



Evaluating the Surveillance-Related Programs and Workforce of the U.S. Centers for Disease Control and Prevention (CDC)

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Disease Surveillance Is Central to CDC's Mission

“CDC serves as the national focus for developing and applying disease prevention and control, environmental health, and health promotion and health education activities designed to improve the health of the people of the United States.

*To accomplish its mission, CDC identifies and defines preventable health problems and **maintains active surveillance of diseases** through epidemiologic and laboratory investigations and data collection, analysis, and distribution”*

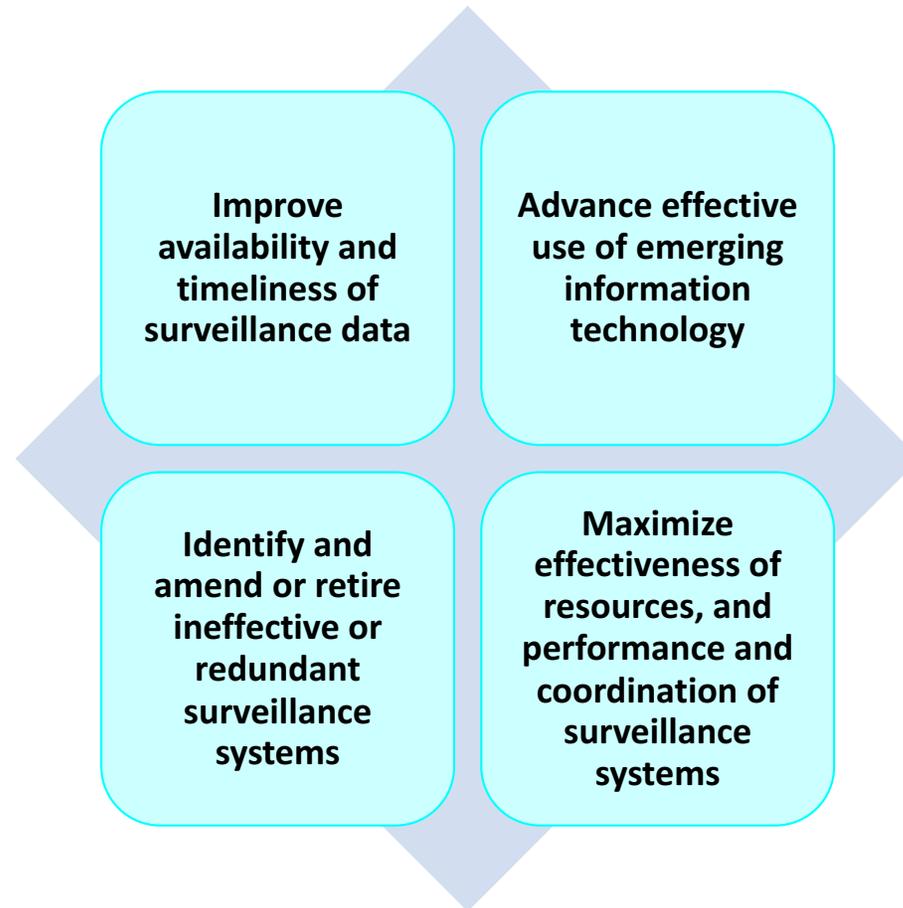
Source: <http://www.cdc.gov/maso/pdf/cdcmiss.pdf>

CDC Called to Enhance its Surveillance Systems

- *Congressional FY 2015 budget language* required CDC to “develop a timeline for a cloud-based and flexible IT public health data reporting platform for CDC programs”
- *Council of State and Territorial Epidemiologists* asked CDC to evaluate which data elements are truly needed for surveillance and to coordinate across CDC programs to harmonize and standardize data elements
- *CDC Director* charged Office of Public Health Scientific Services, in 2014, to lead the CDC Surveillance Strategy



CDC Response: CDC Surveillance Strategy



Evaluation Goals and Approach

- Conduct first comprehensive assessment of CDC's surveillance systems and workforce to support CDC Surveillance Strategy
 - ❑ Use existing administrative data to characterize CDC's intramural surveillance systems, and extramural grant activities and investments in surveillance projects
 - ❑ Use human resources data to characterize the CDC surveillance-related workforce
 - ❑ Apply descriptive and advanced statistical methods, evaluating trends over time, when possible, to glean insights not previously available
 - ❑ Consider data completeness/quality when interpreting results
 - ❑ Work with CDC subject matter experts (SME) to validate findings and help interpret results
- Share final results with CDC senior leadership to inform CDC policies and future investments in surveillance programs and workforce to maximize their effectiveness and efficiency
- Recognize more in-depth follow-up studies may be needed to answer questions suggested by administrative data analyses
- **Evaluation still ongoing – presenting *preliminary results!***

Examples of Analysis Questions

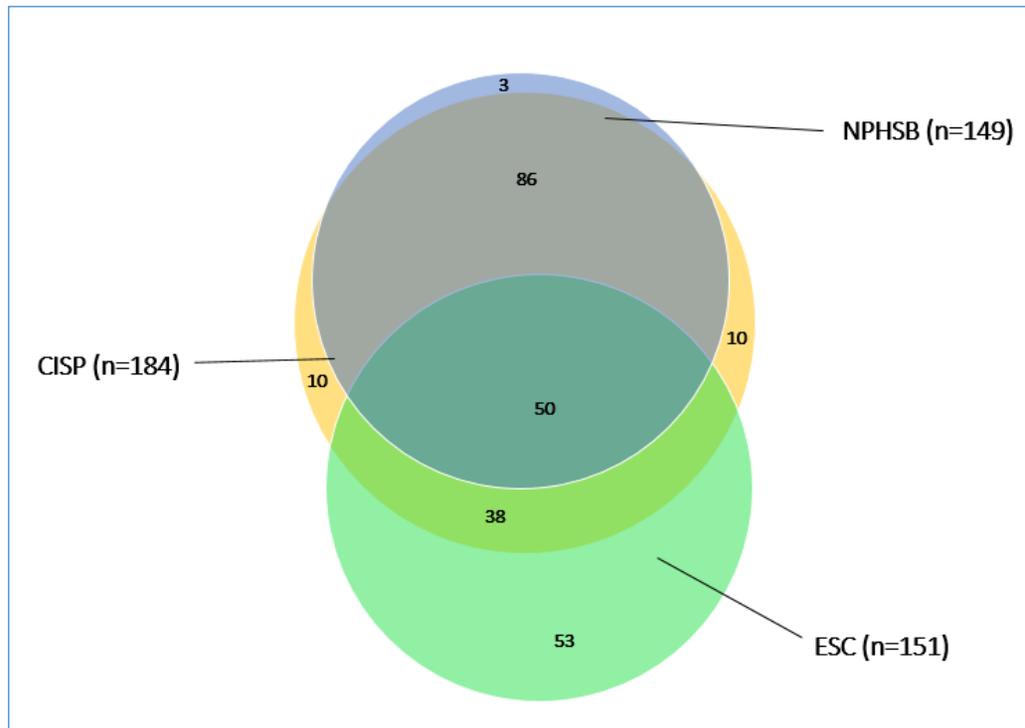
- What are CDC's surveillance programs?
- What are the characteristics of CDC's extramural grants that support surveillance-related activities?
- What specific topic areas are covered by CDC surveillance programs?
- What are the characteristics of the CDC surveillance-related workforce?
- What factors predict when and why the CDC surveillance-related workforce leave CDC or get promoted?
- Which CDC Funding Opportunity Announcements (FOAs) provide support for surveillance-related activities, and what types of activities are supported?
- What surveillance-related knowledge (publications) and impact (citations) are generated by CDC staff, and extramural staff supported by CDC?

How Many Surveillance Systems Does CDC Have?

METHODS

- Analyzed data from 3 administrative databases
 - CDC Integrated Surveillance Portal (CISP)
 - National Public Health Surveillance and Biosurveillance Registry for Human Health (NPHSB Registry)
 - CDC Enterprise Systems Catalogue (ESC)
- Compared names of systems and their organizational homes across the 3 databases to identify and remove duplicates to produce list of each unique surveillance system
- Vetted initial results with CDC subject matter experts (SMEs) to arrive at final list

Initial Results: CDC Surveillance Systems Varied and Overlapped Across 3 Databases (n=250 unique systems)*



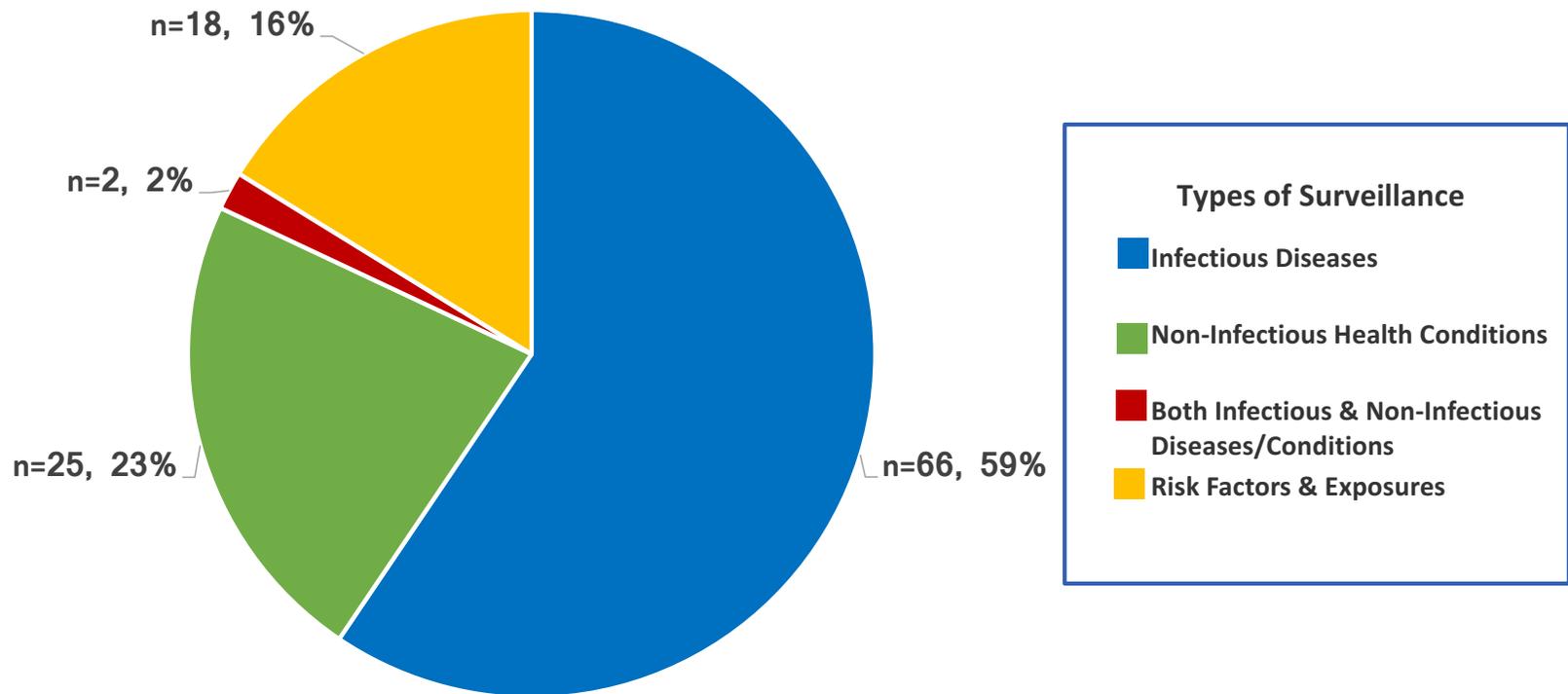
| Database | Number of Surveillance Systems |
|----------|--------------------------------|
| CISP | 184 |
| NPHSB | 149 |
| ESC | 151 |
| All** | 250 |

| Database | Number of Surveillance Systems |
|--------------------|--------------------------------|
| CISP Only | 10 |
| NPHSB Only | 3 |
| ESC Only | 53 |
| CISP & NPHSB | 86 |
| CISP & ESC | 38 |
| NPHSB & ESC | 10 |
| CISP & NPHSB & ESC | 50 |

*Diagram may not be precisely to scale **Total # of systems (N=250) is less than sum of 3 databases due to overlap.

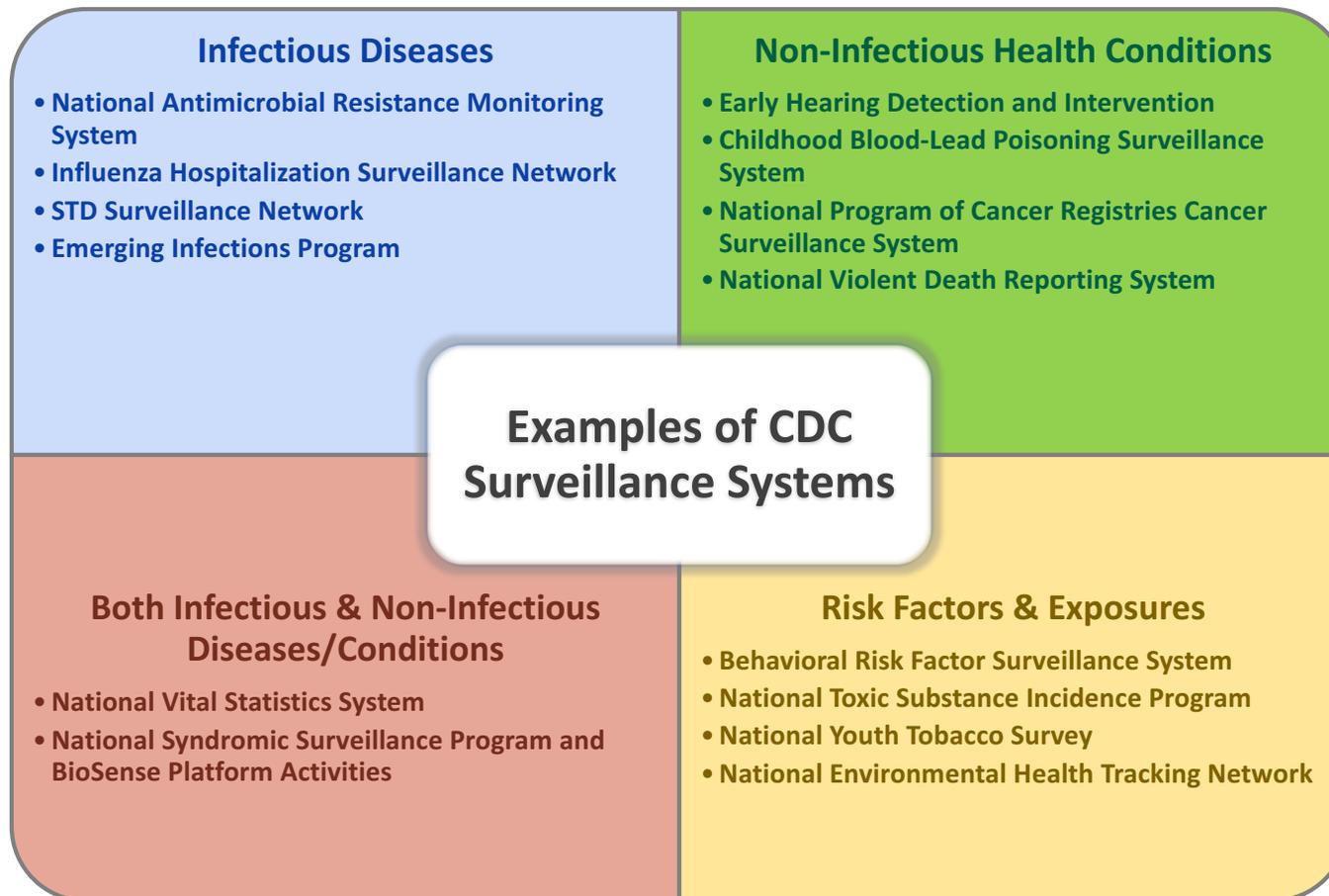
CISP=CDC Integrated Surveillance Portal; NPHSB=National Public Health Surveillance and Biosurveillance Registry for Human Health; ESC=Electronic Systems Catalogue

After Expert Vetting: CDC Active Surveillance Systems (n=111)



As of October 11, 2016.

Systems identified as "subcomponents" of a surveillance system (n=11) were excluded. Surveillance systems in development (n=2) were included.

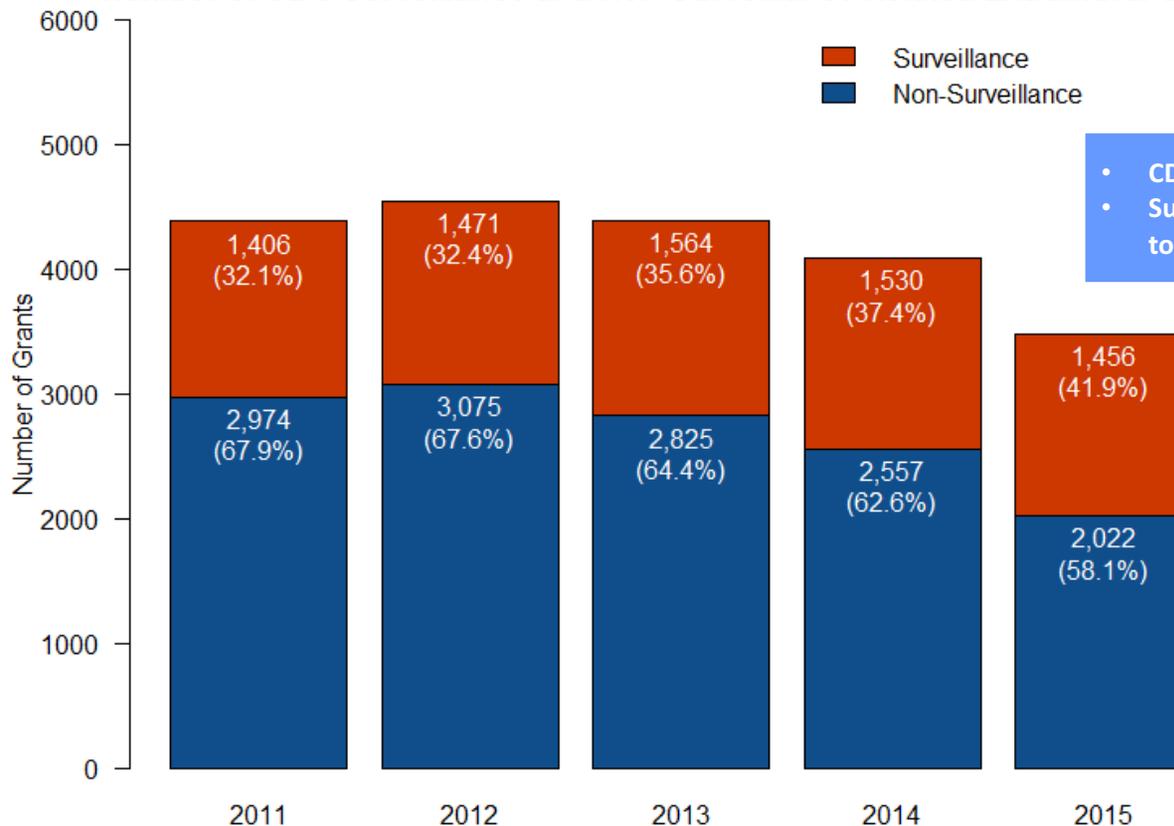


What % of CDC Grants Involve Surveillance?

METHODS

- Searched grant abstracts and project titles for term “surveillance”
 - **Source: IMPAC II database and grant application image files**
 - **Counted grants based on # of awards not projects (some projects have >1 awards/fiscal year (FY))**
 - **Included all grant types (incl. cooperative agreements) and activities (e.g., R01s) in FYs 2011-2015**
 - **In FY2015, CDC began transition from IMPAC II to GrantSolutions for grants management**
 - **Current analyses excluded the 754 grants awards totaling \$643M processed in GrantSolutions (will try to include them in future)**
- Found 33.5% of grants and 33.6% of grant funds had term “surveillance”
 - **Underestimate: only 91% of grant abstracts were recovered**
- Applied simple logistic regression model to impute surveillance status of grants with missing abstracts to *estimate* total surveillance-related grants
 - **Model covariates included: Center, Institute or Office (CIO), activity and institution type**
- Estimated 35.6% of grants and 35.2% of grant funds were “surveillance”-related
 - **The following slides include these estimates**

Number of CDC Surveillance and Non-Surveillance Related Extramural Grants, by Fiscal Year



- CDC made ≈ 4-4.5K grants/year
- Surveillance grants represented about 1/3 to 2/5 of CDC's portfolio over last 5 years

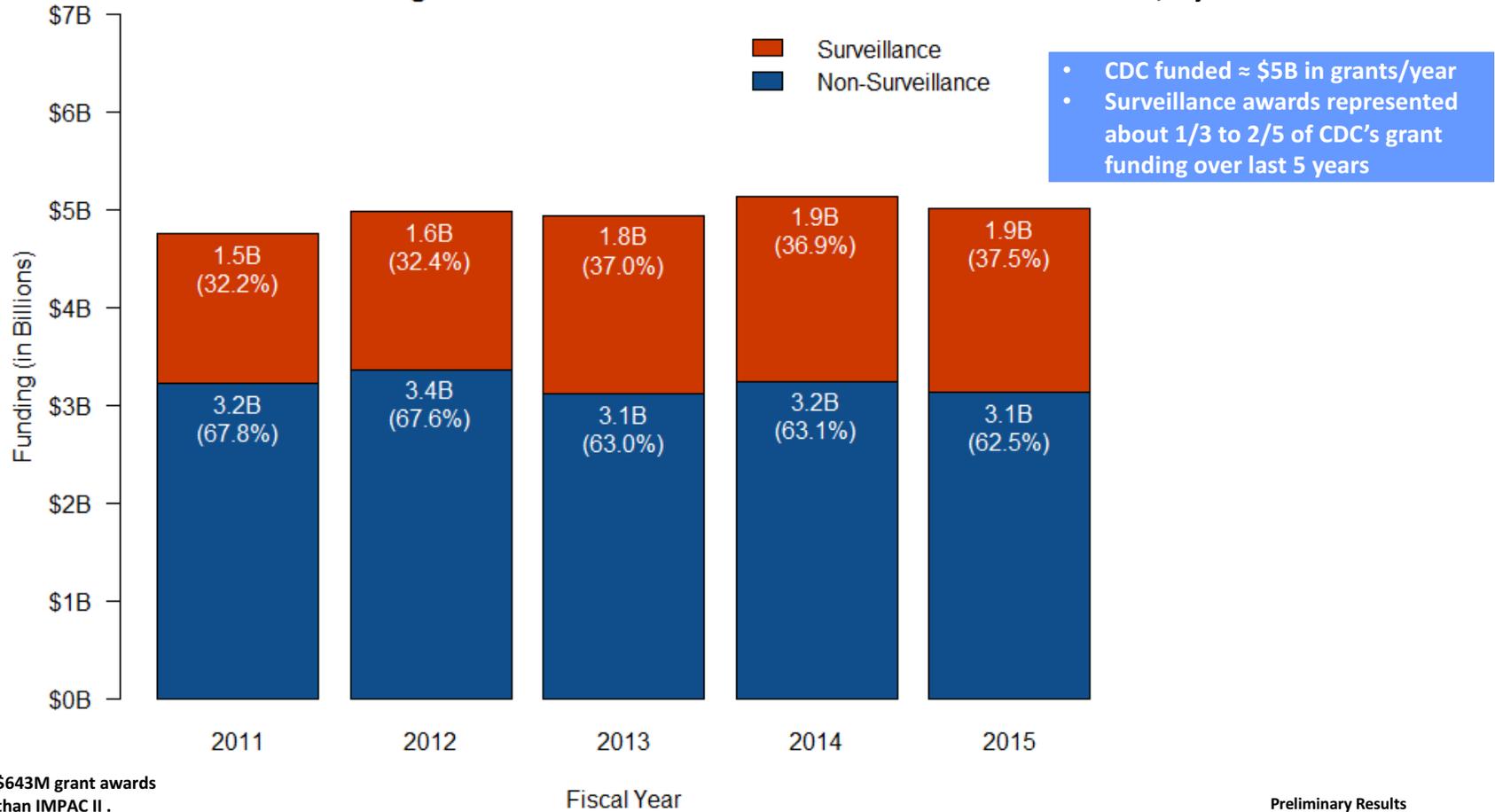
Source: IMPAC II. FY2015 excludes 754 grant awards processed in GrantSolutions rather than IMPAC II.

Fiscal Year

Preliminary Results

Includes CDC grants funded with CDC and/or non-CDC appropriated dollars.

CDC Extramural Funding for Surveillance and Non-Surveillance Related Grants, by Fiscal Year

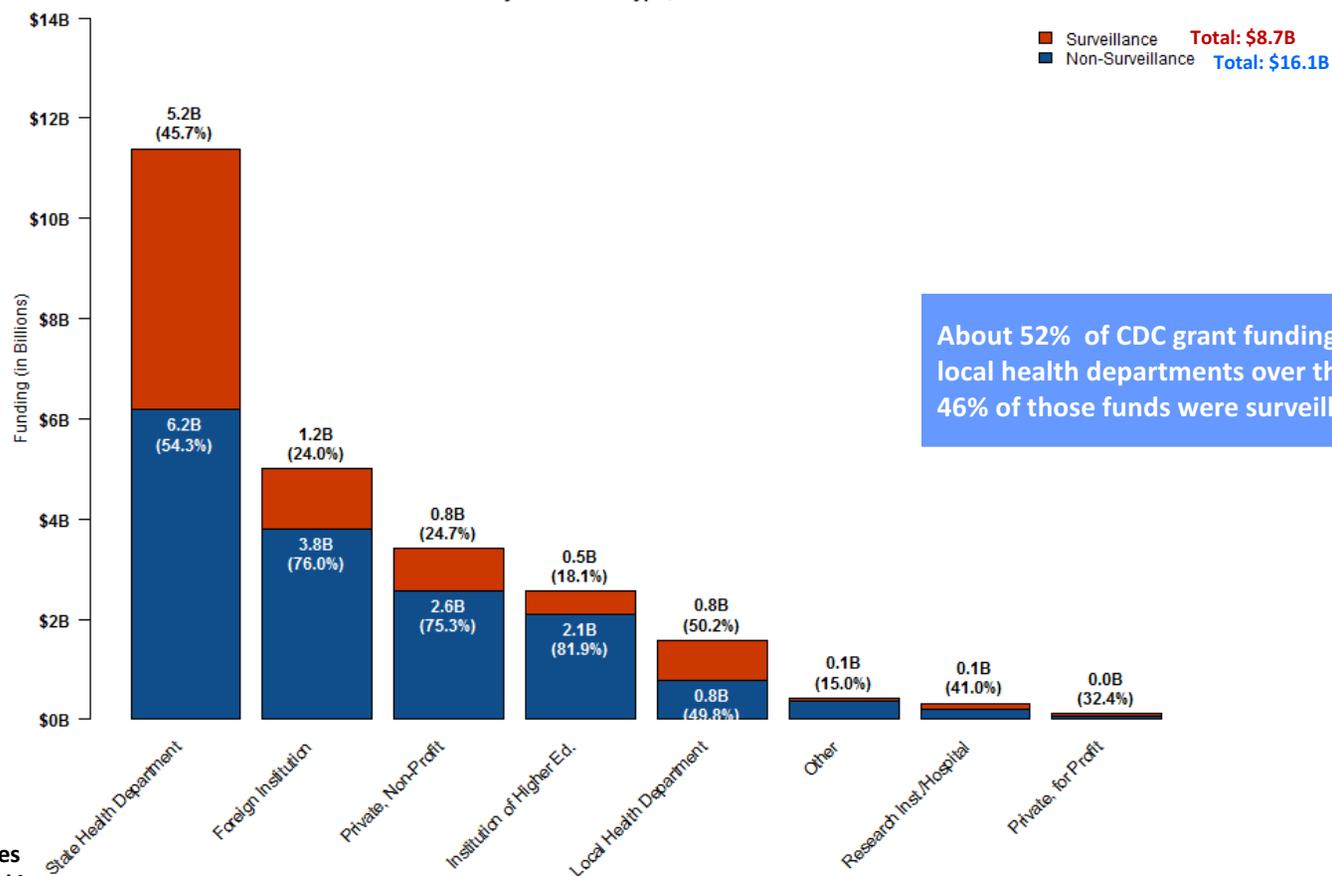


Source: IMPAC II. FY2015 excludes \$643M grant awards processed in GrantSolutions rather than IMPAC II.

Preliminary Results

Includes CDC grants funded with CDC and/or non-CDC appropriated dollars.

CDC Extramural Funding for Surveillance and Non-Surveillance Related Grants
By Institution Type, FY 2011-2015



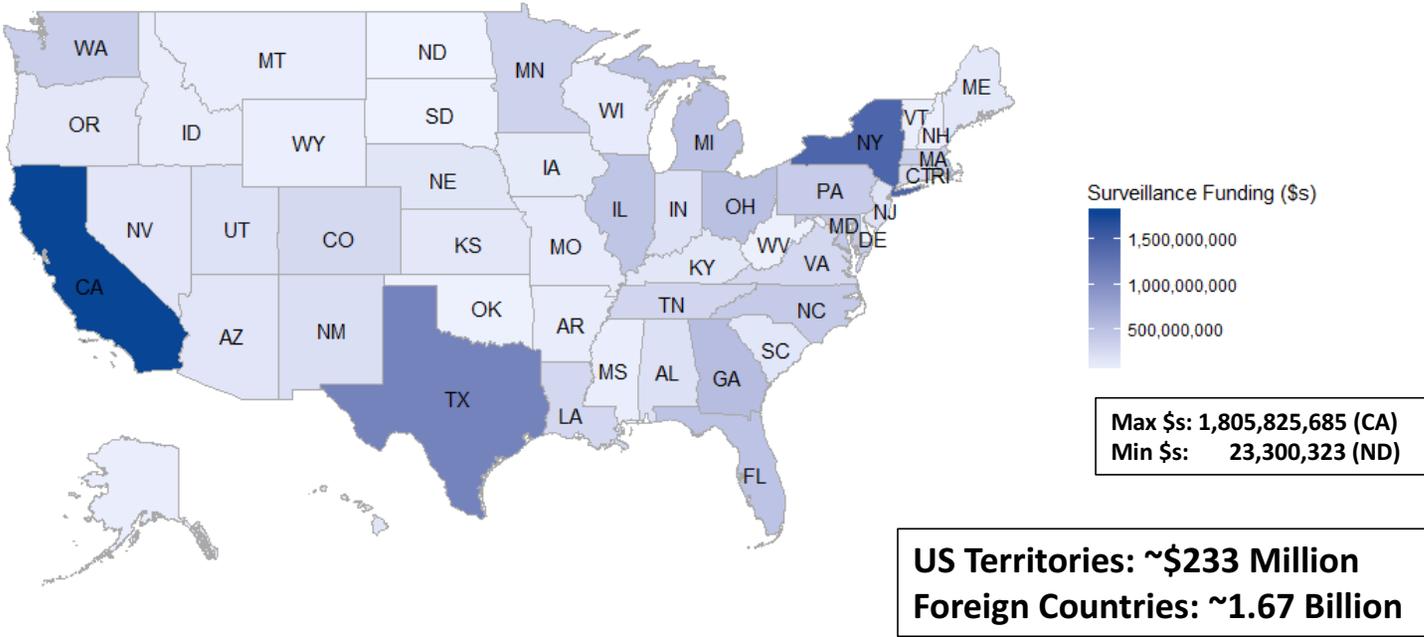
About 52% of CDC grant funding went to state and local health departments over the last 5 years, and 46% of those funds were surveillance-related

Source: IMPAC II. FY2015 excludes \$643M of grant awards processed in GrantSolutions rather than IMPAC II.

Preliminary Results

Includes CDC grants funded with CDC and/or non-CDC appropriated dollars.

CDC Extramural Funding for Surveillance-Related Grants by State, FY 2011-2015

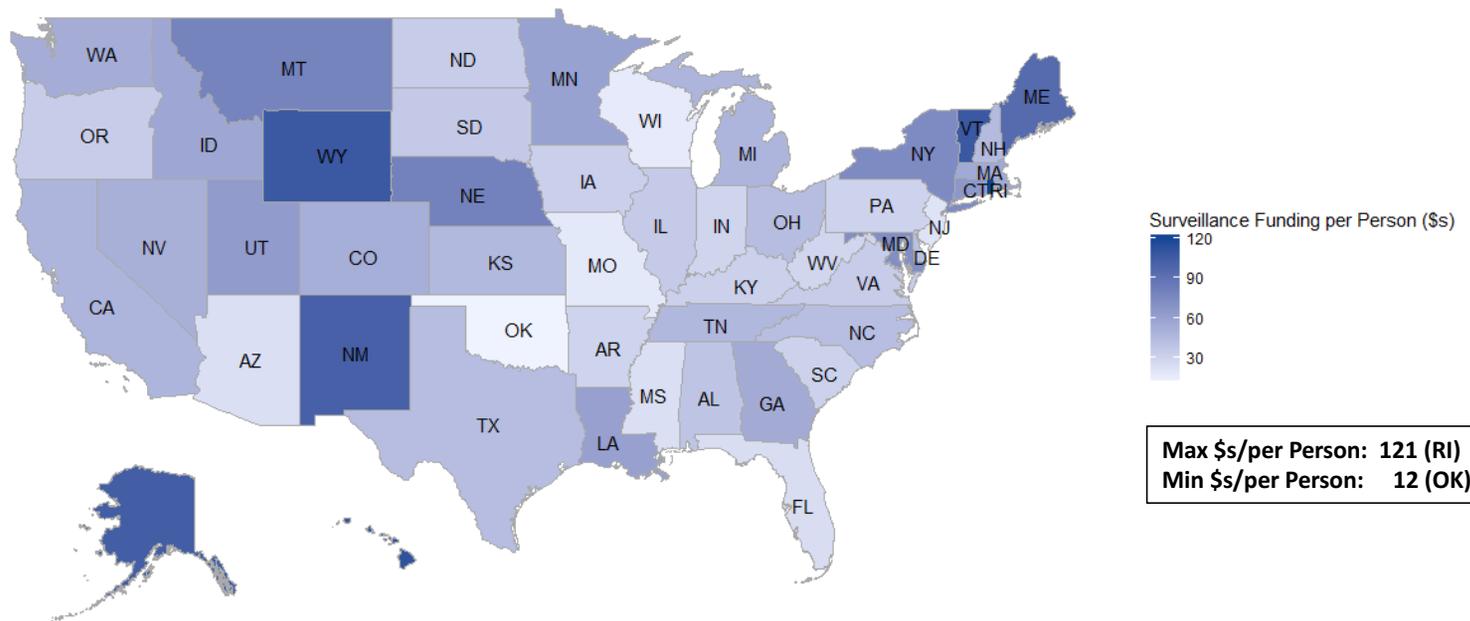


Source: IMPAC II.
FY2015 excludes \$643M of grant awards processed in GrantSolutions rather than IMPAC II.

Includes CDC grants funded with CDC and/or non-CDC appropriated dollars.

Preliminary Results

CDC Extramural Funding per Person for Surveillance-Related Grants by State, FY 2011-2015



Source: IMPAC II and U.S. Census Bureau.
FY2015 excludes \$643M of grant awards processed in GrantSolutions rather than IMPAC II.

Includes CDC grants funded with CDC and/or non-CDC appropriated dollars.

Preliminary Results

What are the characteristics of the CDC surveillance-related workforce?

METHODS

- Classified staff as surveillance-related if “surveillance” was in the name of their immediate organization unit (child level), or units one, two or three levels above in their organization’s hierarchy (parent, grand parent, great grandparent level, respectively), producing a range of workforce size estimates
 - Staff in other units classified as non-surveillance
- Compared surveillance- to non-surveillance-related staff on various characteristics including employee type, occupation, demographics, retirement eligibility; and time to first promotion, and to separation from CDC (survival analysis)
- Have some data on all members of current workforce, including employees (i.e., Civil Service (Titles 5 and 42) and Commissioned Corps) and non-employees paid with CDC funds (e.g., contractors)
 - Excluded “Other Employees” from most analyses due to limited data
 - No demographic data available on non-employees
- Have historical data only on Civil Service employees so longitudinal analyses limited to this group

Surveillance-Related Staff* Estimates Ranged from 5-10% of CDC's Current Workforce Employed in 4-9% of CDC's Organizational Units

| Surveillance in Name of Staff Member's Organizational Unit Hierarchy | # (%) of Surveillance-Related Staff | # (%) of Non-Surveillance-Related Staff | Total # (%) of Staff | # (%) of Units Classified as Surveillance | Total # (%) of Organizational Units |
|--|-------------------------------------|---|----------------------|---|-------------------------------------|
| Immediate Unit (Child) | 1,086 (4.6%) | 22,734 (95.4%) | 23,820 (100%) | 35 (4.3%) | 806 (100%) |
| 1 Level Above (Parent) | 1,821 (7.6%) | 21,999 (92.4%) | 23,820 (100%) | 49 (6.1%) | 806 (100%) |
| 2 Levels Above (Grand Parent) | 2,287 (9.6%) | 21,533 (90.4%) | 23,820 (100%) | 66 (8.2%) | 806 (100%) |
| 3 Levels Above (Great Grand Parent) | 2,323 (9.8%) | 21,497 (90.2%) | 23,820 (100%) | 71 (8.8%) | 806 (100%) |

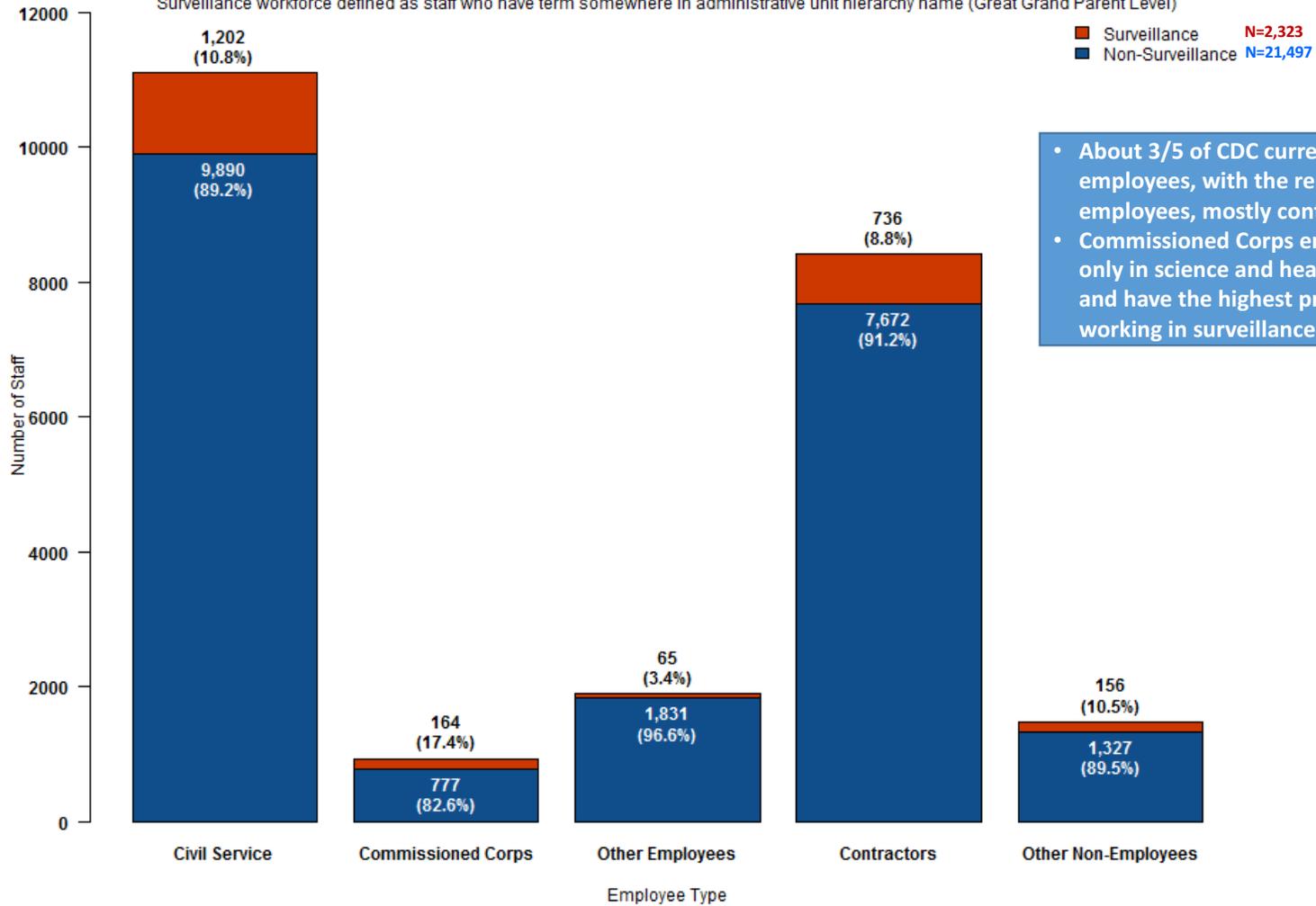
*Includes employees and non-employees (e.g., contractors) paid with CDC appropriated funds.
Excludes non-employee affiliates not paid with CDC appropriated funds.

Preliminary Results

Source: MISO DW External Staffing Views. Data drawn on 10/13/2016.

CDC Current Surveillance and Non-Surveillance Workforce by Employee Type

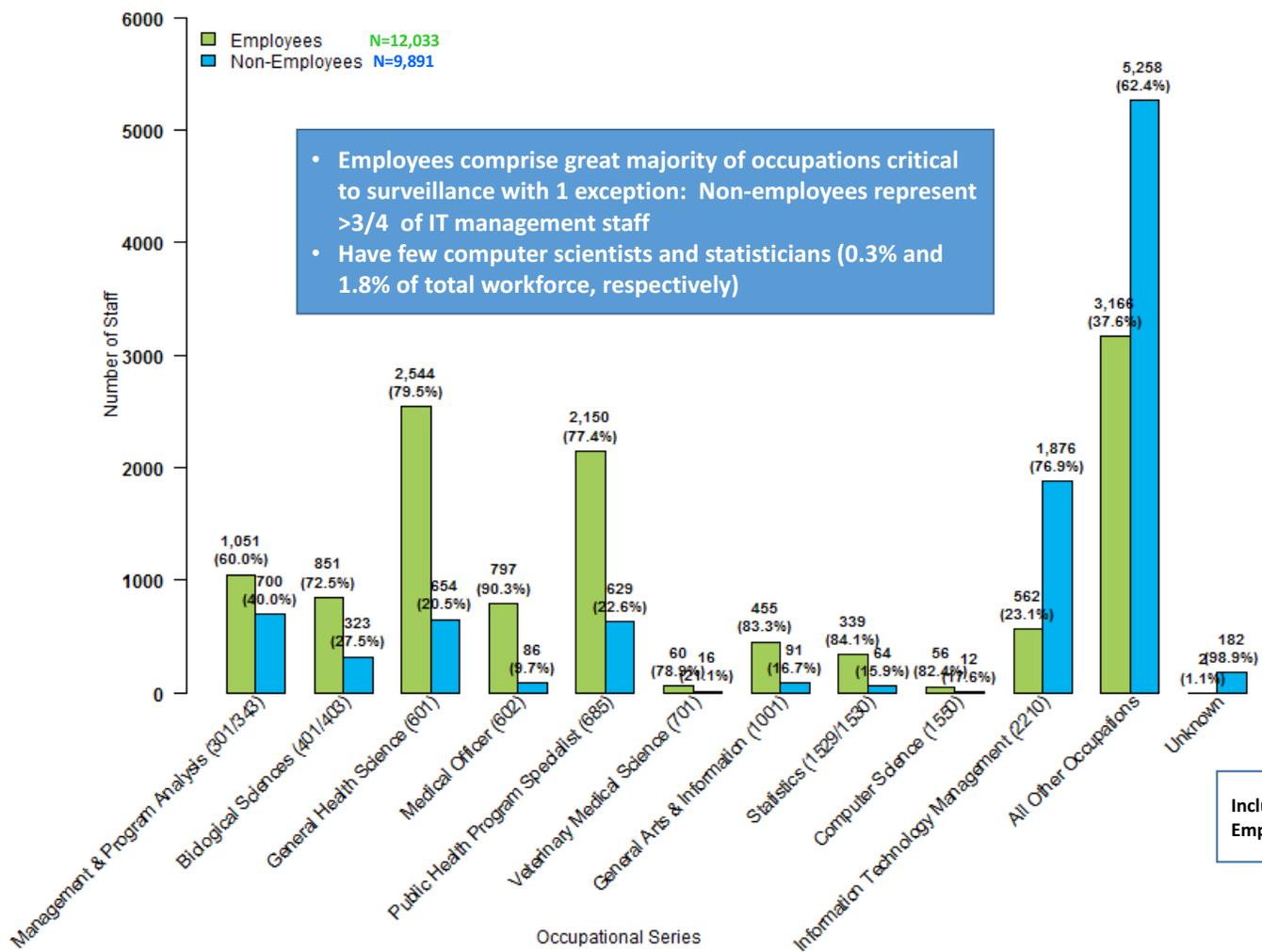
Surveillance workforce defined as staff who have term somewhere in administrative unit hierarchy name (Great Grand Parent Level)



- About 3/5 of CDC current staff are employees, with the remainder non-employees, mostly contractors (35%)
- Commissioned Corps employees are hired only in science and health occupations, and have the highest proportion of staff working in surveillance-related units

Preliminary Results

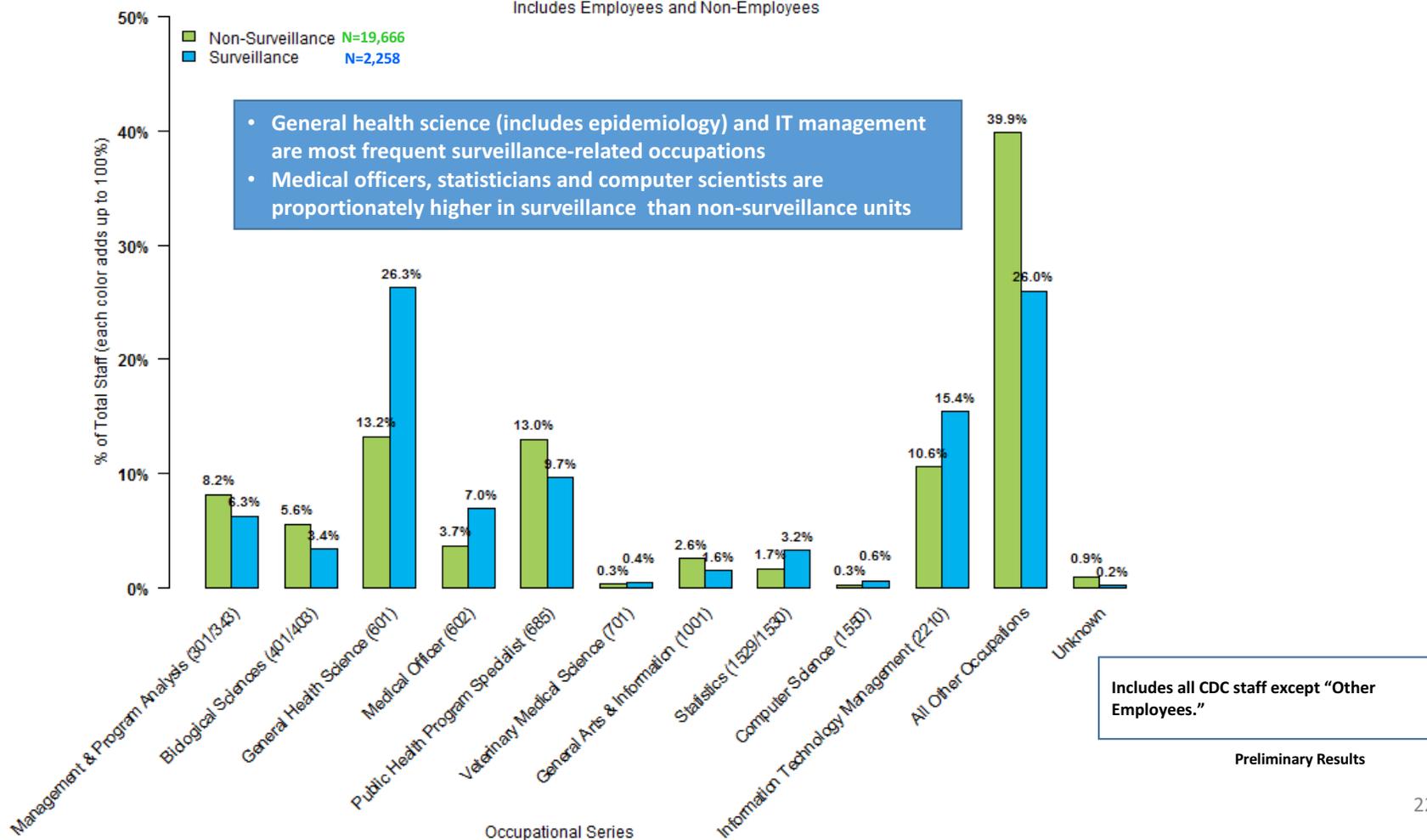
CDC Current Employee and Non-Employee Workforce by Occupational Series



Preliminary Results

CDC Current Surveillance and Non-Surveillance Workforce Distribution by Occupational Series

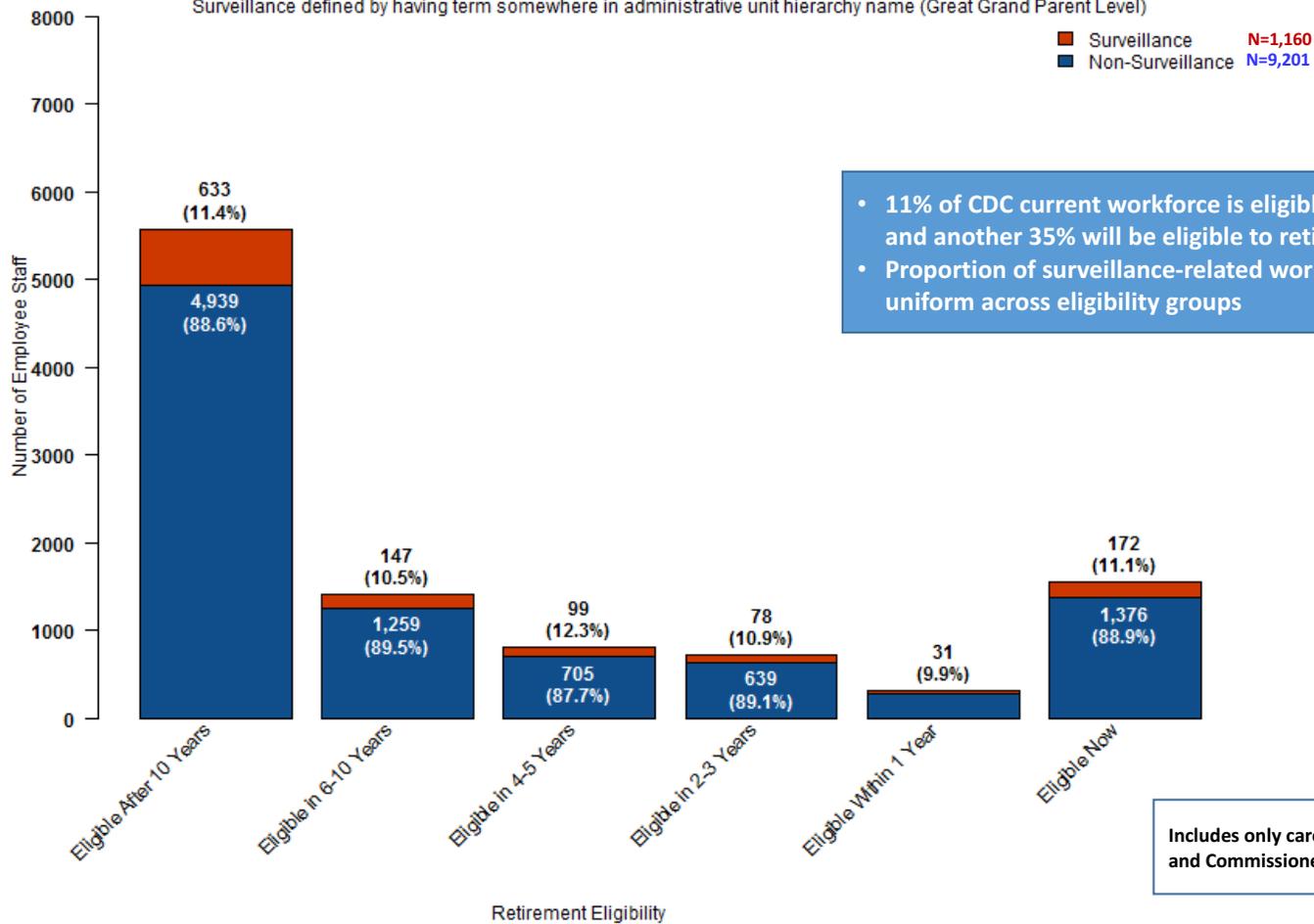
Surveillance workforce defined as staff who have term somewhere in administrative unit hierarchy name (Great Grand Parent Level)
Includes Employees and Non-Employees



Preliminary Results

CDC Current Surveillance and Non-Surveillance Employee Workforce by Retirement Eligibility

Surveillance defined by having term somewhere in administrative unit hierarchy name (Great Grand Parent Level)



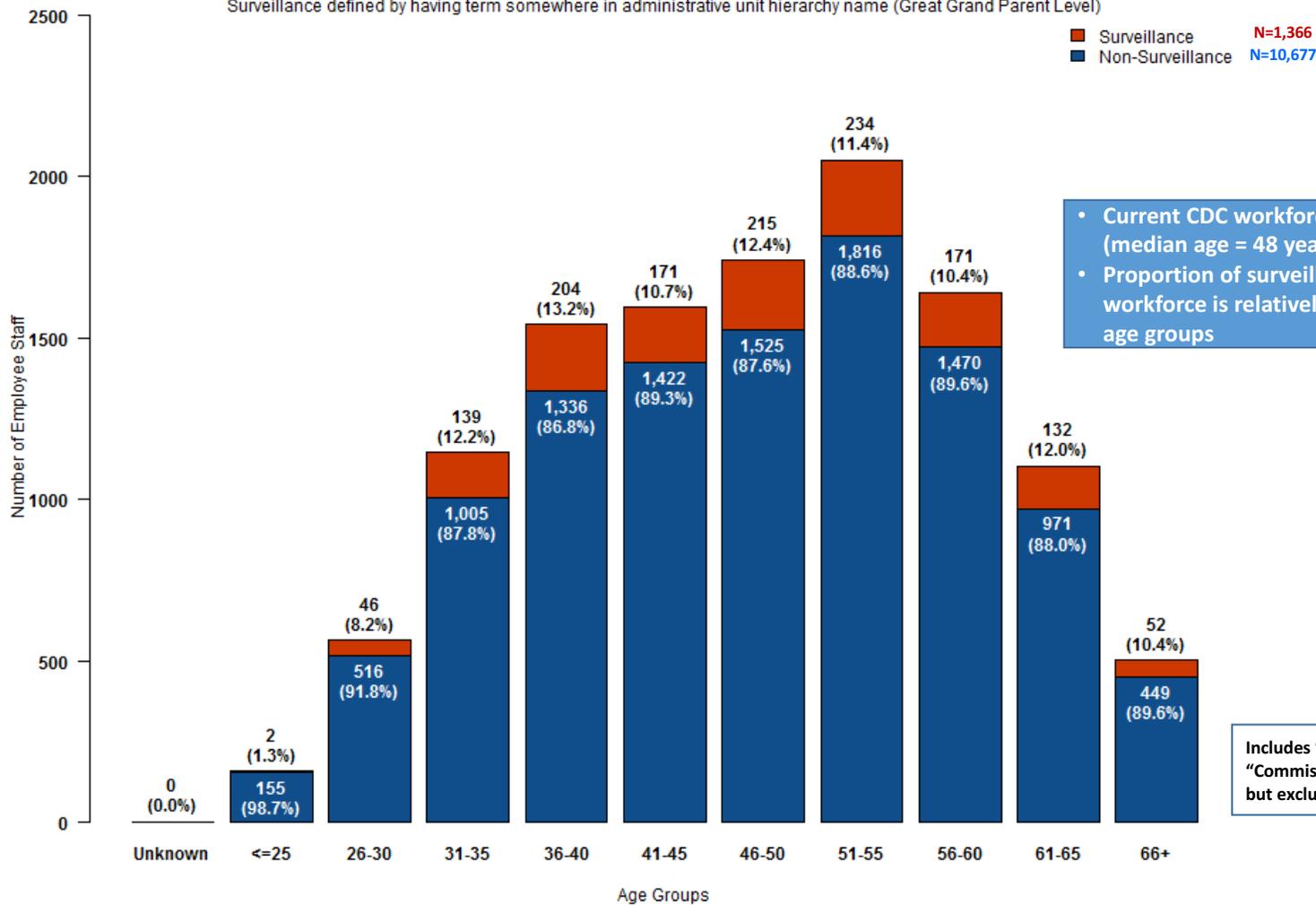
- 11% of CDC current workforce is eligible to retire now, and another 35% will be eligible to retire within 10 years
- Proportion of surveillance-related workforce is relatively uniform across eligibility groups

Includes only career/conditional Civil Service and Commissioned Corps employees.

Preliminary Results

CDC Current Surveillance and Non-Surveillance Employee Workforce by Age Groups

Surveillance defined by having term somewhere in administrative unit hierarchy name (Great Grand Parent Level)



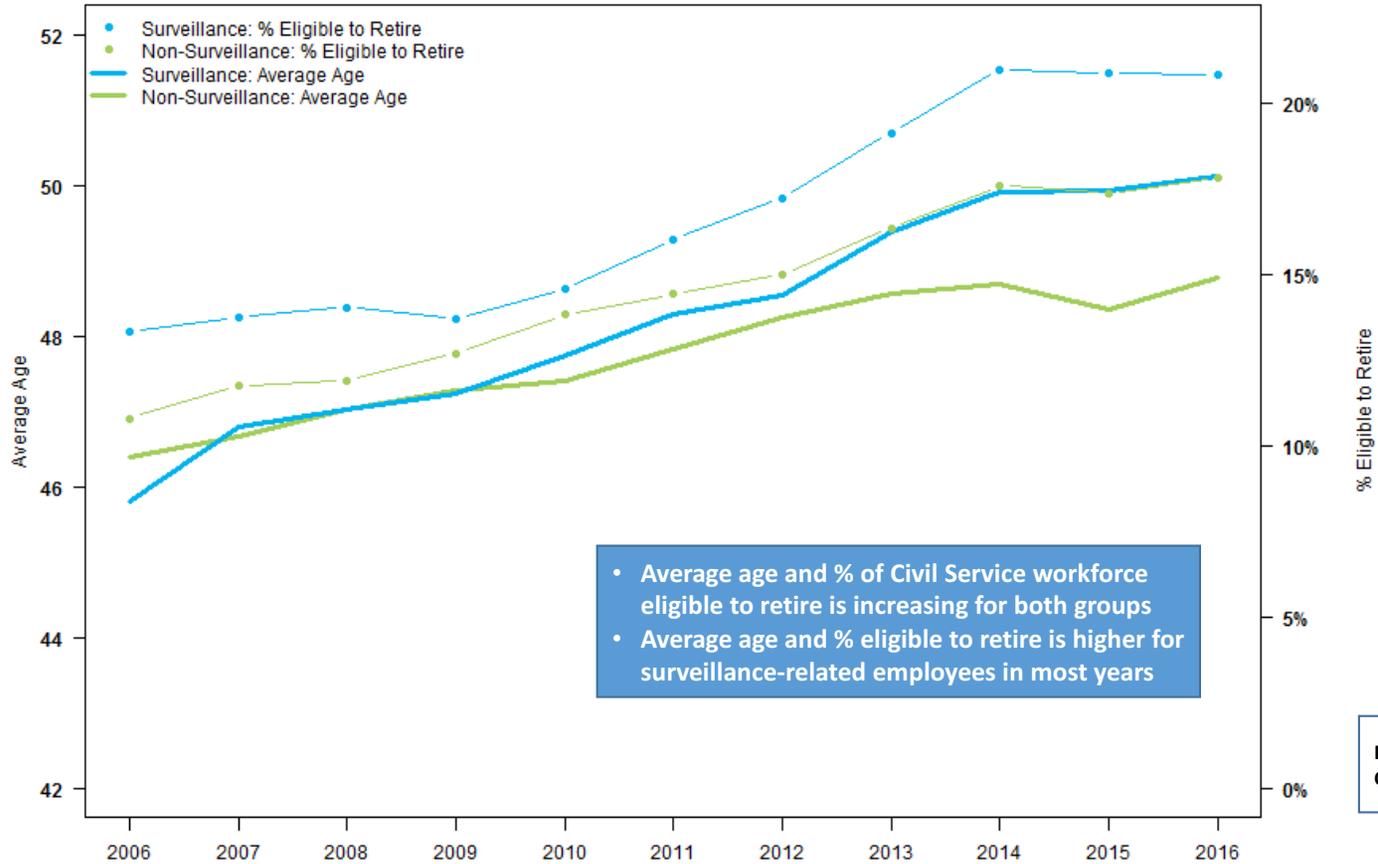
- Current CDC workforce is relatively old (median age = 48 years)
- Proportion of surveillance-related workforce is relatively uniform across age groups

Includes "Civil Service" and "Commissioned Corps" employees but excludes "Other Employees."

Preliminary Results

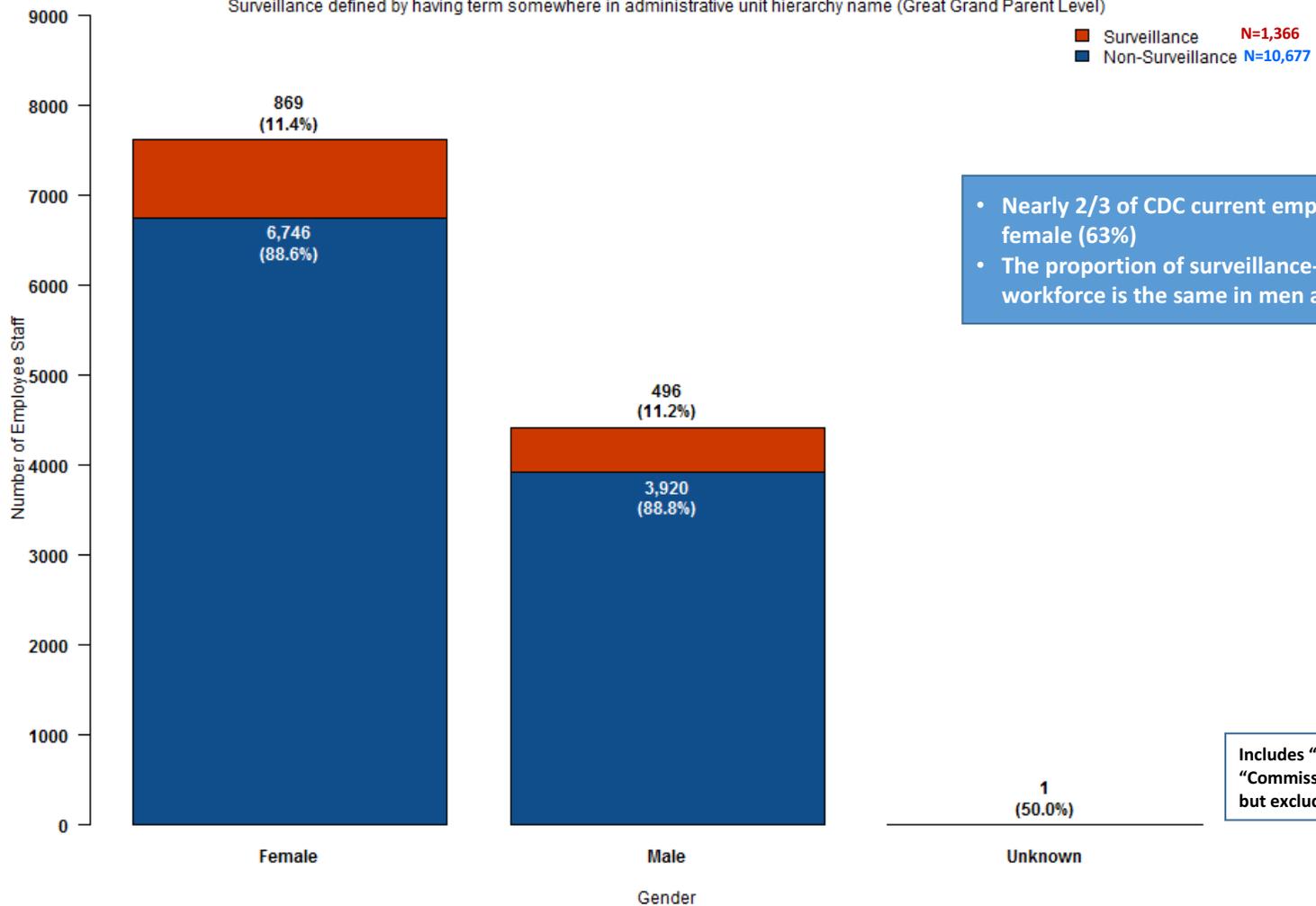
Average Age and Percent Eligible to Retire of CDC Civil Service Employees

Surveillance defined by having term somewhere in administrative unit hierarchy name (Great Grand Parent Level)



CDC Current Surveillance and Non-Surveillance Employee Workforce by Gender

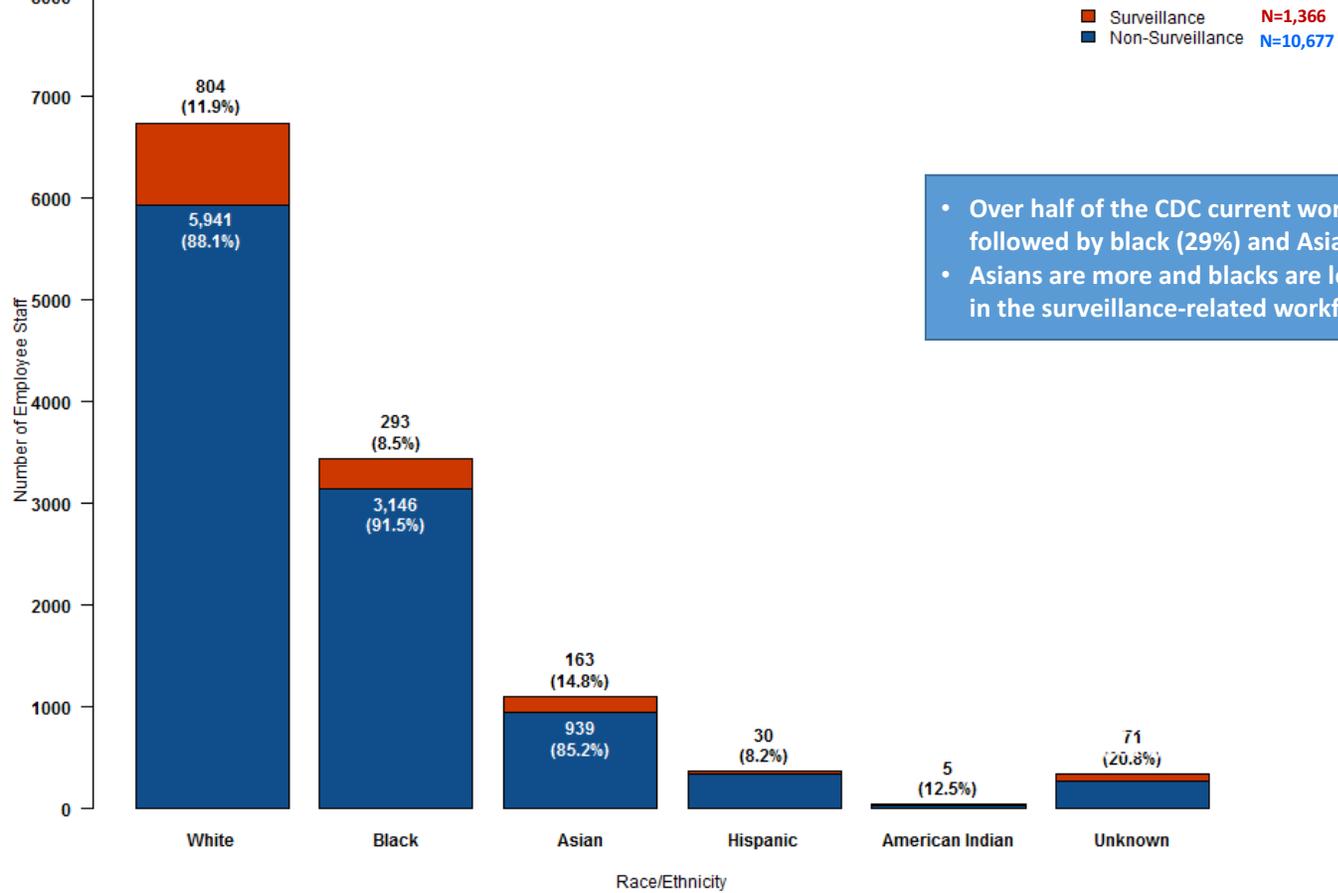
Surveillance defined by having term somewhere in administrative unit hierarchy name (Great Grand Parent Level)



- Nearly 2/3 of CDC current employees are female (63%)
- The proportion of surveillance-related workforce is the same in men and women

CDC Current Surveillance and Non-Surveillance Employee Workforce by Race/Ethnicity

Surveillance defined by having term somewhere in administrative unit hierarchy name (Great Grand Parent Level)

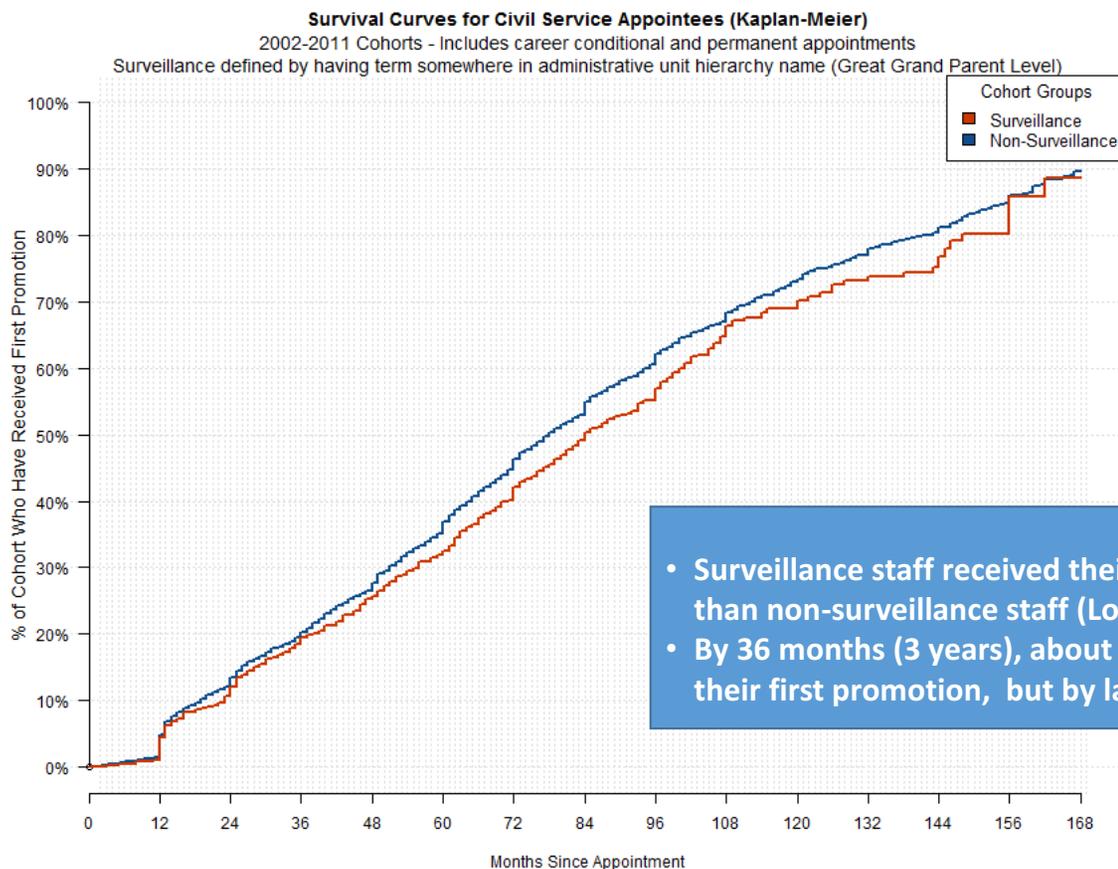


- Over half of the CDC current workforce is white (56%), followed by black (29%) and Asian (9%)
- Asians are more and blacks are less highly represented in the surveillance-related workforce than whites

Includes "Civil Service" and "Commissioned Corps" employees but excludes "Other Employees."

Preliminary Results

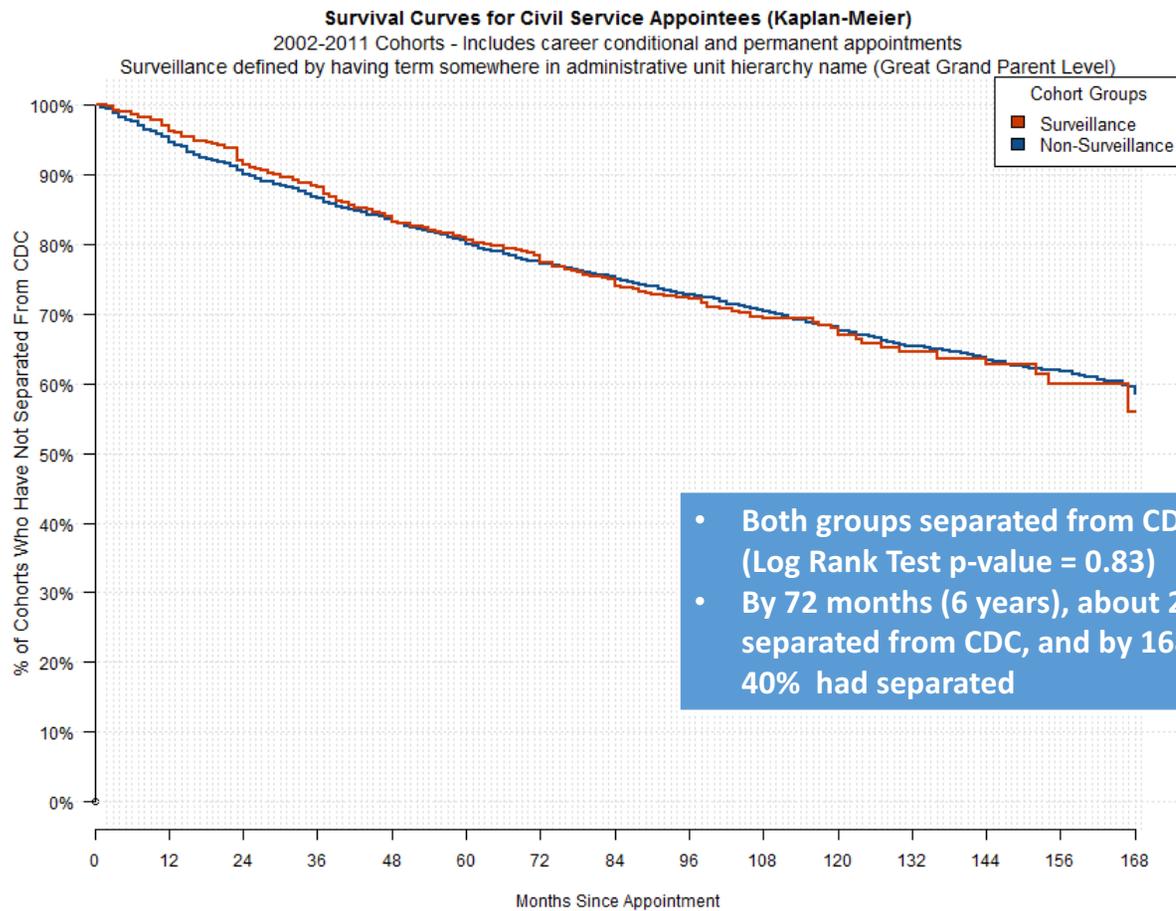
Time to First Promotion for CDC Career/Conditional Civil Service Appointees, by Surveillance Status



- Surveillance staff received their first promotion at a later time than non-surveillance staff (Log Rank Test p-value = 0.03)
- By 36 months (3 years), about 20% of both groups had received their first promotion, but by later years the rates diverged

Preliminary Results

Time to Separation from CDC for Civil Service Career/Conditional Appointees, By Surveillance Status



Preliminary Results

Study Limitations and Challenges

- Data quality issues
 - Inaccurate or missing data, and conflicting data across administrative databases posed challenges
- Potential misclassification of surveillance-related systems and staff, e.g.,
 - Some CIOs interpreted “surveillance” definition differently, leading to inconsistent classification of systems to surveillance (e.g., disease registries)
 - Administrative units working on surveillance did not always have “surveillance” in name, and some staff employed by units with “surveillance” in name were not engaged in surveillance
- Lack of historical data on Commissioned Corps employees and contractors limits the ability to evaluate total contribution of CDC staff to surveillance, e.g.,
 - Can’t fully evaluate Commissioned Corps staff who retire and return to CDC as Civil Service employees or contractors, and Civil Service who staff retire and return as contractors

Conclusions and Lessons Learned

- Analysis of administrative data proved highly useful to generate baseline profile of CDC's surveillance-related programs and workforce
 - With creativity and methodological rigor, can answer questions beyond the purpose of original data collection
 - Is overall cheaper, faster, and less burdensome than alternatives (e.g., surveys)
 - Requires initial time investment to learn business processes that produced the data (e.g., HR policies and codes)
 - Is improved by SME vetting

Next Steps

- Consider alternative methods for identifying surveillance-related staff (e.g., based on occupational series, job title, educational attainment and/or degree discipline)
- Try to obtain historical data on CDC Commissioned Corps employees and contractors
- Complete analyses including applying multivariate analyses and advanced statistical methods (e.g., Cox proportional hazards models, random forest classification, natural language processing topic modeling)
- Continue to vet results with CDC subject matter experts to finalize results
- Disseminate results to CDC leadership to inform policy decisions and workforce planning around surveillance, and share with broader audience via peer reviewed publication(s)
- Repeat baseline evaluation at regular intervals to track progress on CDC Surveillance Strategy

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Note: The findings and conclusions in this presentation are those of the authors and do not necessarily represent the official position of CDC.