



JOHNS HOPKINS *CONQUEST 2019*

A Report on the Maryland Cigarette Restitution Fund

FROM THE DIRECTORS

Confronting a problem produces results, and Maryland's investment in the Cigarette Restitution Fund is proof of that. Recognition of the State's cancer problem more than 20 years ago, and a collaborative effort among the State's academic institutions, elected officials and our citizenry has resulted in remarkable progress that far exceeds national trends. Once the worst in the nation in cancer death rates, today we are 34th.

As you read through this report, you will see the impressive work made possible by Cigarette Restitution Fund research awards and faculty support. As a result of these continued efforts, the most common CRF-targeted cancers—lung cancer, prostate cancer, colorectal cancer and breast cancer—are trending downward in Maryland.

We are grateful for the Cigarette Restitution Fund support and its part in continuing progress against cancer in Maryland.

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HISTORY OF THE CIGARETTE RESTITUTION FUND

In 1998, Maryland joined 46 other states in a class action lawsuit against America's cigarette manufacturers. States were seeking reimbursement for the huge costs associated with cancer and other smoking related diseases. The states prevailed and split a \$53 billion settlement, known as the Master Settlement Agreement.

Maryland became the national model when, in 2001, its elected officials opted to use a considerable portion of its award to fight cancer by establishing the Maryland Cigarette Restitution Fund (CRF) to fund cancer research and other projects aimed at reducing the state's cancer burden.

CRF BY THE NUMBERS

2001 – 2019:

- 7 Targeted Cancers: breast, cervical, colorectal, lung, melanoma, oral and prostate
- \$33.8 million total research dollars awarded
- 814 research grants, including 111 clinical studies already helping cancer patients
- 5,665: Journal articles published
- 128 faculty recruited and retained

2019:

- \$2,067,907 awarded
- **26 total grants** were awarded, including
 - 21 grants for translational research that moves laboratory findings to patient care
 - 4 recruitment grants to provide seed funding for young, new investigators
 - 1 retention grant to support a current researcher

This year's awards focus on CRF-targeted cancers, including lung cancer, colon cancer, prostate cancer and melanoma skin cancer, and environmental causes of cancer. See the full list of grants on pages 9 and 10.

MARYLAND'S IMPRESSIVE PROGRESS

In 1985, Maryland had the highest cancer death rates of all U.S. states. With state action and the Maryland Cancer Council established, cancer rates began to decline. In 2001, the Maryland Cigarette Restitution Fund further accelerated this momentum. Today, Maryland's cancer rates are below the national average for both CRF-targeted and non-targeted cancers. Maryland's progress has been dramatic, improving from worst to 34th in the nation in cancer deaths.

- ✓ Maryland is better than the national average on the following cancer-related issues:
 - alcohol consumption
 - colorectal cancer screening
 - smoking cessation
 - HPV vaccination compliance, girls and boys
 - mammography use
 - obesity rates
 - Pap test compliance
 - PSA screening

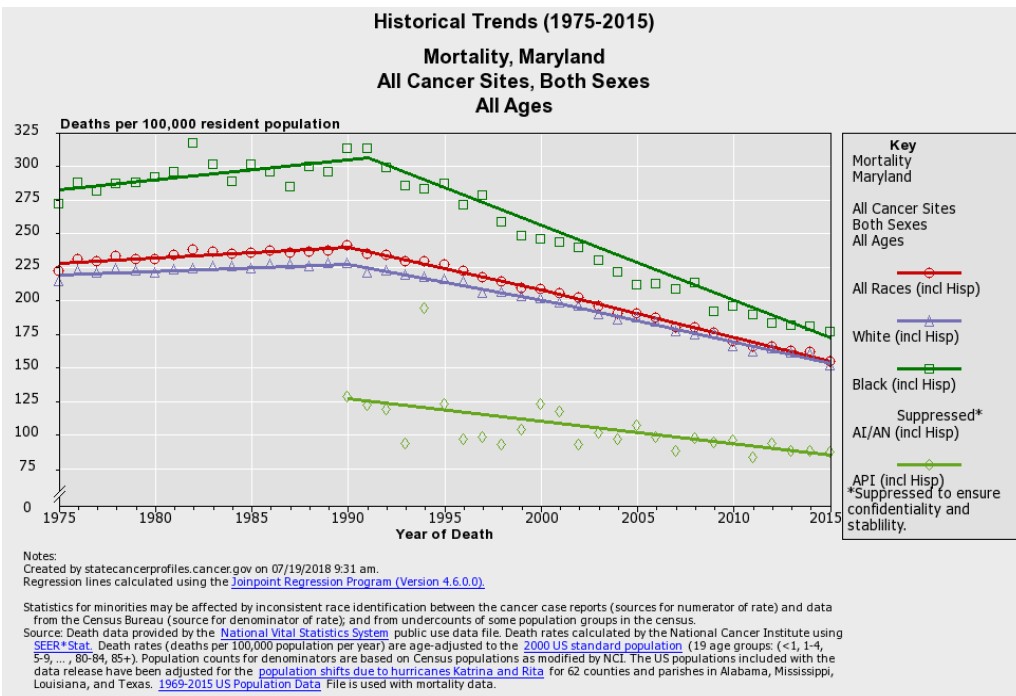
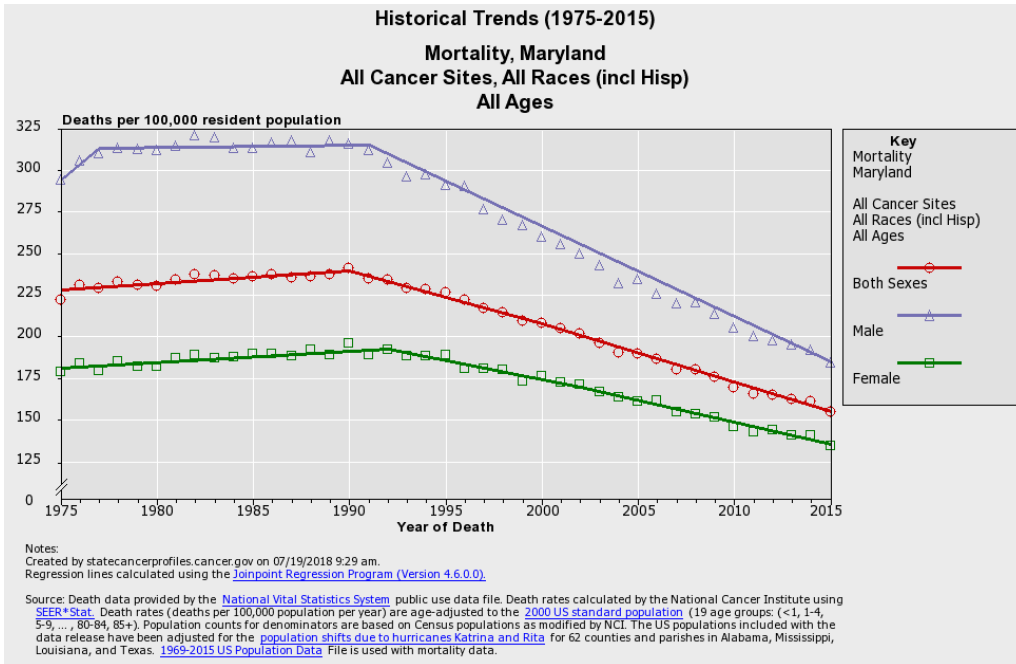
The following two graphs show the historical trends in Maryland's mortality rate for all cancer sites from 1975 to 2015. They demonstrate the narrowing of cancer disparities that is key in Maryland's improved cancer rankings. The first figure shows the data by all races and all ages and the second figure shows the data by both sexes and all ages.

Analysis of Graphs

✓ Differences in cancer death rates (cancer disparities) among men and women, all races, and all ages are decreasing in Maryland.

✓ Cancer death rates in Maryland have declined more rapidly than the nation in both our white and black populations and are approaching parity. This is significant for Maryland, which has double the proportion of persons at high risk compared to the rest of the nation. **The narrowing of cancer disparities is key in Maryland's improved cancer rankings.**

✓ National Cancer Institute reviewers graded the Kimmel Cancer Center "exceptional to outstanding" in inclusion of women in clinical research and inclusion of minorities in clinical research. **As of August 2018, the African-American disparity was 0.5%, improved from 4.5% in 2011.**



PROGRESS AGAINST CRF-TARGETED CANCERS

Lung Cancer: ↓ 3.4%/year (34th nationally)

Colorectal Cancer: ↓ 3.4%/year (32nd nationally)

Prostate Cancer: Black ↓ 4.8%/year • White ↓ 4.0%/year (28th nationally)

Breast Cancer: ↓ 2.0%/year (18th nationally) • Black ↓ 1.6%/year • White ↓ 2.2%/year

CRF ASKED, WE DELIVERED

- ✓ Recruit and retain faculty: Assemble clinicians and researchers to conduct translational research on CRF-targeted cancers.

Competing for limited research funding is difficult for young investigators just beginning their careers. The availability of CRF faculty recruitment grants helps bring the best young researchers to Maryland.

- ✓ Leverage CRF contributions for additional funding and contribute to the Maryland economy through the commercialization of inventions and technologies.

For every CRF research dollar spent, at least \$10 more has come back to Maryland in business contracts and other economic development, including startup companies and drug licensing. One of these startups, Personal Genome Diagnostics, recently negotiated a \$75 million business deal and added a second location in Baltimore. In addition, more than \$300 million in additional, competitive, CRF-investigator initiated projects resulted from CRF seed funding.

- ✓ Recruit young faculty and senior leadership to propel our cancer health disparity research and training program.

Otis Brawley, M.D., was recruited and will lead a broad interdisciplinary research effort of cancer health disparities. Dina Lansey, M.S., R.N., leads efforts to increase minority participation in clinical trials and implemented a system for mandatory training and reporting for all clinical faculty and staff.

- ✓ Reduce the cancer burden in Maryland through research relevant to state-specific issues.

Investigators have tackled emerging factors in cancer development such as air pollution, exposures from tobacco products, and new therapies and technologies.

- ✓ Collaborate with colleagues at the University of Maryland.

Annual Research Matters Conferences are held, resulting in collaborative laboratory and clinical research, including a 2004 collaboration between breast cancer researchers Angela Brodie and Saraswati Sukumar that resulted in a \$10 million Department of Defense grant.

CANCER CONTROL IN MARYLAND: 1985-2015

Norma Kanarek was the lead author on a collaborative study with the Frederick National Laboratory for Cancer Research, Center for Cancer Prevention and Control, Maryland Department of Health, the Kimmel Cancer Center and Bloomberg School of Public Health. Maryland's historically high cancer burden prompted a concerted effort by numerous stakeholders to implement aggressive cancer control strategies throughout the state. The study examined the status of cancer in Maryland as well as past and ongoing public health work targeted at reducing the cancer burden.

Today, Maryland's age-adjusted cancer mortality rate ranks 34th among the 50 states and the District of Columbia. **Overall cancer mortality rates have declined 1.9% annually from 1990 to 2015, saving almost 6,000 lives over three decades.** Maryland has addressed screening, diagnosis, and treatment to promote cancer declines that outpace other states. The state has also achieved important primary prevention goals, including substantial declines in tobacco use.

KIMMEL IN THE COMMUNITY

JOHNS HOPKINS CANCER HEALTH COMMUNITY OUTREACH TAKES NEXT STEP WITH APPOINTMENT OF OTIS BRAWLEY



Otis W. Brawley, M.D., an authority on cancer screening and prevention who served as chief medical and scientific officer for the American Cancer Society, director of the Georgia Cancer Center at Grady Memorial Hospital in Atlanta, and a Maryland Cigarette Restitution Fund Advisory Board member, has been named a Bloomberg Distinguished Professor at Johns Hopkins University. Brawley will lead a broad interdisciplinary research effort of cancer health disparities at the Bloomberg School of Public Health and the Kimmel Cancer Center, working to close racial, economic, and social disparities in the prevention, detection, and treatment of cancer in the United States and worldwide.

THE CENTER TO REDUCE CANCER DISPARITIES

Inclusion in Clinical Trials is Inclusion in Therapy: Johns Hopkins is the first institution using EPIC electronic medical records functionality to support conversations about clinical trials. Minority and low-income patients are matched to available clinical trials and a new database tracks reasons patients decline to participate, helping identify barriers to care. The system also documents that clinical trials were discussed with patients, and communicates names of interested patients to study teams. A CRF-funded pilot project in breast and prostate study groups is ongoing.



Smoking Cessation: The Baltimore City Household Smoking Cessation Project was an innovative research study opened by the Center to Reduce Cancer Disparities and funded by the CRF. It includes three group education sessions, nicotine replacement therapy (lozenges, gum and tablets that provide low levels of nicotine while reducing the urge to smoke) and a four-week follow-up period of individualized phone counseling.

First Large-Scale Study of African-American Men with Prostate Cancer: The Kimmel Cancer Center is part of a multi-institutional group conducting the first large-scale, study of prostate cancer in African-American men to better understand why they are at higher risk for developing more aggressive forms of the disease and why they are more likely to die from it. The goal of the study, called RESPOND, is to determine which factors contribute to poor outcomes among African-American men with prostate cancer to improve survival and decrease racial disparities in this disease.

Using Technology to Reduce Cancer Recurrence: With CRF support, a clinical trial was developed and showed that Amazon's virtual voice assistant may help overweight cancer survivors increase their daily activity and ultimately reduce the chance of their cancer coming back. Physical Activity by Technology Help, or PATH, study compared three types of motivators—written material, text messages and voice assistance technology, to identify the best motivational tool to support weight loss.



Community-based Participant Engagement and Translation (CPET):

The SPIRIT (Survivorship Promotion in Reducing IGF-1 Trial) study offering obese cancer survivors lifestyle intervention, metformin, a drug that treats obesity-related type 2 diabetes, or education was completed. The study was aimed at reducing cancer recurrence and was done entirely in the Baltimore community, enrolling 120 Kimmel Cancer Center patients (47% minority, 79% women) and measuring changes in insulin growth factors (IGF) over time with each type of intervention. Both experimental interventions decreased weight at six months. Similar studies are planned for southern and western Maryland.

CRF IN ACTION

IN THE NEWS

Blood Tests Screen for Cancer: Current **CRF investigator Cristian Tomasetti** and previously funded CRF investigators are part of the team that developed a unique new framework for early detection of the most common cancers. The researchers developed a single blood test called CancerSEEK that screens for eight common cancer types and helps identify the location of the cancer. These cancers—ovary, liver, stomach, pancreas, esophagus, colorectum, lung and breast—account for more than 60 percent of cancer deaths in the U.S., and five of the cancers currently have no screening test. The test is currently in validation studies. Two similar tests, PapSEEK and UroSEEK similarly screen for endometrial and ovarian cancers and bladder cancer respectively.

Start-Up Expands: Personal Genome Diagnostics (PGDx), a company started by **CRF investigators Victor Velculescu** and **Luis Diaz** and based on work to analyze cancer at the genomic level that began at Johns Hopkins in 2010 is adding to its portfolio to further develop new kinds of cancer tests. A licensing deal gives the Canton-based company exclusive rights to develop and commercialize a discovery at the Memorial Sloan Kettering Cancer Center in New York. The licensing deal came soon after PGDx closed a deal for an additional \$75 million in funding. The growth led the company to add a second Baltimore location.

Link Between Severe Gum Disease and Cancer Risk: Data collected during a long-term health study provides additional evidence for a link between increased risk of cancer in individuals with advanced gum disease. A study led by **CRF investigator Elizabeth Platz** found a 24 percent increase in the relative risk of developing cancer among participants with severe gum disease, called periodontitis, compared to those with mild to no periodontitis. The highest risk was observed in cases of lung cancer, followed by colorectal cancer.

Alcohol and Breast Cancer: Evidence is clear that the more alcohol a woman drinks and the younger she drinks contributes to greater risk for breast cancer, but little is known about the underlying mechanism. **CRF investigator Cynthia Zahnow** leveraged funding from the John Fetting Fund for Breast Cancer Prevention to study how normal breast cells change when exposed to alcohol. She will also examine breast cancer cells from women who drink alcohol to look for similarities in chemical changes to the DNA, known as epigenetic alterations, and to see if alcohol-induced epigenetic alterations occur in any genes already associated with breast cancer development and if inherited epigenetic alterations could predispose a woman to a greater risk.

TAKING ON KEY ISSUES



E Cigarettes: Use of electronic cigarettes is on the rise. In a population-based cohort study of 5,105 participants, current exclusive e-cigarette users had greater concentrations of nicotine, tobacco-specific nitrosamines, volatile organic compounds, and metals compared with never tobacco users. Although these concentrations were lower than those observed in current exclusive cigarette smokers and users of both tobacco cigarettes and e-cigarettes, it's clear that e-cigarettes are not a harmless alternative, and more research is needed to fully understand the risks.

Liver Cancer on the Rise in Maryland: Johns Hopkins CRF co-director and liver cancer expert, **John Groopman**, is focused on determining the causes of increasing trend of liver cancer in our state. He has initiated international studies of obesity and liver cancer, which has relevance to domestic liver cancer development. CRF investigator **Elizabeth Platz** is studying the role of fatty liver disease may be playing in Washington County Maryland. Other studies include hepatitis C infection and how it is cleared by the immune system, particularly in people of African ancestry and the use of liquid biopsy for early detection of the cancer. New faculty members interested in conducting clinical research in liver cancer will be recruited. The CRF Research Matters Conference included a liver cancer panel bringing Johns Hopkins and University of Maryland investigators together to jointly address the problem.

IMPACT PAPERS

Gypsyamber D'Souza: A spatiotemporal analysis of invasive cervical cancer incidence in the state of Maryland between 2003 and 2012. *Cancer Causes Control*, 2018.

Corrine Joshu: Circulating Vitamin D and Colorectal Cancer Risk. *Journal of the National Cancer Institute*, June 2018.

Alison Klein: Genome-wide meta-analysis identifies five new susceptibility loci for pancreatic cancer. *Nature Communications*, February, 2018.

Elizabeth Platz: Periodontal Disease Assessed Using Clinical Dental Measurements and Cancer Risk in the ARIC Study. *Journal of the National Cancer Institute*, August, 2018.

Kala Visvanathan, Elizabeth Platz and Corrine Joshu: Enhancing the Infrastructure of the Atherosclerosis Risk in Communities (ARIC) Study for Cancer Epidemiology Research: ARIC Cancer. *Cancer Epidemiology Biomarkers Prevention*, March, 2018.

2019 AWARDS

FY19 Awards \$2,060,907

| Grants: | All | New | FY Target |
|------------------------|------------|------------|------------------|
| Translational Research | 21 | 15 | 20 |
| Faculty Recruitment | 4 | 3 | 4 |
| Faculty Retention | 1 | 0 | 3 |
| TOTAL | 26 | 18 | 27 |

Alphabetical List of Awards by Recipient

Valsamo Anagnostou, M.D., Ph.D.: *Evolution of Neoantigen Landscapes during Immunotherapy in NSCLC.* **NEW**

Alexander Baras, M.D., Ph.D.: *Leveraging clinical somatic mutation profiling of malignancies with modern electronic health records to better characterize etiologic, prognostic, and therapeutic associations.* **CONTINUED**

William Bishai, M.D., Ph.D.: *Development of SON-211, a 2nd generation version of Ontak, for the treatment of melanoma, colon cancer and non-small cell lung cancer.* **NEW**

Otis Brawley, M.D.: *Senior cancer disparities faculty.* **NEW**

Geetanjali Chander, M.D., M.P.H. and Heidi E. Hutton, Ph.D.: *Development, cultural adaptation and piloting of an avatar delivered smoking cessation intervention for low income smokers in Baltimore City.* **CONTINUED**

Gail Daumit, M.D., M.H.S. and Craig Pollack, M.D., M.H.S.: *Understanding disparities in cancer screening among adults with serious mental illness.* **NEW**

Josephine Feliciano, M.D. and Catherine Burdalski, Pharmacist: *Expansion of a Pharmacy Driven Smoking Cessation Program.* **CONTINUED**

John Groopman, Ph.D.: *Air Pollution and Cancer: Benzene Albumin Adductomics in Baltimore.* **NEW**

John Groopman, Ph.D and Elizabeth Platz, Sc.D.: *Developing a P01 on Liver Cancer.* **NEW**

Christine Hann, M.D., Ph.D.: *Optimizing Bcl-2 inhibitor therapy for small cell lung cancer.* **CONTINUED**

Susan Hannum, Ph.D.: *Health experiences research on cancer-related fatigue among older adults.* **CONTINUED**

Corrine Joshu, Ph.D.: *Expanding the EMPOWER Trial to evaluate the influence of weight loss on prostate cancer progression.* **NEW**

Howard Katz, Ph.D., Ana Rule, Ph.D., Mandeep Jassal, M.D., M.P.H. and Arlene Butz, Sc.D.: *Development of a Next Generation Nicotine Vapor Sensor for Tobacco Smoke Exposure Reduction in Children.* **NEW**

Dina Lansey, M.S.N., E.N., O.C.N. and Ahmed Hassoon, M.D., M.P.H., P.M.P.: *Individual characteristics and research decisions in cancer care at Johns Hopkins.* **CONTINUED**

Catherine Handy Marshall, M.D., M.P.H.: *Modifiable risk factors in cancer.* **NEW**

William Osburn, Ph.D.: *Harnessing innovation in silicon microchip-based molecular diagnostics to reduce cervical cancer disparities.* **NEW**

William Osburn, Ph.D., Anne Rositch, Ph.D., Richard Roden, Ph.D.: *P01 planning: Addressing cervical cancer disparities in Maryland.* **NEW**

Elizabeth Platz, Sc.D., M.P.H.: *Cancer Prevention and Control Biostatistics Core for Research and Proposals.* **NEW**

Ana M. Rule, Ph.D.: *Metal exposure from electronic cigarette use: Characterization of exposure factors among users in Maryland.* **NEW**

Katherine Smith, Ph.D.: *Experiences of Immunotherapy Treatment Among Older Adults with Lung Cancer: A Qualitative Study.* **NEW**

Claire Snyder, Ph.D.: *Pro-Cision Medicine: Developing a Patient-Centered Strategy for Cancer Care.* **NEW**

Cristian Tomasetti, Ph.D.: *Mechanistic Model of Absolute Risk in Cancer.* **NEW**

Youseph Yazdi, Ph.D. and Clifford Weiss, M.D.: *Preventing pneumothorax during CT-guided lung biopsy.* **NEW**

Jessica Yeh, Ph.D. and Lawrence Appel, M.D.: *Establishing the Community-based Participant Engagement and Translation (CPET) Core: A developing core to facilitate intervention studies.* **CONTINUED**

Cynthia Zahnow, Ph.D.: *Determination of non-toxic ethanol concentrations associated with induction of adduct formation, DNA damage and mutations associated with increased risk of breast cancer.* **NEW**

Jelani Zarif, M.D.: *Targeting M2-Tumor Associated Macrophages (M2-TAMs) in Prostate Cancer.* **CONTINUED**