-year survival rates were lower among NHB for all three cancer sites analyzed. PR had similar 3-year relative survival rates than NHW for ovarian and uterine cancer, but a lower survival rates than NHW for cervical cancer.

P-28

RARE CANCER INCIDENCE IN NORTH CAROLINA (PANCREAS, MALE BREAST, ADRENAL/OTHER ENDOCRINE GLANDS) S Ali¹

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Introduction: This presentation will focus on patterns of rare cancer incidence for white and African American in North Carolina. The rare cancer in this study will include pancreas, male breast, and adrenal/other endocrine glands. The adrenal/other endocrine cancers have been steadily increasing in North Carolina, from 8.4 per 100,000 in 2004 to 13.3 per 100,000 in 2013.¹ These rare cancers collectively accounted for 25 percent of all tumors among adults aged 20 and older.²

Purpose: This study will examine the patterns of pancreas, male breast and adrenal endocrine cancers in North Carolina. This study will enable us to know the racial differences of rare cancer incidence among white and African American in North Carolina. This study will also discuss rare cancer prevention strategies.

Methods: The most current data on pancreas, male breast, and adrenal cancer incidence will be obtained through North Carolina Central Cancer Registry (NCCCR). Population data from the National Center for Health Statistics (NCHS) will be used in the denominators of the rates, which will be expressed per 100,000 population. The 12-year incidence rates for whites and African Americans will be calculated to identify the rare cancer incidence trends over the 12 year period. Graphs and data tables will be included for visualization of the data.

References:

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P-29

PRODUCING CANCER STATISTICS AT THE CENSUS TRACT LEVEL: A LOUISIANA STORY**L Maniscalco**¹, C Rosales¹, Y Yi¹, L Zhang¹, C Lefante¹, M Hsieh¹, S Scoppa², M Yu³, X Wu¹¹Louisiana Tumor Registry, New Orleans, LA, United States; ²Information Management Services, Inc., Calverton, MD, United States; ³National Cancer Institute, National Institutes of Health, Bethesda, MD, United States

Background: During the 2017 Louisiana Legislative Session, a new law was signed requiring that the Louisiana Tumor Registry (LTR) produce cancer statistics at the census tract level. Previously, cancer statistics could be released to the public at the parish (county) level. To comply with this law, the LTR convened a team, including experts from NCI-SEER and IMS, to develop the appropriate methodology to produce incidence rates at the census tract level while ensuring rate stability and patient confidentiality.

Methods: To preserve confidentiality and comply with HIPAA laws, the team of experts discussed levels of suppression for both case counts and the underlying population, including the number of years that should be combined in the analysis, and assessed population estimates from three sources (Woods and Poole, the American Community Survey, and the 2010 Census). Additionally, we made efforts to identify physical addresses for cases that had been geocoded based on zip code, PO Box, and parish centroid.

Results: After reviewing the preliminary analysis, it was determined that 9 years of data (2006-2014) should be included, and the 2010 Census was determined to be the best population source for this time period based on the 95% confidence intervals. An underlying population of 20,000 was determined to be the minimum based on HIPAA laws, and census tract rates would be suppressed if based on fewer than 16 cases as indicated by the United States Cancer Statistics. For all cancer sites combined, 76.4% of the census tracts have the required case and population counts for presentation in the final report.

Conclusions: It is feasible to publish cancer incidence rates at the census tract level while ensuring reliable rates and patient confidentiality. Due to small case counts, only the top five cancer sites, in addition to all cancers combined, will be presented in the final report, which will include an explanation of the results and methodology to prevent misinterpretation.

P-30

CONTRARY TO THE POPULAR BELIEF: DIFFERENTIAL IMPACT OF HRT AND MPH RULES ON FEMALE INVASIVE BREAST CANCER INCIDENCE**A Balamurugan**¹, A Holt¹, C Fisher¹, R Delongchamp¹¹Arkansas Department of Health, Little Rock, AR, United States

Background: While the decrease in incidence trends of female invasive breast cancer has been generally praised, the influence of hormone replacement therapy (HRT) cessation and implementation of the multiple primary and histology (MPH) rules has been understated.

Purpose: To assess the impact of HRT and MPH rules on female invasive breast cancer incidence trends.

Method: We followed primary and subsequent invasive breast cancer incidence among all white females diagnosed in Arkansas between 1997-2014. Age-adjusted incidence rates were calculated for each of the following: females with a primary or subsequent breast cancer, and females with first primary breast cancer alone. Trends and joinpoint analysis were used to measure the impact of HRT cessation and MPH rules on first primary breast tumor diagnoses.

Result: A total of 29,335 white females were diagnosed with either a primary (23,438 females) or subsequent (5,897 females) breast cancer from 1997-2014. The age-adjusted rates from 1997-2014 has been declining 1 case per 100,000 per year, and this trend was significant ($p = .002$). When accounting for HRT cessation ($p < .001$) and the MPH rules ($p = .005$), there has been an increase of 1.2 cases per 100,000 per year, and the joinpoint trend was significant, ($p = .014$). When assessing those with first primary of breast cancer alone, the increasing trend was no longer significant ($p = .280$), also the estimate for HRT cessation ($p < .001$) remained unchanged, suggesting the increasing trend was likely due to increased subsequent primary tumor diagnoses.

Conclusion: Contrary to the decreasing trend in primary and subsequent breast cancer incidence from 1997-2014, when accounting for the impact of HRT cessation in 2002 and MPH rules implementation in 2007, there has been an increase in female invasive breast cancer incidence. Therefore, regardless of the MPH rules implementation in 2007, the increasing trend could be due to an increase of subsequent primary diagnoses.

P-31

CERVICAL CANCER AND EMERGENCY DEPARTMENT USE IN CALIFORNIA FROM 2010 TO 2014**J Killion¹**, F Maguire¹, C Morris¹, A Parikh-Patel¹, K Kizer¹¹California Cancer Reporting and Epidemiologic Surveillance Program, University Of California Davis Health, Institute for Population Health Improvement, Sacramento, CA, United States

Background: Compared to persons with other types of insurance, Medicaid patients are more likely to use emergency departments (ED) for non-emergent conditions. Women with cervical cancer are more likely to have Medicaid coverage. Cervical cancer has the highest rates among Black and Hispanic women. This study examined the characteristics of patients with cervical cancer who used an ED within a year prior to diagnosis in an effort to identify cancer symptoms that may have led to an earlier diagnosis.

Methods: ED and hospital admissions data from the California Office of Statewide Health Planning and Development were linked to the California Cancer Registry. We compared demographic and clinical characteristics of patients with cervical cancer who had an ED visit within the year prior to diagnosis and those without an ED visit and assessed cervical cancer and patient characteristic frequencies with chi-square tests.

Results: There was a statistically significant relationship between ED use and socioeconomic status (SES), stage at diagnosis, age at diagnosis, race/ethnicity, and insurance type. A larger percentage of patients visiting the ED were diagnosed at a late stage (58% stage IV) and were Black (60%) compared to patients without ED visits (42% stage IV, 40% Black). A smaller percentage of patients visiting the ED were from the highest SES (39%) and in the age group of 20-44 years (42%) compared to patients without ED visits (61% highest SES, 58% age 20-44). Among ED users, 61% had symptoms consistent with cervical cancer based on ICD-9 codes.

Conclusion: Among women with cervical cancer, those visiting an ED within a year prior to diagnosis compared to those not visiting an ED were older and more likely to be poor, Black, and diagnosed at a late stage. 61% of ED users presented with symptoms consistent with cervical cancer. This study suggests that there may be opportunities to diagnose cervical cancer at an earlier stage among women seeking ED care.

P-32

COMPETING RISKS SURVIVAL AND CAUSE OF DEATH IN FEMALE BREAST CANCER PATIENTS IN KOREA**H Cho¹**, D Lee¹, E Lee¹¹National Cancer Center, Goyang, Korea, Republic of Korea

Background: Breast cancer patients are at the risk of dying from diagnosed breast cancer and from other competing causes of death (e.g., CVD). Understanding causes of death and actual mortality patterns experienced by patients are critical in both survivorship studies and clinical decision-making, as, for example, higher chances of dying from competing causes of death may preclude the benefit of cancer treatment.

Methods: We conducted competing risks survival analysis on female breast cancer patients in Korea diagnosed in 1993–2013 (n = 184,721) by deriving cumulative incidence. Five-year probabilities of death from cancer and other causes were estimated by age and stage at cancer diagnosis. Distribution of causes of death is shown to illustrate descriptive patterns of mortality. Population-based cancer registry data, Korea Central Cancer Registry, linked to the cause of death information based on ICD-10, Statistics of Korea, was utilized for this analysis.

Results: Most death is attributed to breast cancer and for non-cancer causes of death, cerebrovascular diseases were the most common. Survival experience from cancer and other causes varied substantially by age and stage diagnosis. Younger patients had worse probability of death from breast cancer relative to their competing causes of death. Both cancer and other-cause survival were worse for the elderly; 5-year probability of death increases from 12% (age 65-75) to 27% (over age 75) for breast cancer and 3% to 10% for other competing causes. For recently diagnosed localized cancer patients aged 75-85, 5-year probability of death from cancer (13.6%) and from other causes of death (9.1%) were similar.

Conclusion: Death from breast cancer remains substantial relative to the other causes, in particular younger ages and advanced stage. Death from other causes become increasingly important in the elderly diagnosed as early stage cancer. Treatment and health care decisions may benefit from understanding probability of death from cancer and other causes.

This work was supported by National Cancer Center, Korea, under grant NCC-1710300-2.

P-33

WHAT'S BEHIND THE DECREASING CERVICAL CANCER SURVIVAL IN THE UNITED STATES?**H Weir**¹, V Benard¹, M Coleman², C Allemani²¹Centers for Disease Control and Prevention, Atlanta, GA, United States; ²London School of Hygiene and Tropical Medicine, London, Great Britain

Background: Cancer survival measures the effectiveness of the health care system to address the needs of cancer patients in the population. According to CONCORD studies, cervical cancer survival decreased slightly in the United States from 64.2% in 1995-99 to 62.6% in 2010-14. This analysis sought to explore the reasons for the decrease.

Methods: Incidence data for U.S. women diagnosed between 1995 and 2014 were obtained from the CINA Public Use file. SEER*Stat was used to examine trends in 3-year average annual age-standardized incidence rates per 100,000 women. 5-year age-standardized net survival (%) by SEER Summary Stage 2000 was estimated using CONCORD-2 data (2001-2009).

Results: Overall, cervical cancer incidence decreased from 10.9 in 1995-97 to 7.5 in 2012-14. Rates by stage decreased from 5.6 to 3.3 (local), 3.2 to 2.6 (regional), and 1.2 to 0.5 (unknown); and remained stable from 1.0 to 1.1 (distant). Overall survival decreased from 64.2% in 1995-99 to 62.8% in 2004-09. Between 2001 through 2009, there was slight improvement in stage specific survival (local: 84.5% to 85.9%; regional: 53.2% to 55.8%; distant: 16.0% to 16.3%). Stage-specific survival will be updated to 2010-14 using the CONCORD-3 data.

Discussion: Cancer screening has successfully reduced the incidence of invasive cervical cancer diagnosed at early stages by selectively identifying and removing precancerous lesions. Stage-specific survival has improved slightly. The decrease in overall survival (all stages combined) results from the fact that women diagnosed with more aggressive, late-stage cancers, for which survival is lower, now comprise a higher proportion of all cervical cancers.

P-34

INNOVATIVE SOURCES FOR BREAST CANCER: SUPPLEMENTING REGISTRY MULTIGENE ASSAY DATA THROUGH LINKAGES**H Katz**¹, N Schussler², W Howe², A Stroup^{1,3,4}, **S Hill**^{1,3}¹New Jersey State Cancer Registry, Cancer Epidemiology Services, New Jersey Department of Health, Trenton, NJ, United States; ²Information Management Services, Inc., Calverton, MD, United States; ³Rutgers Cancer Institute of New Jersey, New Brunswick, NJ, United States; ⁴Rutgers School of Public Health, Department of Epidemiology, Piscataway, NJ, United States

Background: The National Comprehensive Cancer Network recommends a multigene assay for certain breast cancers to determine the benefit of chemotherapy. Patients with low recurrence scores (RS) may be able to avoid the toxicity of chemotherapy. Two such tests are available: OncotypeDx (ODx) (Genomic Health, Inc.) and MammaPrint (Agendia). Although the results of these assays are collected by registries, the completeness and accuracy of assay data are unknown.

Purpose: In an effort to improve collection, the New Jersey State Cancer Registry (NJSCR), together with NCI and Information Management Services, Inc. (IMS), conducted a linkage of breast cancer patients with ODx results from Genomic Health, Inc. (GHI).

Methods: A linkage was conducted of New Jersey breast cancer patients and ODx results from GHI. Matches with ODx results within a specified timeframe of diagnosis had assay results automatically populated into new fields in the NJSCR. Uncertain matches, or where the date of the ODx was outside the timeframe, were manually reviewed. NJSCR compared the data in the abstract to that from GHI.

Results: Preliminary analysis found 16,957 cases in the NJSCR that were eligible for multigene assay. Of those, 7,026 were coded as having ODx testing. GHI reported 7,238 patients receiving ODx testing. Among those with a documented RS, 96.8% agreed with GHI data. There was 93.1% agreement between risk group in the abstract and data from GHI. Of 7,026 patients meeting criteria for multigene assay with a result documented in the abstract, 14.8% had no test result from GHI. Of those not meeting criteria (31,814), 2,660 cases had a test documented by GHI. 1,419 of these were documented in the abstract as having assays performed.

Conclusion: Linkages with laboratories performing genomic testing may be a valuable source for improving registry documentation. However, additional investigation into discrepancies between registry-documented data and lab-reported data are warranted.

P-35

CHARACTERISTICS OF COMORBIDITY INDICES DERIVED FROM HEALTH ADMINISTRATIVE CLAIMS DATA FOR YOUNGER AND OLDER PATIENTS

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Background: Comorbidity burden is an important concept used in outcomes research that is not well captured in cancer registry data. While several comorbidity indices developed from administrative claims data have been widely used in cancer research, it is not clear which index is best suited for population-based cancer research utilizing cancer registry data, particularly for the younger cancer patients. The Kentucky Cancer Registry (KCR), in collaboration with the Centers for Disease Control and Prevention, conducted a study to link registry data with Medicare, Medicaid and private insurance claims files. Using the linked data, KCR calculated several comorbidity indices and examined their characteristics.

Methods: Four comorbidity indices (Modified Charlson [CCI], Klabunde Site Specific [KCI], ACE-27, and Elixhauser [ECI]) for three cancer sites (breast, lung and colorectal) were calculated from the linked claims data for two age groups: 20-64 years old and 65+. Logistic regression was used to ascertain the predictive power of each index with one-year survival as the outcome variable. The c-statistic and Akaike Information criterion were compared and a bootstrap approach was used to calculate 95% confidence intervals for several statistics.

Results: The performance of the comorbidity indices vary considerably between the younger and older populations. For the older population, the KCI performed the best or near the best across the three cancer sites while the CCI had better performance than other indices. In the younger group, the ECI had the best performance for breast and lung cancer. The KCI had the best performance for colorectal cancer but had poor performance for lung and breast cancer.

Conclusion: Our results indicate that use of the CCI or the KCI as the measure of comorbidity is most appropriate for older population and the ECI is better for younger population. This finding likely reflects the fact that the KCI was developed using SEER*Medicare data.

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LUNG CANCER SURVIVAL IN AMERICAN INDIANS, HISPANICS, AND NON-HISPANIC WHITES IN NEW MEXICO, USA

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Background: New Mexico is home to diverse populations, including Hispanics (47%), non-Hispanic Whites (40%), American Indians (10%), and other racial/ethnic groups (3%). Lung cancer incidence rates for non-Hispanic whites are similar to the national average, while Hispanics and American Indians have lower rates of the disease. To better understand the burden of lung cancer in our state, we undertook an investigation to characterize survival by race/ethnicity.

Purpose: To determine if lung cancer survival varies by race/ethnicity in New Mexico.

Methods: This investigation was based on incident cases of malignant lung cancer diagnosed in New Mexico residents during the period 1990-2009. We calculated lung cancer-specific survival using Kaplan-Meier methods and Cox proportional hazards models, the latter adjusted by age, sex, stage of disease, and time period of diagnosis (1990-99 and 2000-09). By convention, the analysis was restricted to histologically confirmed cases with active follow-up, and to cases in which lung cancer was the only known primary cancer or the first of multiple primaries.

Results: Five-year cause-specific survival was 13.8 percent for American Indians, 14.6 percent for Hispanics, 15.5 percent for non-Hispanic whites, and 18.5 percent for members of other racial/ethnic groups-combined (no statistical significance). Compared with American Indians (reference group), the proportional hazards of death from lung cancer, after adjustment for the above-listed variables, were slightly less for Hispanics and non-Hispanic whites but not statistically significant, and less for other race/ethnic groups and statistically significant.

Conclusion: Survival differences by race/ethnicity were not statistically significant, with the exception of slightly favorable survival among members of other racial/ethnic groups-combined. Lung cancer is a highly fatal disease and remains the most common cancer cause of death for all racial/ethnic groups in New Mexico.

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WORLDWIDE INCIDENCE OF COLORECTAL CANCER: A 10-YEAR FORECAST

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Background: Colorectal cancer (CRC) is the third most commonly diagnosed cancer worldwide, with the incidence growing due to an increase in associated risk factors such as unhealthy diets, lack of exercise, obesity, and smoking.

Purpose: To estimate the change in CRC incidence over the next 10 years due to the change in CRC risk factors worldwide and uptake of screening programs.

Methods: To estimate the incidence of CRC in 45 countries, representing approximately 90% of the world population in 2017, we obtained data reported by country-specific cancer registries such as those found in the International Agency for Research on Cancer (IARC) (ICD-10 codes C18, C19, and C20). We calculated the total population for each region using published population estimates from the United Nations. We also calculated the total population of each country within each region with DRG Epidemiology estimates available. Using the ratio of the total population of all countries to the sum of the population of all countries covered by DRG Epidemiology in each region as a projection factor, the total case counts for the entire region were estimated. We identified screening programs as a protective factor associated with CRC and developed an incidence forecast model of CRC that incorporates the effect of screening in developed countries with established programs in place.

Results: In 2018, the incidence of CRC ranged from 5 per 100,000 in the Middle East and Africa to 71 per 100,000 in the mature pharmaceutical markets (EU5, Japan, and U.S.). Over the next 10 years, we expect approximately a 25% increase in CRC cases in the mature pharmaceutical markets region (EU5, Japan, and U.S.) due to CRC risk factors, population growth, and aging.

Conclusions: The incidence of CRC will continue to increase over the next 10 years due to an increase in risk factors and demographic changes.

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BUILDING LINKAGE AMONG CENTRAL REGISTRATION SYSTEMS – UNCOVER THE IMPACT OF HPV IMMUNIZATION ON CERVICAL CANCER INCIDENCE

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Although clinical trial efficacy of HPV vaccine is promising, the effectiveness under real world conditions of accessibility of vaccine, adherence to vaccine schedule, and population coverage needs a population-based assessment.

Female enrollees in Michigan immunization registration system, Michigan Care Improvement Registry (MCIR), are linked to reports in the Michigan Cancer Surveillance Program (MCSP) including *in situ* and invasive cervical cancer. Differences in cancer incidences are explored among women who never had HPV vaccine (No Doses), received an incomplete series (Incomplete) or completed the series (Complete).

Adherence to HPV schedule is classified under the guidelines of Advisory Committee on Immunization Practices. Logistic analysis were conducted with cervical cancer status as dependent variable, adherence to HPV schedule type (Complete, Incomplete, and No Doses) as explanatory variable, birth years as a continuous covariate. Two independently stratified random samples of 5 birth years' span were pulled for women born in Michigan, either matched or not with MCIR. Their home address from birth files along with parents' files were pulled to check the historical continuity of MI residence.

777,817 women were identified in MICR as born between 1980 and 1995 and having a birth IDs in the Michigan Birth Registry System. Among them, 554,534 (71%) were HPV No Doses, 79,105 (10%) Incomplete, and 144,178 (19%) Complete. 7,010 women from MCSP in same birth cohort were linked by birth IDs. The *in situ* and invasive cervical cancer rates among Complete, Incomplete, and No Doses of HPV vaccine are 18, 50, and 115 per 100,000 women, respectively. The chance of continuous residence for parents (mom, dad) of women who matched in MCIR are two-fold higher than those MI born only.

Logistic analysis model shows that, adjusted by birth years, Complete HPV has significant positive impact on cervical cancer lesions incidence.

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PATTERNS AND RECENT TRENDS IN MASTECTOMY AND BREAST CONSERVING SURGERY FOR WOMEN WITH EARLY-STAGE BREAST TUMORS IN MISSOURI: AN UPDATE AND FURTHER INVESTIGATION

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Background: Most women age 18–64 diagnosed with an early-stage breast tumor in Missouri, 2008–2015, were surgically treated with either total (simple) mastectomy (TM), modified radical mastectomy (MRM) or breast conserving surgery (BCS). Last year, the Missouri Cancer Registry examined demographic differences between women receiving these treatments and noted a slight decrease in the percentage of cases receiving BCS since 2008 with an increase in TM.

Purpose: To continue monitoring trends in the surgical treatment of early-stage breast cancer in Missouri and describe the patterns by demographics and tumor characteristics.

Method: The “BCS” measure from the NCDB CP3R was adapted to central cancer registry data along with corresponding measures for mastectomy. Logistic regression was used to analyze surgical trends among women with early-stage breast tumors (AJCC stage 0, I or II) while controlling for selected demographics. Survival was compared among these surgical treatments as well as the delay between diagnosis and surgery. We will further analyze the survival and surgery delay to account for differing covariates between women who receive BCS vs. other treatments.

Results: The latest data continue to show similar patterns as found last year (higher percentage of BCS among blacks, older women, earlier years of diagnosis, and earlier stages). Preliminary survival analysis showed slightly higher survival among cases receiving BCS than mastectomy (but survival was very high among all selected patients who have early-stage tumors). The treatment delay was shorter for patients receiving BCS than mastectomy. Further results from this ongoing project will be presented in June.

Conclusions: These data provide quantitative population-based data on the surgical treatment for women diagnosed with early-stage breast tumors in Missouri. Trends and sociodemographic patterns may help inform patients and health professionals in Missouri by providing broad information on treatment options being utilized.

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P-1S

THE ASSOCIATION BETWEEN DIABETES AND DEPRESSION AMONG ADULTS RESIDING IN BRAZIL: DOES IT DIFFER AMONG CANCER SURVIVORS WHEN COMPARED TO THE GENERAL POPULATION?**IW Watson¹**, SC Oancea¹, LB Nucci²¹University of North Dakota - School of Medicine and Health and Sciences, Grand Forks, ND, United States; ²Pontificia Universidade Católica de Campinas - School of Medicine, Campinas, SP, Brazil**Background:** The number of adults with diabetes mellitus (DM), a health problem with medical and economic consequences, is estimated to increase in developed (20%) and developing (69%) countries between 2010 to 2030.¹ Comorbid depression (DE) has the potential to exacerbate disease effects.²**Purpose:** This study investigates the association between DM and DE in Brazil among adult cancer (CA) survivors in comparison with the adult general population.**Methods:** Data from the 2013 Brazilian National Health Survey was used to study 56,372 adults without CA and 847 adult CA survivors ≥ 1 year from initial cancer diagnosis, not pregnant, and not taking depression medication. Multivariable weighted logistic regression analyses were performed to investigate the association between DM and DE in the two groups, while adjusting for possible confounders.**Results:** The prevalence of DE and DM was 12.3% and 13.2% among CA survivors, and 6.7% and 5.7% among non-CA individuals. The odds of DE among CA survivors were 1.12 times greater (OR 95%CI: 0.53-2.41) in DM compared to non-DM individuals. The odds of DE among non-CA individuals were 1.36 times significantly greater (OR 95%CI: 1.11-1.66) in DM compared to non-DM individuals. While the prevalence of both DE and DM was greater in CA survivors, the odds of having depression were lower for CA survivors with DM than in persons with DM and without CA. For persons with DM only, the perceived psychological impact of DM is greater, resulting in higher odds of DE.**Conclusion:** This result indicates there is more to understand regarding how CA survivors respond differently to additional diagnoses.**References:**

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2. Rustad, J.K., D.L. Musselman, and C.B. Nemeroff, The relationship of depression and diabetes: Pathophysiological and treatment implications. *Psychoneuroendocrinology*, 2011. 36(9): p. 1276-1286.

P-2S

DEPRESSIVE SYMPTOMS AND HEALTH-RELATED QUALITY OF LIFE IN OLDER WOMEN WITH GYNECOLOGICAL CANCER: A POPULATION-BASED ANALYSIS USING THE SURVEILLANCE, EPIDEMIOLOGY, AND END RESULTS – MEDICARE HEALTH OUTCOMES SURVEY**A Klapheke^{1,2}**, R Cress^{1,2}¹Cancer Registry of Greater California, Public Health Institute, Sacramento, CA, United States; ²University of California Davis, Davis, CA, United States**Background:** Depression is often underdiagnosed in elderly cancer patients and is correlated with worse health-related quality of life (HRQOL). Few studies focus specifically on depression in older women with gynecological cancers. Determining which factors are associated with depression risk as well as its impact on HRQOL may be useful in diagnosing and treating the disorder in women with cancer.**Purpose:** To identify factors associated with positive depression screen in older women with gynecological cancer and measure the impact on HRQOL.**Methods:** Women who were aged 65 years and older when diagnosed with cervical, ovarian, or uterine cancer ($n = 1,889$) were identified from the Surveillance, Epidemiology, and End Results – Medicare Health Outcomes Survey linked database and compared to cancer-free controls ($n = 9,445$). Positive depression screen was defined using three diagnostic interview schedule questions and HRQOL measures were derived from the Short Form 36 and Veterans RAND 12. Logistic regression was used to identify factors associated with positive depression screen. Linear regression was used to assess the impact of positive depression screen on HRQOL scores.**Results:** Preliminary results show that prevalence of depressive symptoms was higher among gynecological cancer patients than cancer-free women. Among cancer patients, non-white race, lower education levels, and higher numbers of comorbidities and impairments in activities of daily living were significantly associated with positive depression screen, while time since diagnosis decreased risk. Positive depression screen was significantly associated with decreases in HRQOL scores.**Implications:** The findings from this study can be useful in identifying women with gynecological cancer who are at high risk of depression and may be most in need of psychosocial or clinical support, and in designing targeted interventions to diagnose and treat depression in older women with cancer.

P-3S

LIFESTYLE-RELATED RISK FACTORS FOR CANCER AND ASSOCIATIONS WITH SOCIAL DETERMINANTS OF HEALTH: CASE STUDY OF THE CANCER RISK FACTORS ATLAS OF ONTARIO IN TORONTO

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Background: Monitoring and reporting of population determinants of health is facilitated by large, complex surveys in Canada and the United States. Two examples are the Canadian Community Health Survey (CCHS) and Behavioural Risk Factor Surveillance System. However, these surveys are not designed to provide local information for targeted prevention activities. As a result, statistical methods were used to estimate the micro-area prevalence of lifestyle risk factors for chronic disease across Ontario, Canada to develop a cancer risk factor atlas of Ontario. Lifestyle factors are related to social determinants of health (SDOH) indicators such as income or material deprivation.

Purpose: To characterize associations between SDOH and CCHS-based prevalence estimates of current smoking, alcohol consumption and excess body weight (overweight or obese) in Toronto, Ontario.

Methods: Micro-area (dissemination areas, 400-700 persons on average) prevalence estimates for current smoking, alcohol consumption and excess body weight were provided by the methods used to develop the *Cancer Risk Factors Atlas of Ontario* (<https://www.cancercareontario.ca/en/statistical-reports/cancer-risk-factors-atlas-ontario>). These estimates were linked to micro-area indicators of SDOH to explore associations between determinants and lifestyle risk factors in Toronto, Ontario.

Results: The magnitude and direction of association between lifestyle risk factors and SDOH indicators varied. For example, current smoking among males displays a negative association with increased income but displays no apparent association among females; excess body weight displays a negative association with increased income among females but no apparent association among males.

Conclusion: Associations between behavioural risk factors and social determinants of health are complex and varied. A focus on one dimension or indicator of social determinants of health may not be sufficient to characterize associations.

P-4S

A SPATIO-TEMPORAL INVESTIGATION OF BREAST CANCER TREATMENT DELAY IN MISSOURI

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Background: Existing studies have shown correlations between breast cancer treatment delay and survival. Thus, it is important to understand the distribution of breast cancer treatment delay. However, no prior population-based study of Missouri (MO) patients exists that investigates disparities in treatment delay across demographics, space and time.

Purpose: Discover patterns of breast cancer treatment delay across patients' demographic characteristics, county at diagnosis, and year of diagnosis.

Methods: The data included female breast cancer cases in MO from 1997 to 2014 with known age, race, date of diagnosis, and first course of treatment. We removed cases having treatment delay more than a year (less than 0.011%), which gave us 74,510 total cases. The treatment delay was measured as the number of days after diagnosis until the first treatment. However, 27.37% had a treatment delay of zero days. A Bayesian Hurdle Poisson model was built to account for the large number of zeros and to explain the relation between treatment delay and covariates, including patient's age (grouped), race, cancer stage, county at diagnosis, and year of diagnosis. Conditional autoregressive models were used for the spatial effects and smoothed nonlinear structures were put on age and year. Integrated Nested Laplace Approximation was used for computing

Results: The probability of having a treatment delay of zero days decreased over time and had a "U" shaped relationship with age. The mean days of non-zero delay increased over time and decreased with age. The spatial patterns changed over time for both quantities. Differences existed among race and cancer stages as well.

Conclusions: Disparities in treatment delay do exist. Reasons for the discovered patterns should be investigated as well as the large proportion of cases with a treatment delay of zero days.

P-5S

COLORECTAL CANCER SURVIVAL IN THE MOUNTAIN WEST STATE OF NEVADA**K Callahan**¹, C Ponce², P Pinheiro³¹University of Nevada Las Vegas, Las Vegas, NV, United States; ²Nevada Central Cancer Registry, Carson City, NV, United States; ³University of Miami Miller School of Medicine, Miami, FL, United States**Background:** No study to date has characterized the colorectal cancer (CRC) survival burden in the rapidly growing Mountain West state of Nevada (NV).**Purpose:** To characterize CRC survival in Nevada, using Nevada Central Cancer Registry data augmented with linkages to the National Death Index.**Methods:** 5-year cause-specific overall and stage-specific survival was calculated and stratified by region of NV (northwestern, southern, and rural). Treatment according to Guidelines (TAG) was assessed for AJCC Stage I-III tumors by examination of receipt of radiation, chemotherapy and surgery by stage in accordance with national guidelines. To identify factors impacting survival, multivariate Cox proportional hazards regression models were constructed, adjusting for relevant covariates.**Results:** 12,413 cases of CRC diagnosed in NV between 2003-2013 were identified. 77% were non-Hispanic white, 39% younger than age 65, and 66% from Southern Nevada. Of the 8,480 tumors diagnosed in AJCC Stages I-III, only 36% received TAG; 39% did not, and 26% did not have complete treatment information. Overall 5-year CRC survival in NV was 56% among males and 60% among females, significantly lower than 65% and 67% survival in the SEER-18 catchment area for the same period. All racial/ethnic groups in NV had significantly lower survival than their counterparts nationally except Asian and Filipino women. Notably, northwestern Nevada had approximately equivalent survival to national levels. For tumors diagnosed in AJCC stages I-III, southern and rural Nevadans were at 20% and 37% significantly higher risk of death from CRC, respectively, compared to their counterparts in Northwestern Nevada. Adjusting for receipt of TAG, the risk of death was attenuated but still 14% and 28% higher.**Conclusions:** Efforts to identify and remediate the causes of the disproportionately low survival among CRC patients in populous Southern Nevada as well as the rural areas are urgently required.

P-6S

DESCRIPTIVE EPIDEMIOLOGY OF GERM CELL TUMORS IN THE CENTRAL NERVOUS SYSTEM FROM 2005-2014**H Gittleman**^{1,2}, T Vecchione-Koval³, QT Ostrom^{1,2}, C Kruchko¹, JL Finlay^{4,5}, DS Osorio⁴, JS Barnholtz-Sloan^{1,2}¹Central Brain Tumor Registry of the United States, Hinsdale, IL, United States; ²Case Comprehensive Cancer Center, CWRU School of Medicine, Cleveland, OH, United States; ³Sargent College, Boston University, Boston, MA, United States; ⁴The Neuro-Oncology Program, Division of Hematology, Oncology and BMT, Nationwide Children's Hospital and The Ohio State University, Columbus, OH, United States; ⁵Department of Radiation Oncology, Ohio State University, Columbus, OH, United States**Background:** Germ cell tumors (GCT) in the central nervous system (CNS) are rare tumors that occur with highest frequency in males, Asian populations, and children less than age 20 years. Due to the rarity of these tumors, their patterns of incidence are not well described. The purpose of this study is to provide the most up-to-date data on incidence and survival patterns for CNS GCT by sex, race, and age at diagnosis.**Methods:** The CBTRUS is the largest aggregation of population-based incidence data on primary brain and other CNS tumors in the United States (U.S.), containing incidence data from 51 CCR (46 NPCR and 5 SEER) and representing approximately 99.9% of the U.S. population. The current study used the CBTRUS analytic file to examine incidence (IR) of CNS GCT from 2005 to 2014, as well as registry data from the NCI SEER program to examine survival.**Results:** Males had greater IR than females in all CNS GCT histologies examined. Asian and Pacific Islanders had a significantly greater incidence of CNS GCT than the other race categories. Overall, CNS GCT frequency was greatest for those age 10-19 years. Overall survival rates were high for malignant CNS GCT, germinoma, mixed germ cell tumors, and malignant teratoma.**Conclusions:** There is significant variation in CNS GCT incidence by sex, race, and age at diagnosis. Ascertaining accurate incidence and survival rates of CNS GCT provides vital information usable in real time for clinicians, public health planners, patients, and their families.

P-7S

DATA COLLECTION STRATEGIES AND SURVEY TECHNOLOGY PREFERENCE IN A SEER RAPID RESPONSE SURVEILLANCE STUDY (SEER RRSS) OFFERING NO PARTICIPANT INCENTIVE

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Objective: Describe enrollment strategies and participant technology preferences among diverse cancer survivors offered the choice of an online vs. phone survey in a study offering no participant incentive.

Methods: Eligible participants were English-speaking white or African-American (AA) cancer survivors diagnosed with colorectal, female breast, or prostate cancer before age 50, or ovarian cancer or multiple myeloma before age 65. Recent survivors were diagnosed in the previous year. Long-term survivors were those who survived at least 3 or 5 years depending on cancer type. Mailed recruitment letters offered the choice of a phone or online survey and interviewers followed up with non-responders with up to 9 calls at a variety of days and times.

Results: We contacted 486 survivors. Of those, 23% refused, 18% were abandoned after maximum calls, 14% had no current contact data, and for 15%, contact was not made before the study ended. Of the 142 cases enrolled (30%), 71% were female, 62% white, and 49% recently diagnosed. Mean age at diagnosis was 49. 67% of participants completed the survey by phone (78% of men, 62% of women, 89% of AAs, 68% of whites, 65% of recently-diagnosed, 56% of long-term survivors). Among survivors receiving at least one call (76%), 29% completed the survey on the first call and 80% completed it within the first 4 calls. The greatest proportion of interviews (24% each) were completed on Monday and Tuesday). The greatest proportion of calls (15%) resulted in a completed survey on Fridays and Saturdays. Most phone surveys were completed in the afternoon (53%).

Conclusions: Understanding which participants opt for phone vs. online interview and volume of follow-up calls needed is helpful for determining budget, especially for studies with short timeframes. Best days/times for calls can be shared via employee training materials. Tracking variables can be included in study databases for quality improvement.

NOTES:

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PROGRAM AT A GLANCE



TIME	MONDAY, JUNE 11	TUESDAY, JUNE 12	WEDNESDAY, JUNE 13	THURSDAY, JUNE 14	TIME		
6:30 am				NAACCR FREE FUN RUN / WALK Meet in Hotel Lobby: 6:30am - 7:30am	6:30 am		
7:00					7:00		
7:30					7:30		
8:00	NAACCR COMMITTEE & PARTNER MEETINGS Various locations: 8:00am - 5:00pm	OPENING CEREMONIES Grand Ballroom: 8:00am - 8:30am KEYNOTE SPEECH Grand Ballroom: 8:30am - 9:00am	NAACCR BUSINESS MEETING Grand Ballroom: 8:15am - 8:45am	PLENARY SESSION 4 Cancer Surveillance Data for Cancer Control and Clinical Outcome Improvement Grand Ballroom: 8:30am - 10:00am	8:00		
8:30		PLENARY SESSION 1: Bridge to the Future Grand Ballroom: 9:00am - 10:00am			8:30		
9:00	CDC / NPCCR INFORMATICS TRAINING Various locations: 8:00am - 5:00pm		CONCURRENT SESSION 3 Various Rooms: 9:00am - 10:30am	BREAK/POSTERS/EXHIBITS: 10:00am - 10:30am	9:00		
9:30					10:00		
10:00		BREAK/POSTERS/EXHIBITS: 10:00am - 10:30am	BREAK/POSTERS/EXHIBITS: 10:30am - 11:00am	CONCURRENT SESSION 4 Various Rooms: 10:30am - 12:00pm	10:00		
10:30		NAACCR YOUNG TALK 1: 10:05am - 10:25am	NAACCR YOUNG TALK 3: 10:35am - 10:55am		10:30		
11:00		CONCURRENT SESSION 1 Various Rooms: 10:30am - 12:00pm	PLENARY SESSION 3 New Paths to New Data and New Sources Grand Ballroom: 11:00am - 1:00pm		11:00		
11:30					11:30		
12:00 pm		LUNCH ON YOUR OWN POSTERS/EXHIBITS: 12:00pm - 1:30pm	LUNCH ON YOUR OWN/POSTERS/EXHIBITS Ballroom 2, 3, 4: 1:00pm - 2:00pm	LUNCH ON YOUR OWN/POSTERS/EXHIBITS Ballroom 2, 3, 4: 12:00pm - 1:30pm	12:00 pm		
12:30							12:30
1:00							1:00
1:30	COMMUNICATIONS STEERING COMMITTEE King's Garden 3: 2:00pm - 3:00pm	PLENARY SESSION 2 A Clear Path to the Legal Side Grand Ballroom: 1:30pm - 3:00pm	PROFESSIONAL DEVELOPMENT STEERING COMMITTEE King's Garden 3: 2:00pm - 3:30pm	CONCURRENT SESSION 5 Various Rooms: 1:30pm - 3:00pm	1:30		
2:00							2:00
2:30							2:30
3:00							3:00
3:30	STANDARDIZATION & REGISTRY DEVELOPMENT STEERING COMMITTEE King's Garden 1: 2:00pm - 4:00pm	NAACCR YOUNG TALK 2: 3:05pm - 3:25pm	EXPLORE PITTSBURGH BIKE RIDE TOUR Meet at Point State Park, 4:00pm	PLENARY SESSION 5 Bridge to the Future - The NAACCR Showcase Grand Ballroom: 3:30pm - 5:30pm	3:30		
4:00							4:00
4:30	RESEARCH & DATA USE STEERING COMMITTEE King's Garden 4: 3:00pm - 4:00pm	CONCURRENT SESSION 2 Various Rooms: 3:30pm - 5:00pm	XML DATA EXCHANGE WORK GROUP MTG Kind's Garden 4: 4:00am - 5:30pm	CLOSING CEREMONIES: 4:50pm - 5:15pm	4:30		
5:00	HACKATHON Presentations & Judging Ballroom Foyer: 5:00pm - 6:30pm Exhibitor Showcase and Poster Pre-Viewing Ballroom 2, 3, 4: 5:30pm - 7:00pm	BIRDS OF A FEATHER OPEN DISCUSSION King's Garden 5: 5:30pm - 6:30pm	XML EDITS WORK GROUP MEETING King's Garden 4: 5:30pm - 6:30pm	INVITATION TO NAACCR 2019: 5:15pm - 5:30pm	5:00		
5:30							5:30
6:00							6:00
6:30							6:30
7:00					7:00		
7:30					7:30		
8:00					8:00		
8:30					8:30		
9:00		2018 OPENING RECEPTION Grand Ballroom: 7:00pm - 9:30pm			9:00		
9:30					9:30		

Plenary Sessions

Concurrent Sessions

Committee Meetings

Other Sessions

Break/Lunch

Breaks: Ballroom 2, 3, 4