Missile Community Cancer Study (MCCS) Update

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AFGSC/CC
October 2024

Missile *Community Cancer Study (MCCS) Town Hall, Oct. 31, 2024*

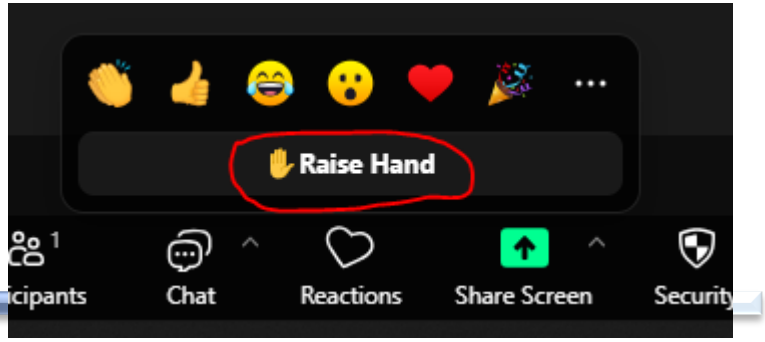
Ground Rules

- We will begin admitting attendees at 1430. The Town Hall will begin at 1500.
- Everyone will have access to the chat.
- You may submit questions in the chat **at any time**. We will compile them and ask as many as we can in the Q&A session.
- If you would like to ask your question out loud, **raise your hand** during the Q&A session. I will call on you and unmute you to speak.
- Please be respectful of other attendees and their time
- These slides will be posted after the town hall on the MCCS website: https://www.airforcemedicine.af.mil/Resources/Missile-Community-Cancer-Study/

How to raise your hand:

1. Click the “Reactions” box at the bottom of the screen:

2. Click the ‘Raise Hand” icon:



MCCS Timeline/Recap

December 2022 - Space Force Guardian and Former Missileer started an important dialogue: *Do Missileers have an increased cancer risk?*

February 2023
AFGSC/CC Directs Study via USAFSAM
Commander of Air Force Global Strike Command initiates the Missile Community Cancer Study (MCCS) to assess potential risk factors and cancer prevalence in missile-related career fields.

March – May 2023
Site Visits & Town Halls
AFGSC and USAF School of Aerospace Medicine design a 2-track study environmental and epidemiological – based off missile alert facility sight visits and missile community member feedback.

June – July 2023
Round 1 Environmental Sampling
USAFSAM completes the 1 of 3 rounds of environmental sampling, testing for known hazardous materials at every active MAF within AFGSC; begins combing data bases for epidemiological trends.

Aug – Oct 2023
PCBs Identified & Mitigation Efforts Completed
Results from round 1 of sampling identify PCB levels above Environmental Protection Agency recommended standards at 4 sites. These sites are immediately closed until cleaning and mitigation efforts are complete.

Oct – Nov 2023
Round 2 Environmental Sampling
USAFSAM completes 2nd of 3 Rounds of environmental sampling and begins the analysis of electronic medical data from 2001-2021 for Air Force Specialty Codes which work in/around MAFs

February 2024
Phase 1A Epidemiology Results
A very small data set found no increase incidence of Non-Hodgkin Lymphoma. Potential trend towards increase breast and prostate cancer.

Fall 2024
Round 3 Environmental Sampling
Phase 1B Epidemiology Results

Jan 2023	Feb 2023	March 2023	April 2023	May 2023	June 2023	July 2023	Aug 2023	Sept 2023	Oct 2023	Nov 2023	Dec 2023	Jan 2024	Feb 2024	March 2024	April 2024	May 2024	June 2024	July 2024	Aug 2024	Sept 2024	Oct 2024	Nov 2024	Dec 2024

MCCS Summary

Space Force Guardian/former Missileer diagnosed with non-Hodgkin Lymphoma (NHL) discovered colleagues with cancer & started important dialog: *do Missileers have increased cancer risk?*

Cancer concerns in Missileers Dec 22

AFGSC/CC directs study **Feb 23**

Site Visits & Town Halls at Missile Wgs, Space Delta **Mar-May 23**

Round 1 Environmental sampling **Summer 23**

PCBs ID'd & Mitigation efforts started **Aug-Oct 23**

Round 2 & 3 Environmental sampling **Fall 23 & Spring 24**

Epidemiology Review Phase 1A **Feb 24**

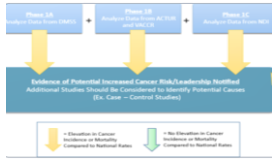
Epidemiology Review Phase 1 B&C Fall 24

Epidemiology Review Phase 2 **December 25**

Missile Community Cancer Study (MCCS)

Run by US Air Force School of Aerospace Medicine (USAFSAM)

Epidemiology Review
Compare 14 common cancers in the general population to missile-related career fields using large government databases



- Data back to 1976
- Includes past/present missile community members

Environmental Sampling
Collect 3 seasonal rounds to assess for any chemicals, contaminants, or hazards

Safety of Airmen prioritized at all stages
- Immediately instituted changes after site visits
  - ✓ Burning activities ceased, hazard signs updated
  - Deep cleans & living space upgrades scheduled
- ✓ MAFs with PCBs over EPA threshold closed until mitigated
  - ✓ PCB LF/LCC location analysis complete
  - ✓ PCB Cleaning contract awarded

Environmental Sampling
- ✓ All Rounds complete to include Vandenberg SFB and Hill AFB
- Launch Facility Sampling

Epidemiology Review
- ✓ Phase 1A – DoD Medical Data
- ✓ Phase 1B – VA Records, DoD Cancer Registry, VA Cancer Registry
- Phase 1C – Currently analyzing Death Index Data
- Phase 2 – Virtual Pooled Registry (VPR)

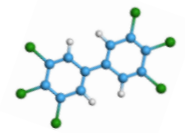
Transparent engagement with stakeholders & leaders
- VA Military Environmental Exposure Sub-Council
- Veterans' Service Organizations

Environmental Sampling Results

- 20th Air Force Missile Wings: all 45 Missile Alert Facilities (MAFs) tested in each of 3 seasonal rounds - over 8400 samples
  - Vandenberg SFB missile facilities
  - Hill AFB Strategic Missile Integration Complex (SMIC)
- **All Rounds: all air, water, & soil samples <u>below</u> acceptable regulatory levels for any chemicals or hazards**
- **Radon levels well <u>below</u> intervention threshold for all 5 bases**

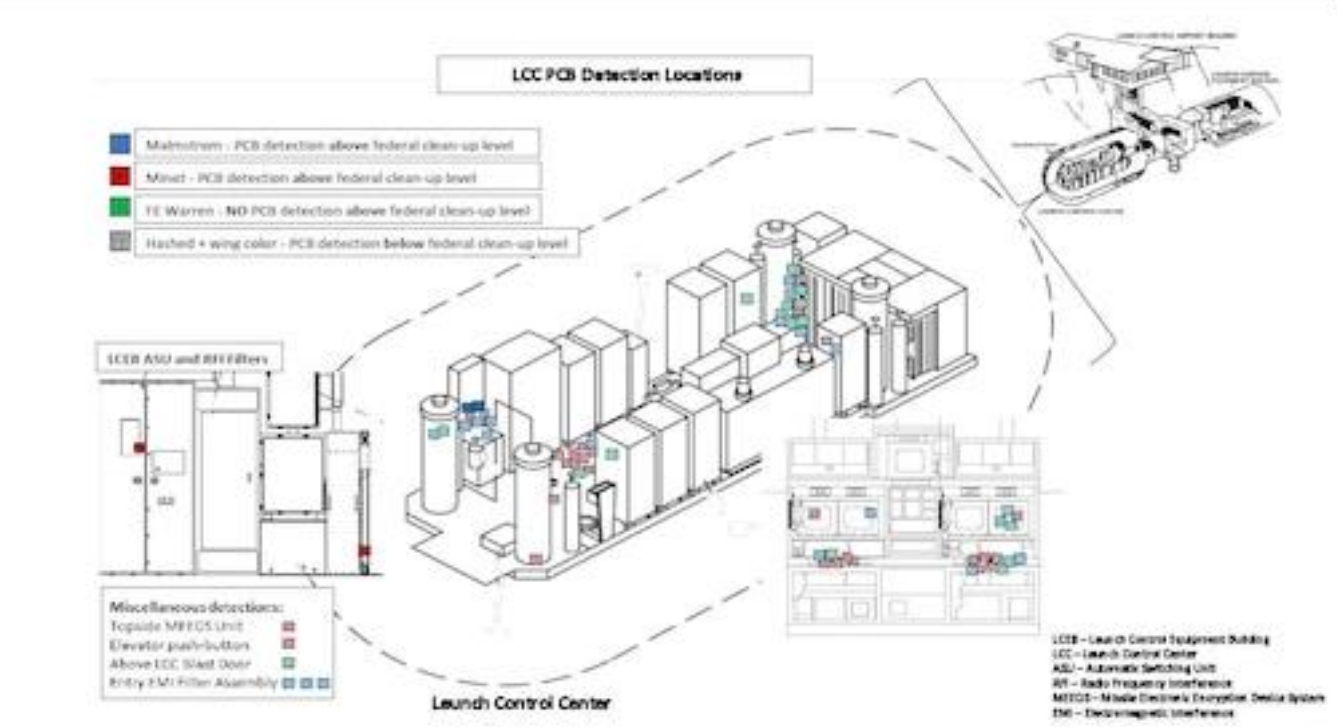
Nitrate & Nitrites	• Seasonal testing to track water quality fluctuations • Compared to community water systems
Radon	• Odorless, radioactive gas from natural stone deposits • 90-day sampling process
Organo-phosphates	• Pesticide sampling conducted seasonally to assess fluctuation based on local farmers spray schedule
Volatile Organic Cmpds (VOCs)	• Often in cleaning supplies & pesticides • Can accumulate indoors with low ventilation
Polychlorinated Biphenlys (PCBs)	• Common in lubricating oils & electrical equipment • Found in electrical components in MAFs
Carbon Monoxide	• Colorless, odorless gas produced from fuel combustion • Can accumulate indoors

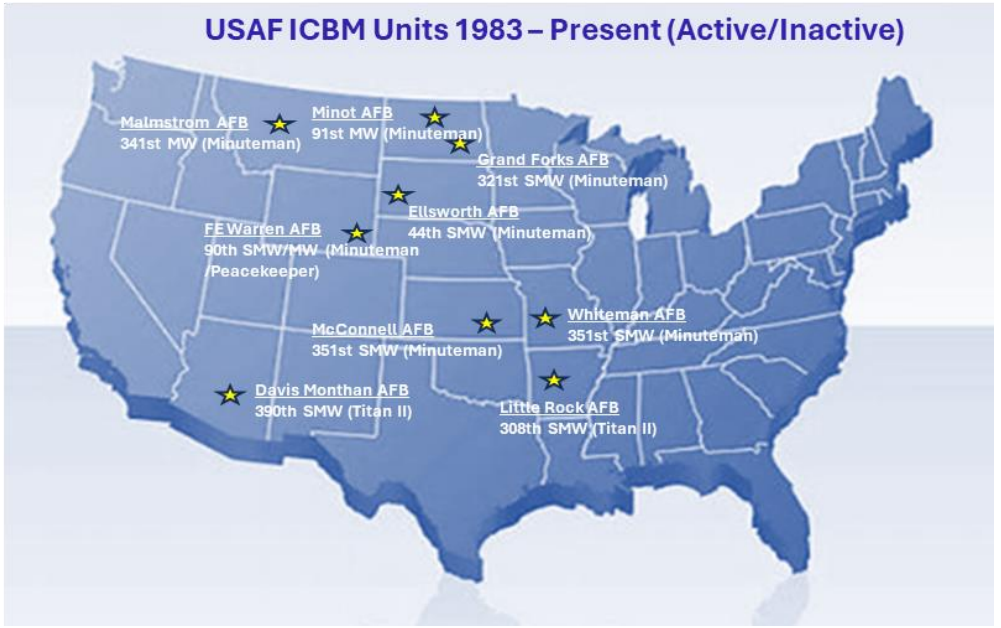
- **PCBs on surfaces, <u>only</u> hazard discovered above EPA recommended threshold**
- Long-lasting chemicals widely used in electrical, heat transfer, and hydraulic equipment
  - Labeled as a potential carcinogen, US banned production in 1979
  - AF Civil Engineer - Elimination of Liquid PCBs Prioritization Guidance, 1996
  - 3 MAFs (4 surface samples out of 1205 total at 5 bases) over EPA recommended threshold for mitigation
    - PCBs mitigated to prevent exposure



Ongoing Efforts

- **PCB response protocols standardization complete**
  - Maintenance Technical Orders (TOs)
  - Civil Engineer Manuals
  - Signage





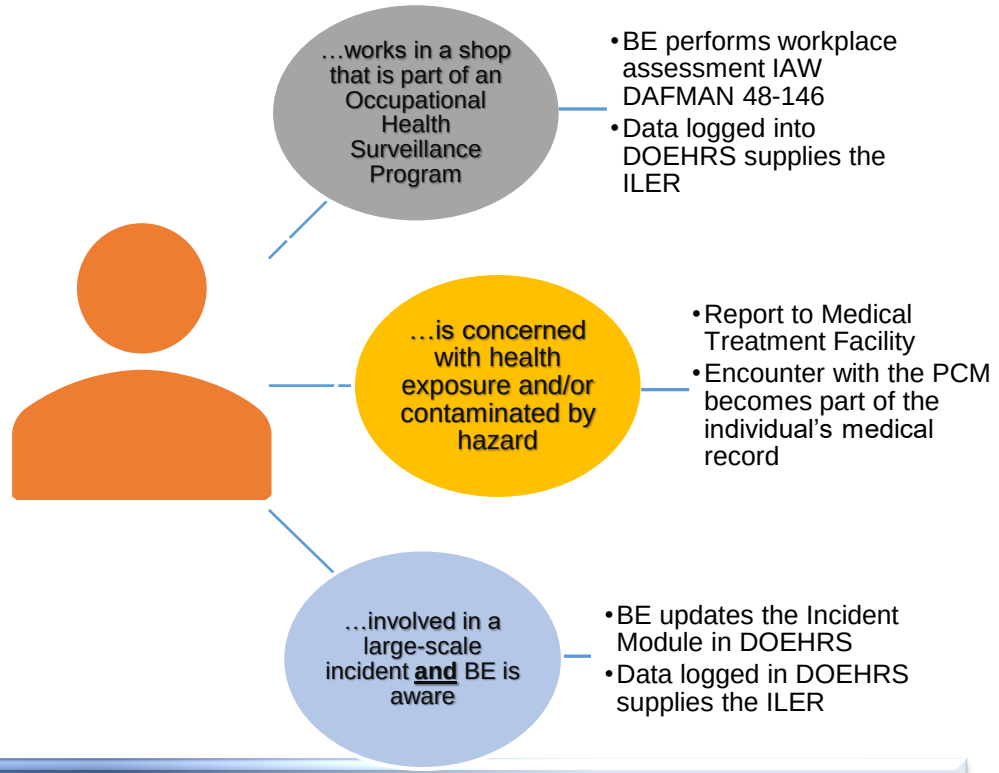
- MAF environmental upgrades & Deep Cleaning contract in progress
- PCB Cleaning contract awarded; 1st task order projected to start mid-Nov 24 for 4 LCCs per wing
- **Launch Facility** (LF) PCB sampling completed for Jul-Sep 2024; results pending, ETIC Nov 24

Hazard Documentation

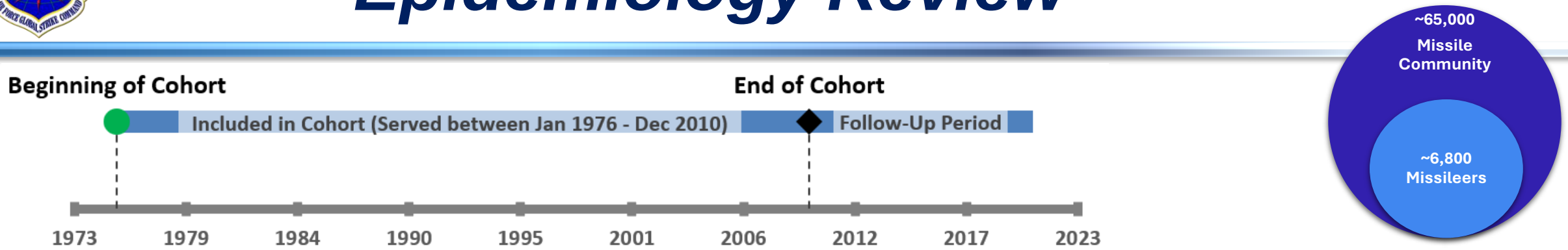
- **Missile-related Career Fields - Defense Occupational & Environmental Health Readiness System (DOEHRS)**
  - Tracks exposure information, environmental monitoring data, and health risk assessments
  - MCCS results (including PCBs) are loaded in DOEHRS
  - Health Risk Assessments - environmental data in DOEHRS will define exposure risk by base
  - Finalizing robust & comprehensive documentation of potential exposures

- **Individual Longitudinal Exposure Record (ILER)**
  - Individual data - will reflect hazards/exposures associated with your current / previous workcenters
  - Location-based data - hazards listed by base, not yet linked to individuals for CONUS
  - DoD ILER Committee working to connect data sets
  - Expanding access for Service members & veterans with CAC access in 2025
  - VA has access to members' individual and location-based data

- **"Polychlorinated biphenyls (PCBs) at Missile Wings" memo**



Epidemiology Review



2001-2020 — **DoD Electronic Medical Record** — **Phase 1A**
Includes persons diagnosed with cancer utilizing the military healthcare system/Tricare

1991-2020 — **VA Electronic Medical Record** — **Phase 1B**
Includes persons diagnosed with cancer in the VA healthcare system

1986-2020 — **DoD Cancer Registry** — **Phase 1B**
Includes persons diagnosed with cancer in the military healthcare system and reported to cancer registry

1976-2020 — **VA Cancer Registry** — **Phase 1B**
Includes persons diagnosed with cancer in the VA healthcare system and reported to cancer registry

1979-2020 — **National Death Index** — **Phase 1C**
Includes persons who have died and had death reported on death certificate

Various Dates — **Virtual Pooled Registry** — **Phase 2**
Includes persons diagnosed with cancer in a state or U.S. territory with a participating cancer registry

Basics of Epi Statistics

- **Internal Comparison (MC vs non-MC):** Used Incidence Rate Ratios (IRR)
  - We *can* directly compare incidence rates in the MC to the non-MC
    - Counted the number of cases in MC and non-MC
    - Calculated the amount of person-time contributed
  - The whole study timeframe (1976-2010) was used since we calculated the incidence rates directly
- **External Comparison (MC vs U.S. population)**: Used Standardized Incidence Ratios (SIR)
  - We *cannot* directly calculate incidence rates for the U.S. population, so IRR is not an appropriate statistic to use.
    - Counted the number of cases in MC
    - Used deidentified data from the National Cancer Institute Surveillance, Epidemiology, and End Results Program (SEER)
    - SEER gives age, race, and sex specific rates for each year
      - E.g., white females aged 20-24 years in 2001
      - Multiply that rate by the amount of person-time contributed by that demographic to get expected count for that demographic for that year
      - Repeat for each demographic slice of the MC for each year and add all slices (90 demographic combination slices per year) together to get total expected # of cases

Missile Community (MC)

Non-Missile Community (non-MC)

Person-time is a measurement that estimates the total time that participants are at risk of developing a disease or dying.

Incidence Rate Ratio (IRR) = $\frac{Incidence\ Rate\ of\ Cancer\ in\ MC}{Incidence\ Rate\ of\ Cancer\ in\ non-MC}$

$= \frac{\frac{Number\ of\ Cancer\ Cases\ in\ MC}{Person-Years}}{\frac{Number\ of\ Cancer\ Cases\ in\ non-MC}{Person-Years}}$

Standardized Incidence Ratio (SIR) = $\frac{Observed\ \#\ of\ cases\ in\ MC}{Expected\ \#\ of\ cases}$

Basics of Epi Statistics (cont)

- Both IRR and SIR comparisons are interpreted similarly
  - IRR or SIR < 1 means that the incidence rate is lower in the MC
  - IRR or SIR = 1 means that incidence rate is the same
  - IRR or SIR > 1 means that incidence rate is higher in the MC

- 95% confidence intervals and p-values are used to determine statistical significance
  - Statistical significance tells us if our findings are likely to be true and not just a coincidence.
  - If both the lower and upper confidence intervals are < 1 AND the p-value is <0.05, the incidence rate is lower in the MC and the result is *statistically significant.*
  - If both the lower and upper confidence intervals are > 1 AND the p-value is <0.05, the incidence rate is higher in the MC and the result is *statistically significant.*
  - If the 95% confidence interval crosses 1 OR the p-value is >0.05, the result is not statistically significant. In other words, the incidence rates are *statistically similar.*

Phase 1B Results

VA Medical Records, DoD Cancer Registry, and VA Cancer Registry

- There were 55,224 cancer cases identified in the DAF cohort overall from 1976-2020.
- Prostate cancer was the most common cancer type among both the MC and non-MC.
- Lung and Bronchus cancers were the second most common cancers in both cohorts.
- Cases were counted once per person per cancer type over the course of the 44-year surveillance period in any of the four data sources.
  - An individual with colon and breast cancer would be counted once for each cancer type.
    - A second occurrence of breast cancer in the same individual would not be counted again.

Case Counts

Table 3. **Cancer cases (count (column %)) by cancer type and exposure status (missile community versus non-missile community) from 1 January 1976 – 31 December 2020**

	Missile Community (N=64,930)	Non-missile Community (N=1,757,254)	Total
Total Cancer Cases*	**1,839**	**53,385**	**55,224**
Breast (Male and Female)	62 (3.37)	3,744 (7.01)	3,806 (6.89)
Colon and Rectum	191 (10.39)	4,962 (9.29)	5,153 (9.33)
Hodgkin Lymphoma	38 (2.07)	919 (1.72)	957 (1.73)
Kidney and Renal Pelvis	131 (7.12)	2,998 (5.62)	3,129 (5.67)
Leukemia	89 (4.84)	2,288 (4.29)	2,377 (4.30)
Lung and Bronchus	193 (10.49)	6,338 (11.87)	6,531 (11.83)
Melanoma of the Skin	160 (8.70)	3,980 (7.46)	4,140 (7.50)
Non-Hodgkin Lymphoma	126 (6.85)	3,268 (6.12)	3,394 (6.15)
Ovarian	5 (0.27)	309 (0.58)	314 (0.57)
Pancreatic	62 (3.37)	1,377 (2.58)	1,439 (2.61)
Prostate	577 (31.38)	16,845 (31.55)	17,422 (31.55)
Testicular	63 (3.43)	1,566 (2.93)	1,629 (2.95)
Thyroid	73 (3.97)	2,389 (4.48)	2,462 (4.46)
Urinary Bladder	69 (3.75)	2,402 (4.50)	2,471 (4.47)

*** An individual may have more than 1 type of cancer, but not more than 1 case per type of cancer**

Internal Comparison: MC to non-MC

- Cancer incidence in the MC was compared to the rest of the AD DAF (non-MC) as these groups share similar health status, insurance access, and demographics.
- Comparisons were adjusted for sex, age, race, and rank.
  - These variables are known to modify cancer risk.
- Incidence was not significantly increased for total cancer or any of the 14 individual cancers in the MC.
  - Compared to the non-MC, the MC had significantly lower cancer incidence for lung and bronchus, prostate, and urinary bladder as well as overall cancer.
    - There was no difference in incidence for the other 11 study cancers, i.e., the incidence was statistically similar.
  - Data showed no increased incidence of non-Hodgkin lymphoma.

Internal Comparison: MC to non-MC

Table 6. **Cancer cases, by type, of missile career field compared to non-missile career field* from 1 January 1976 - 31 December 2020 (IRR = Incidence Rate Ratio) (SE = Standard Error)**

Cancer Type	IRR	SE	95% CI, lower	95% CI, upper	p-value
All 14 types (Male and Female)**	**0.94**	**1.02**	**0.89**	**0.99**	**≤0.01**
All 12 types (Female)**	0.88	1.10	0.68	1.07	0.18
All 13 types (Male)**	**0.94**	**1.03**	**0.89**	**0.99**	**0.02**
Breast (Male and Female)	0.99	1.14	0.74	1.24	0.91
Breast (Female)	1.00	1.14	0.73	1.26	0.98
Colon and Rectum	1.01	1.08	0.86	1.15	0.92
Hodgkin Lymphoma	1.23	1.18	0.91	1.55	0.21
Kidney and Renal Pelvis	1.11	1.09	0.93	1.28	0.25
Leukemia	1.00	1.11	0.79	1.21	0.99
Lung and Bronchus	**0.78**	**1.08**	**0.64**	**0.93**	**≤0.01**
Melanoma of the Skin	1.08	1.08	0.92	1.24	0.35
Non-Hodgkin Lymphoma	1.02	1.10	0.84	1.20	0.85
Ovarian (Female)	0.98	1.57	0.10	1.86	0.97
Pancreatic	1.18	1.14	0.92	1.43	0.21
Prostate (Male)	**0.88**	**1.04**	**0.80**	**0.96**	**≤0.01**
Testicular (Male)	1.15	1.14	0.90	1.41	0.27
Thyroid	1.02	1.13	0.79	1.25	0.88
Urinary Bladder	**0.70**	**1.13**	**0.46**	**0.94**	**≤0.01**

***Multiple Poisson regression adjusted for age, race, sex, and rank.**
**** Only the first primary cancer per individual was counted.**

External Comparison: MC to U.S. population

- Cancer incidence in MC was compared to the general U.S. population using SIRs. This allows for accurate comparison of cancer incidence in the MC versus the general U.S. population.
- No increased incidence of total cancer or any of the 14 individual cancers in the MC.
  - Compared to the general U.S. population, the MC had significantly lower cancer incidence for 11 of the 14 cancers and for overall cancer.
    - Preliminary results show that the MC has lower cancer incidence compared to the U.S. general population, based on the data sources we are using now; however, there are known gaps in these data sources.
  - Data showed no increased incidence of non-Hodgkin lymphoma in the MC.

External Comparison: MC to U.S. general population

Table 5. **Standardized Incidence Ratios (SIRs) by cancer type among the missile community, compared to U.S. civilian cases using SEER Research database from 1 January 2001 – 31 December 2020**

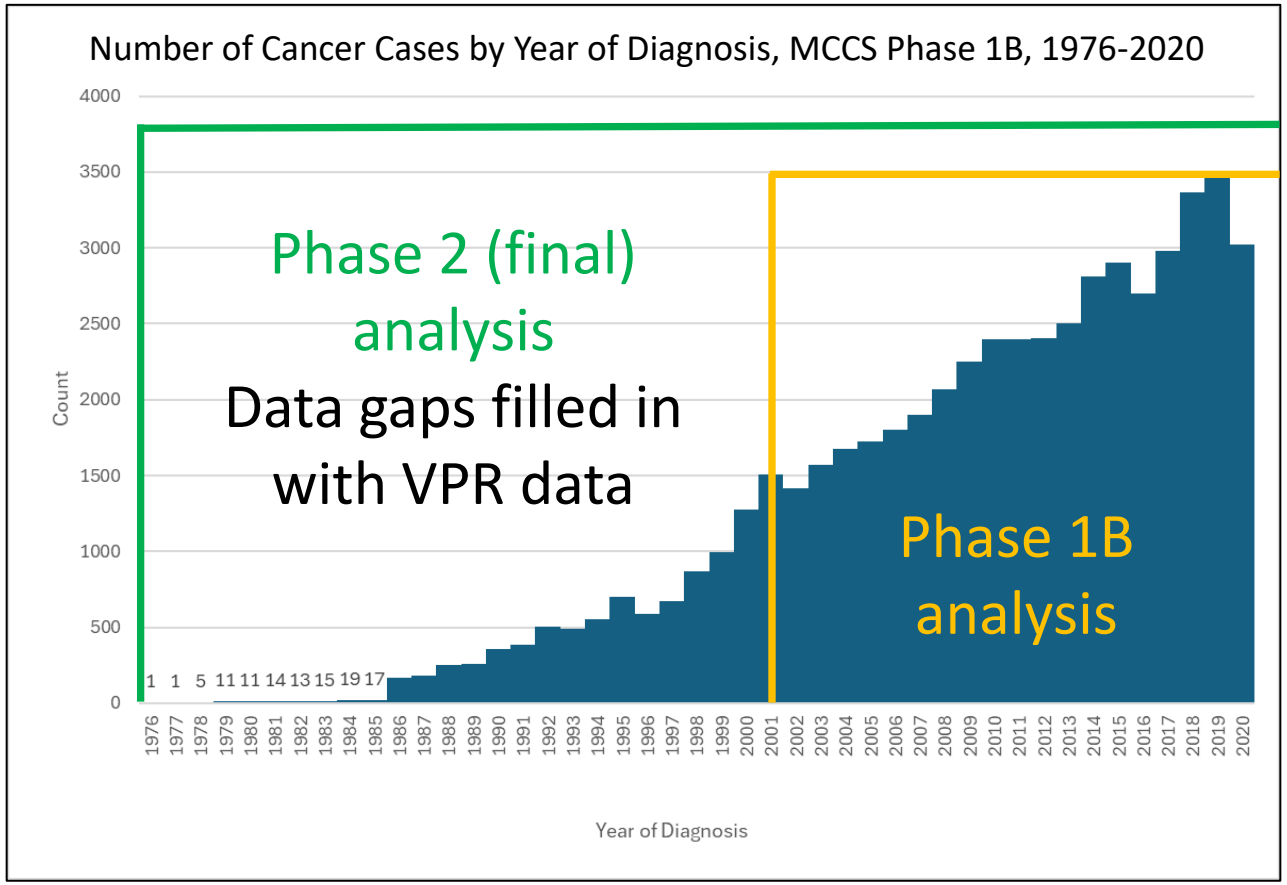
Cancer Type	Observed Cases	Expected Cases	SIR	95% CI, lower	95% CI, upper	p-value
All 14 types	1,630	3,198	**0.51**	**0.48**	**0.54**	**≤0.01**
Male and Female Breast	56	56	1.00	0.69	1.40	1.00
Colon and Rectum	171	417	**0.41**	**0.33**	**0.50**	**≤0.01**
Hodgkin Lymphoma	26	27	0.97	0.55	1.58	0.99
Kidney and Renal Pelvis	122	209	**0.58**	**0.46**	**0.73**	**≤0.01**
Leukemia	75	116	**0.65**	**0.47**	**0.87**	**≤0.01**
Lung and Bronchus	180	475	**0.38**	**0.31**	**0.46**	**≤0.01**
Melanoma of the Skin	134	222	**0.60**	**0.48**	**0.75**	**≤0.01**
Non-Hodgkin Lymphoma	111	194	**0.57**	**0.44**	**0.73**	**≤0.01**
Ovarian	5	4	1.32	0.29	3.74	0.66
Pancreatic	56	116	**0.48**	**0.33**	**0.68**	**≤0.01**
Prostate	542	1,023	**0.53**	**0.47**	**0.59**	**≤0.01**
Testicular	34	48	**0.71**	**0.44**	**1.09**	**0.05**
Thyroid	57	82	**0.70**	**0.48**	**0.97**	**≤0.01**
Urinary Bladder	61	211	**0.29**	**0.20**	**0.40**	**≤0.01**

*Bold **represents statistically significant findings (p≤0.05)**

External Comparison: Years 2001-2020

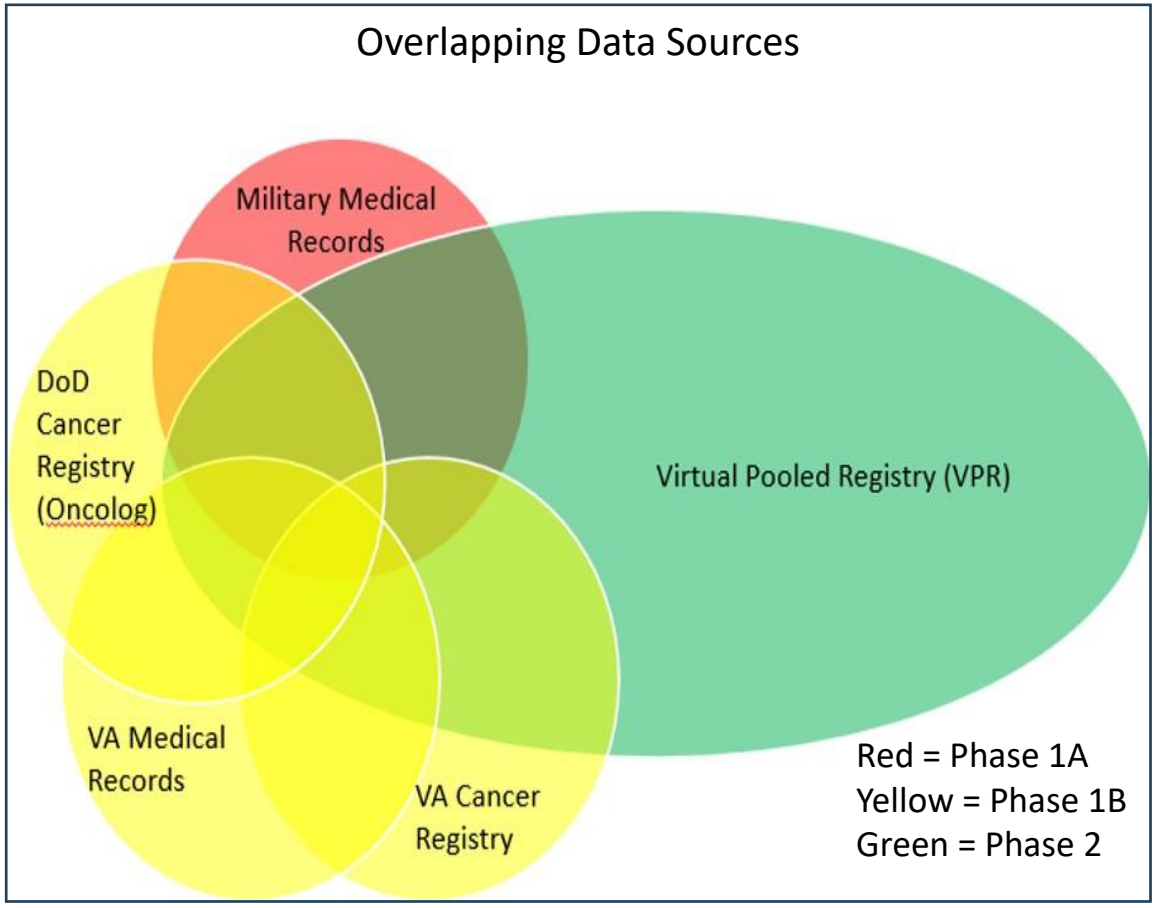
2001-2020 captures 85% of cancers for Phase 1B

- For Phase 1B analysis, only cancers from 2001-2020 were included for the external analysis (MC to U.S. population), why?
  - 2001 was the first year that all datasets included in Phase 1B analysis were available.
  - During 2001-2020, our capture of cases is as complete as it can be using Phase 1B data sources.
    - In Phase 1B, only the VA registry goes back to 1976
  - Analyzing the whole study timeframe (1976-2020) would have added a lot of person-time but only added a disproportionately small number of cancer cases
    - The SIRs would have been artificially lower due to this known data gap
  - Phase 2 analysis plans to include cancers from the entire study period for both the internal and the external comparisons.



Collaboration & Case Capture

- The MCCS Team collaborated with experts from Wright State University and the National Institute for Occupational Safety and Health (NIOSH).
- Phase 1B included considerably more data, capturing nearly 11 times more cancer cases compared to Phase 1A.
  - Phase 1A captured DoD medical data only.
  - Phase 1B added DoD/VA tumor registry data and VA medical data.
- Study team anticipates finding 2-3 times more cancer cases using the VPR during Phase 2.
- No definitive conclusions should be drawn until Phase 2 is complete and all data sources have been incorporated.



Way Forward

- **Complete Environmental Sampling**
  - Comprehensive health risk assessment incorporating data from all environmental sampling efforts
  - Assess Launch Facility PCB sampling results
- **Continue Epidemiology Review –** Phase 1C data set analysis; Phase 2 obtaining data through Virtual Pooled Registry (VPR)
- **Stakeholder Engagement**
  - Congressional updates
  - VA Coordination - Military Environmental Exposure Sub-Council
  - For more information on expanded VA coverage

The PACT Act And Your VA Benefits | Veterans Affairs

- **Website for public information/questions:** Missile Community Cancer Study (af.mil)