Spatial variation along the HIV care continuum in Washington, DC 2014-2015

Arpi S Terzian[1], Naji Younes[1], Jenevieve Opoku[2], Johnathan Hubbard[1], Rena R Jones[3], Princy Kumar[4] and Amanda D Castel[1] on Behalf of the DC Cohort Executive Committee

[1]George Washington University Milken Institute School of Public Health; [2]DC Department of Health; [3]Occupational & Environmental Epidemiology Branch, Division of Cancer Epidemiology & Genetics, National Cancer Institute; [4]Georgetown University School of Medicine

Poster #905

BACKGROUND

- Neighborhood-level features such as transportation access, HIV & socioeconomic characteristics have been found to influence one's ability to engage & remain in HIV care.

OBJECTIVES

- To identify ZIP codes that cluster spatially with respect to three HIV care outcomes: retention-in-care (RIC), prescribed antiretroviral therapy ('on ART'), & viral suppression (VS)
- To describe person-level & neighborhood-level factors associated with residing in a cluster.

METHODS

Study design, eligibility criteria and data sources

- The DC Cohort, an observational cohort study of HIV-infected persons in care at 13 participating clinical sites throughout Washington, DC.
- Included participants enrolled from 1/2011 to 6/2015 with ≥ 1 year of follow-up; excluded those who withdrew, not seen in 18 months, had missing ZIP of current residence, resided outside DC or in ZIP with <5 participants.
- Data sources include the DC DOH, WMATA, US Census, ACS & AIDSVu (an online mapping resource; www.aidsvu.org).

Primary outcomes

- RIC, 'on ART', VS were based on nested outcomes along the HIV care cascade & aggregated to the ZIP level, using participant data collected from 6/2014 to 6/2015.
  - ➢ RIC: ≥2 visits and/or labs ≥90 days apart in a 12 month period.
  - ➢ 'On ART': Prescribed ART among retained.
  - ➢ VS: Last VL lab result <200 copies/ml among retained & 'on ART.'

Analysis

- Generated choropleth maps and computed spatial statistics.
- Conducted hot spot analysis using Gi*statistic to determine whether ZIPs with either high or low values cluster spatially.
  - ➢ ZIPs with high proportion of RIC or VS mapped in red ('Hot spots').
  - ➢ ZIPs with low proportion of RIC or VS mapped in blue ('Cold spots').
- Computed descriptive statistics by hot spot status.

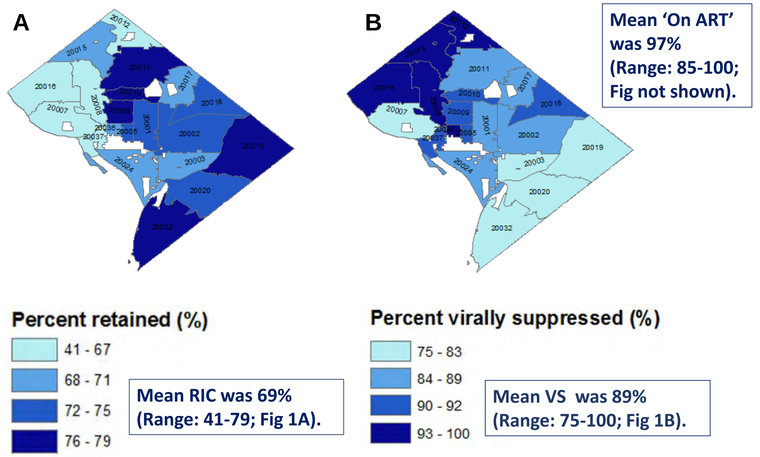
RESULTS

Table 1. ZIP code-level HIV, transportation & socioeconomic characteristics among ZIPs in retention-in-care (RIC) cold spot, viral suppression (VS) cold spot & VS hot spot in Washington, DC 2014-2015 (N=20 ZIPs)

ZIP-level features	Summary statistic	Overall	ZIPs in RIC cold spot		ZIPs in VS cold spot		ZIPs in VS hot spot	
			Yes	No	Yes	No	Yes	No
Total ZIPs	N	20	2	18	3	17	2	18
Total participants	N	3,623	45	3,578	1,138	2,485	50	3,573
HIV-related								
5-Year cumulative new dx[1]	Mean (SD)	272.3 (109.7)	**20.0**	162.7	**275.0**	126.1	**17.5**	163.0
HIV prevalence per 100K[2]	Mean (Med)	1,867.3 (1,945.5)	**872.3**	1,977.9	**2,614.6**	1,735.4	**857.5**	1,979.5
Retention %	Mean (SD)	68.8 (8.8)	**64.4**	73.3	**74.1**	72.8	**64.0**	73.3
On ART %	Mean (SD)	96.7 (3.6)	100	96.8	96.2	97.2	100	96.8
Viral suppression %	Mean (SD)	88.7 (7.3)	**92.9**	84.6	**81.6**	86.1	**96.8**	84.6
Transportation-related								
Public transit density per 1K	Mean (Med)	5.6 (5.6)	**6.1**	5.5	**4.9**	5.7	**6.2**	5.5
-Bus stop density	Mean (Med)	5.5 (5.5)	6.0	5.5	4.9	5.6	6.0	5.5
-Metro stop density	Mean (Med)	0.1 (0.1)	0.2	0.08	0.1	0.09	0.2	0.08
Car ownership %	Mean (Med)	64.2 (62.3)	**58.0**	64.9	**65.4**	64.0	**60.6**	64.6
Socioeconomic-related								
Gini coefficient[3]	0-1 scale	0.49	0.48	0.49	0.48	0.49	0.48	0.49
NH Black %	Mean	42.7 (33.2)	**3.5**	47.0	**61.5**	39.3	**4.8**	46.9
At least HS education %	Mean	90.0 (6.3)	**98.9**	89.1	**86.1**	90.7	**97.8**	89.2
Living in poverty %	Mean	16.6 (8.6)	**10.6**	17.3	**20.6**	15.9	**10.5**	17.3
Household income in $10K	Med	77 (31)	**93**	75	**69**	79	**99**	75
Housing status								
-Occupied %	Mean	90.3	91.6	90.1	88.1	90.7	91.7	90.1
-Owned %	Mean	43.9	41.7	44.1	42.4	44.2	48.4	43.4
-Vacant %	Mean	9.7	**8.5**	9.9	**11.9**	9.3	**8.3**	9.9

[1]5-year cumulative new diagnoses obtained from AIDSVu & reflect persons newly diagnosed with HIV or infection ever classified as stage 3 (AIDS) from Jan 2010 to Dec 2014. [2]HIV prevalence obtained from the DC DOH. [3]Index based on residents' net income with 0 representing perfect equality and 1 representing perfect inequality.
Note: Med=Median; SD=Standard Deviation. P-values not computed because of small cell sizes at the ZIP code level. Numbers in bold denote qualitative differences across cluster status.

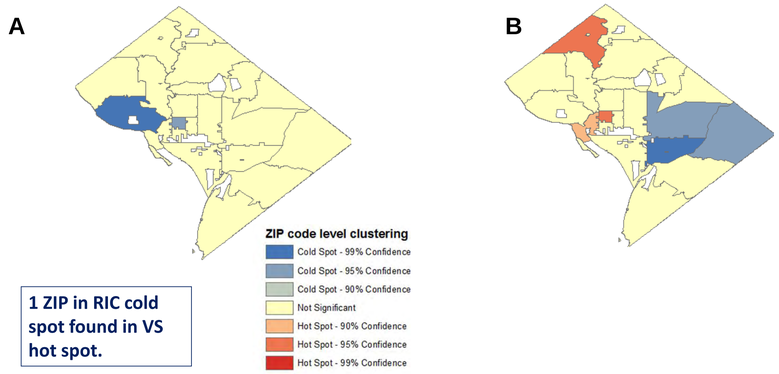
Figure 1. Retention-in-care (RIC) & viral suppression (VS) by ZIP code of current residence in Washington, DC 2014-2015.[1] A, RIC % (Quartiles). B, VS% (Quartiles).



[1]Polygons in white represent non-residential ZIPs or suppressed ZIPs with <5 participants.

RESULTS

Figure 2. Retention-in-care (RIC) & viral suppression (VS) clusters in Washington, DC 2014-2015.[1] A, Cold spots of low RIC. B, Hot and cold spots of VS.



[1]Polygons in white represent non-residential ZIPs or suppressed ZIPs with <5 participants.

- 75% of The DC Cohort live in DC, representing 35% of all DC residents with HIV.
- 3,623 participants resided in 20 out of 31 eligible ZIP codes (65%), representing 78% of all Cohort participants who live in DC.
- Observed high proportions of ZIP code-level RIC, 'on ART' & VS.
- Identified RIC cold spots in West & VS hot & cold spots in NW & SE (Fig 2).
- No identified hot or cold spots for 'On ART' (Data not shown).
- At the individual-level, those with RIC were more likely to be older, black, MSM & publicly insured compared to those with VS (Data not shown).
- A the neighborhood-level, RIC cold spots looked similar to VS hot spots; both differed from VS cold spots (See numbers in bold in Table 1).
  - ➢ Higher density of public transit, educational attainment & income.
  - ➢ Lower % car ownership, home vacancy, black, & lower HIV burden.

DISCUSSION & CONCLUSIONS

- Individual-level & neighborhood-level features (transportation, HIV & socioeconomics) may be associated with spatial clusters of RIC & VS.
- RIC cold spots had high proportion of VS, perhaps representing those with well-controlled infection who require fewer visits. Finding is similar to results from spatial analyses of HIV care in Philadelphia.
- Spatial analyses may inform geographically targeted interventions to improve care outcomes for HIV-infected persons.

For additional information please contact: Arpi Terzian, PhD at aterzian@gwu.edu

Acknowledgements: This work was supported by the National Institute of Allergy and Infectious Diseases at the National Institutes of Health under Grant UO1 AI69503-03S2. Data in this manuscript were collected by the DC Cohort investigators and research staff located at: Cerner Corporation (Jeffrey Binkley, Harlen Hays, Thila Subramanian, Qingjiang Hou, Rachel Hart, Nabil Rayeed and Rob Taylor); Children's National Medical Center Adolescent (Lawrence D'Angelo) and Pediatric (Natella Rakhmanina) clinics; The Senior Deputy Director of the DC Department of Health HAHSTA (Michael Kharfen); Family and Medical Counseling Service (Angela Wood); Georgetown University (Princy Kumar); George Washington Medical Faculty Associates (David Parenti); George Washington University Department of Epidemiology and Biostatistics (Lindsey Powers Happ, Maria Jaurretche and Brittany Lewis); Howard University (Saumil Doshi); La Clinica Del Pueblo (Ricardo Fernandez); MetroHealth (Annick Hebou); Providence Hospital (Jose Bordon); National Institutes of Health (Carl Dieffenbach); Unity Health Care (Gebeyehu Teferi); Veterans Affairs Medical Center (Debra Benator); Washington Hospital Center (Maria Elena Ruiz); Whitman-Walker Health (David Hardy); Kaiser Permanente (Michael Horberg). We would also like to acknowledge the Research Assistants at all of the participating sites, the DC Cohort Community Advisory Board and the DC Cohort participants.