IIS Denominator De-Inflation

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Why IIS Denominators Matter

- IIS data drives vaccination coverage estimates
- Coverage informs public health planning and resource allocation
- Inflated denominators lead to underestimated coverage
- Accurate denominators are essential!

Prior Approach & Motivation

- How were denominators defined previously?
- Public reporting:
  - Census-based denominators (Decennial Census / ACS)
- Internal analyses:
  - Varied by:
    - Program area
    - Vaccine type
    - Analytic intent
  - No standardized approach

Why change?

- Lack of consistency across analyses
- Census ≠ IIS population
- Opportunity to better leverage a mature IIS
- Need for a standardized, IIS-based denominator

What Causes IIS Inflation in Philadelphia?

- Patient mobility across jurisdictions
- Regional healthcare utilization
- Long-term record retention
- Inactive records
- Large post-secondary population

IIS active population (March 2026)	Census population (July 2024)
Over 3.4 million	Over 1.5 million

Why Not Use Census Data?

- Decennial Census & ACS:
  - Strong population estimates
  - But not IIS-linked
- Methodological differences
- Overestimation in older populations
- Not directly usable as IIS denominator

ACS Data vs. Census Data

The American Community Survey
How is the American Community Survey Different from a Census?

	ACS	Census
Purpose	Sample estimates	Official counts
Collects	Detailed social, economic, housing, and demographic characteristics	Basic demographics
Produces	Population and housing characteristics	Population and housing totals
New Data Every	Year	10 years
Data Reflect	Period of time	Point in time

United States Census Bureau

Objective

- Develop a method to identify active Philadelphia residents within the IIS to improve denominator accuracy.
- Shift from:
  - “Who exists in the IIS?”
- To:
  - “Who is active and currently residing in our jurisdiction in the IIS?”

Candidate Definitions

- Address only
  - Most recent address-> Philadelphia address
- Address + recency
  - Philadelphia address
  - Recent activity in IIS (5 years)
- Address + dose count
  - Philadelphia address
  - Minimum number of documented vaccinations (2)
- Combined approaches
  - Address + dose count + recency

- Metadata Field Limitations
  - Address update date → unreliable
  - Audit date → system-driven, not patient-driven

Candidate Definitions: Break-Down

Approach	IIS Count	Census Count	Percent of Census	Difference from Census
Address only	2,391,070	1,573,916	152%	817,154
Address + recency	1,732,782	1,573,916	110%	158,866
Address + dose count	1,905,160	1,573,916	121%	331,244
Combined approaches	1,465,373	1,573,916	93%	-108,543

Source: U.S. Census Bureau, 2020 Decennial Census; American Community Survey 5-Year Estimates.

Informed by Best Practices

- Patient status guidance supports defining “active” populations
- No universal time threshold defined
- Jurisdictions determine their own criteria

- BR415:

“No activity for extended period of time” → classify as unknown/inactive

Source: AIRA MIROW, *Management of Patient Status in IIS*, v6.1 (2020), BR415

Why 5 Years?

- Balances capturing true residents and avoiding outdated records
- Includes adolescents and adults with routine care
- Shorter windows (e.g., 1–3 years): excluded too many adolescents and adults under 65
- Longer windows (e.g., 7–10 years): retained too many outdated or inactive records
- 5 years optimized coverage across age groups

Approach 1. Most recent address and dose count

Approach 1.	Age Group	IIS Count	SEERS Census Count	Difference from Census
Address + dose count (2)	6 months- 4 years	79,906	80,937	-1,031
	5-11 years	143,924	127,376	16,548
	12-17 years	158,769	106,569	52,200
	18-64 years	1,197,593	990,667	206,926
	65+ years	285,365	235,398	49,967
Address + dose count (3)	18-64 years	997,530	990,667	6,863
	65+ years	249,897	235,398	14,499

Source: Surveillance, Epidemiology, and End Results Program (SEER), 2023 population estimates (U.S. Census Bureau)

Approach 2. Most recent address, dose count, and recency

Approach 2.	Age Group	IIS Count	SEERS Census Count	Difference from Census
Address + dose count (2) + recency (1 dose in last 5 years)	6 months- 4 years	79,906	80,937	-1,031
	5-11 years	113,350	127,376	-14,026
	12-17 years	115,380	106,569	8,811
	18-64 years	882,699	990,667	-107,968
	65+ years	244,155	235,398	8,757
Address + dose count (3) + recency (1 dose in last 5 years)	18-64 years	623,875	990,667	-366,762
	65+ years	211,006	235,398	-24,392

Source: Surveillance, Epidemiology, and End Results Program (SEER), 2023 population estimates (U.S. Census Bureau)

Population Comparison (cont.)

		Approach 1: Address + Dose Count	Approach 2: Address + Dose Count + Recency
Age Group	Dose Count	Difference from Census	Difference % from Census
6 months- 4 years	2	-1,031	-1,031
5-11 years	2	16,548	-14,026
12-17 years	2	52,200	8,811
18-64 years	2	206,926	-107,968
65+ years	2	49,967	8,757
18-64 years	3	6,863	-366,762
65+ years	3	14,499	-24,392

Final Definition

Active Resident =

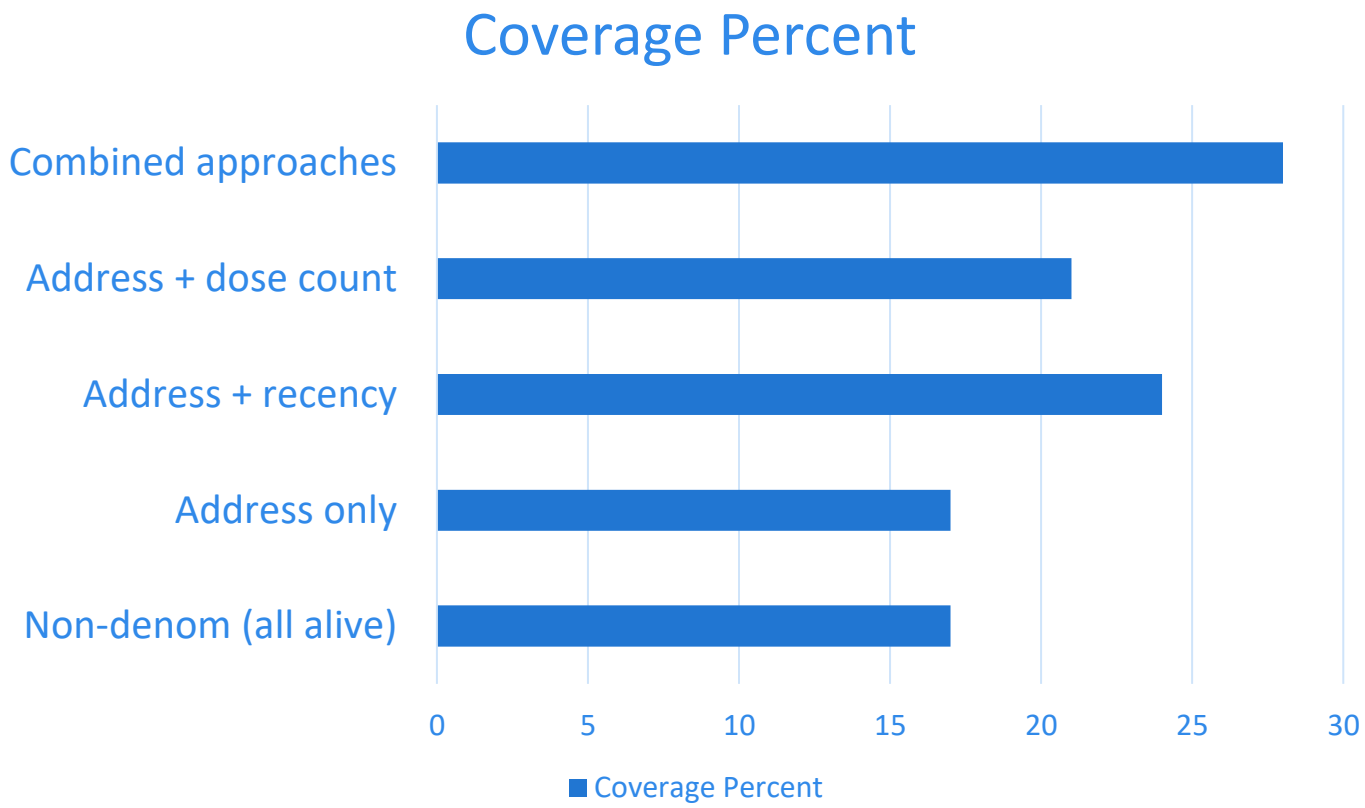
- Philadelphia address
- ≥2 documented vaccinations
- ≥1 vaccination within past 5 years

Season of interest	Dates for season of interest	At least one dose needs to be administered after:
Respiratory season 2024-2025	August 1, 2024 to March 31, 2025	December 31, 2020

Impact on Coverage

- Illustrative comparison of coverage estimates
- Inflated denominator → artificially low coverage
- Refined denominator → more accurate coverage estimate
- Difference is meaningful at the program and public health planning level

*Percentages reflect relative coverage among the selected denominator; absolute city counts are withheld for privacy.



Interpretation

- Aligns numerator and denominator within IIS
- Reduces bias from population inflation
- Produces more valid and stable coverage estimates
- Supports more accurate trend analysis over time

Limitations

- Does not capture unvaccinated individuals
- May overrepresent healthcare-engaged populations
- Potential misclassification of residents
- Dependent on IIS data completeness and quality
- Cross-jurisdictional reporting variability

COVID Limitations

- COVID-era records introduced a distinct inflation risk
  - Mass vaccination events added records with temporary or student addresses
  - Many individuals have COVID-only vaccination histories with no ongoing IIS engagement
  - Recency alone would retain these records; dose count + address criteria help mitigate this

Public Health Implications

- Improves accuracy of vaccination coverage estimates
- Enables better targeting of public health interventions
- Supports more informed public health planning and funding decisions
- Provides a scalable framework for other IIS jurisdictions

Conclusion

- IIS inflation is a measurable issue
- Rule-based definition improves accuracy
- Practical & reproducible approach

Future Directions

- Incorporate additional data sources (e.g., EHR, vital records)
- Explore methods to identify unvaccinated populations
- Evaluate and refine recency thresholds over time
- Refine dose count for children under age 13

Resources

- Population Data:
  - Surveillance, Epidemiology, and End Results Program (SEER), 2023 population estimates (U.S. Census Bureau)
  - U.S. Census Bureau, 2020 Decennial Census; American Community Survey 5-Year Estimates
- IIS Guidance & Best Practices:
  - Patient Status in Immunization Information Systems – https://repository.immregistries.org/resource/management-of-patient-status-in-immunization-information-systems/
  - Management of Patient Status in IIS (AIRA MIROW v6.1, 2020, BR415) – https://repository.immregistries.org/files/resources/5cf691f15b26e/aira_mirow_mgmt_of_patient_status_in_iis_-_6_1_2020.pdf
  - Comparing & Communicating Vaccination Coverage Estimates from IIS & NIS – https://repository.immregistries.org/resource/comparing-communicating-vaccination-coverage-estimates-from-iis-nis/
  - NCIRD CoAg Kickoff: School Vaccination Assessment – Proposed Best Practices for Handling Denominator Inflation

Thank you!

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