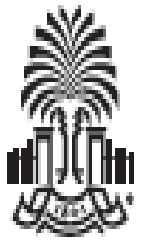


UNIVERSITY OF SOUTH CAROLINA
School of Medicine

PALMETTO HEALTH

Using Big Data to Make Precision Public Health Interventions
Missed Opportunities and Ending the HIV Epidemic in South Carolina

Disclosures, Disclaimer

- I have no financial disclosure

Ending the HIV Epidemic

- Effective tools
  - Treatment as Prevention (TasP):
    - Persons who are aware of their HIV infection and maintain a suppressed viral load have effectively no risk of sexually transmitting the virus to HIV-negative partners
  - Pre-exposure Prophylaxis (PrEP)
    - Daily pill of tenofovir and emtricitabine (Truvada® or Descovy ®) >90% effective in preventing HIV acquisition

Ending the HIV Epidemic: A Plan for America

- The goal is to reduce new infections by at least 90% by 2030
- Targets to reach that goal:
  - 95% of persons living with HIV diagnosed
  - 95% of those diagnosed virally suppressed
  - 50% of persons with PrEP indications being on PrEP

https://www.cdc.gov/mmwr/volumes/68/wr/mm6848e1.htm?s_cid=mm6848e1_w

Ending the HIV Epidemic

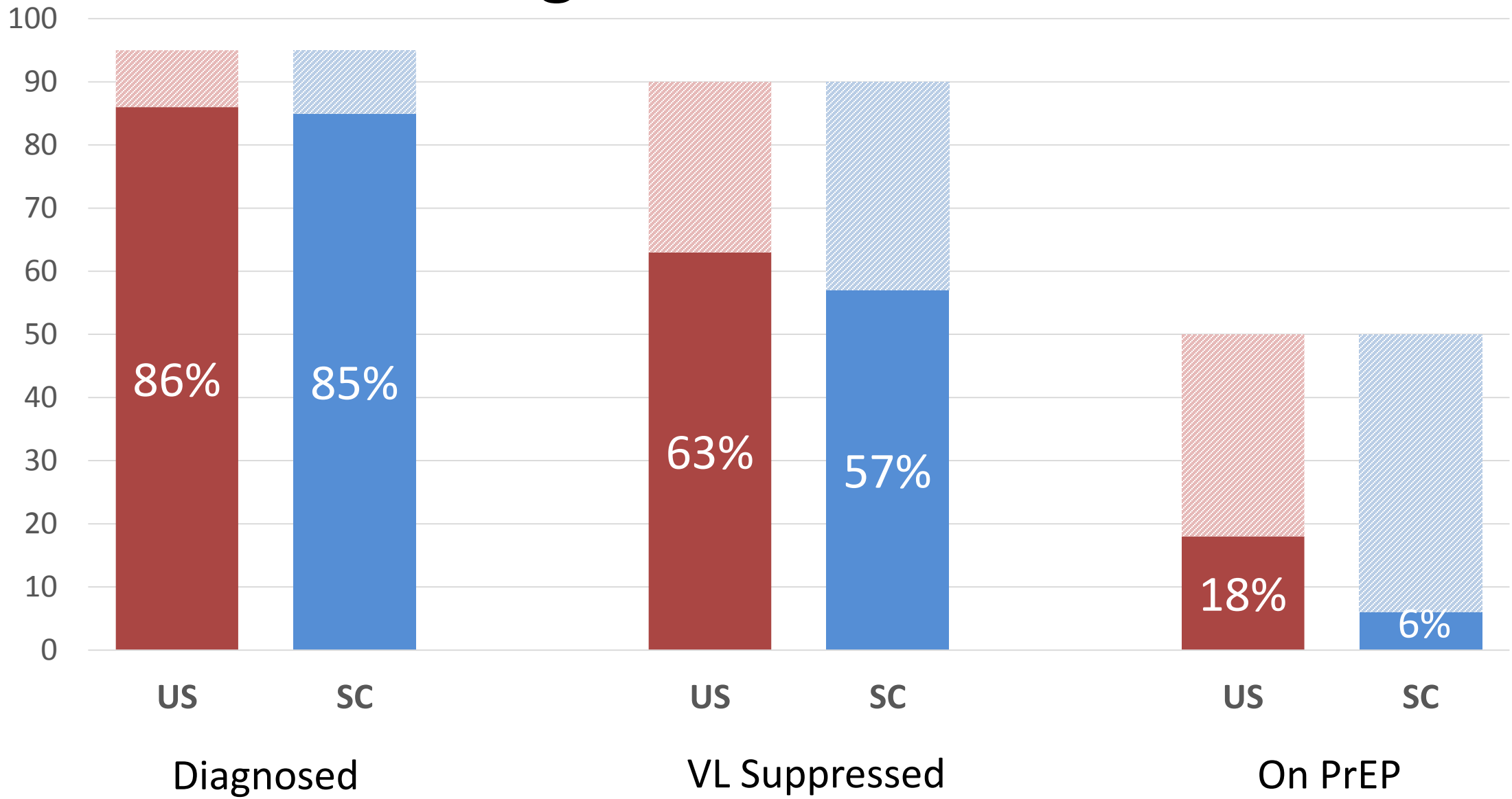
- In the US, 1.1 million People Living with HIV (PLWH)
  - 37,500 new infection in 2017
  - 63% of those who know of their HIV infection were virally suppressed
  - 18.1% with PrEP indications have been prescribed PrEP
- No declines in new infections despite effective tools to prevent and treat HIV infections

Department of Health and Human Services, Centers for Disease Control and Prevention. HIV in the United States and dependent areas. https://www.cdc.gov/hiv/statistics/overview/ataglance.html. Updated January 29, 2019. Accessed February 5, 2019.

Ending the HIV Epidemic

- South Carolina 2017: 19,719 living with diagnosed HIV
  - SC ranks in the top 10 for HIV prevalence and incidence
  - 750 new infections per year in SC
  - 57% of those who know of their HIV infection were virally suppressed
  - 901 PrEP users or ~6% those with PrEP indications
- No declines in new infections despite effective tools to prevent and treat HIV infections

ETE: Progress Towards Goals



Ending the HIV Epidemic

- Identifying people at risk for HIV acquisition and prescribing pre-exposure prophylaxis (PrEP) as well as early HIV diagnosis and treatment are essential for reducing the rates of new HIV infections and achieving the ending the epidemic goals

Objectives

1. To investigate the characteristics and proportion of newly diagnosed HIV-infected individuals in South Carolina (SC) who had visited a health care facility (HCF) prior to HIV diagnosed, to examine missed opportunities for early HIV testing and diagnosis: **Missed Diagnosis**
2. Second analysis, examined a subset of individuals who were likely **newly infected**, to examine missed opportunities for prescribing PrEP: **Missed PrEP**

Study Databases

- Linked SC enhanced HIV/AIDS Reporting System (eHARS) data to three external databases using a Unique Person Identifier and DOB, SSN, race/ethnicity
  - South Carolina Bureau of Laboratory
  - Sexually Transmitted Diseases Management Information System (STD*MIS)
  - SC Revenue and Fiscal Affairs Health Statistics

Study Databases

- **SC enhanced HIV/AIDS Reporting System (eHARS) data**
  - Confidential name-base HIV/AIDS reporting in 1986.
  - Since 2004, state law has required reporting of all CD4 counts and HIV viral loads (VL) to the SC DHEC which records all HIV case reports in eHARS.
  - Data quality 95% within 6 months of a diagnosis 98% complete reporting
- **South Carolina Bureau of Laboratory**
  - Sexually transmitted infection, and HIV laboratory results

Study Databases

- **Sexually Transmitted Diseases Management Information System (STD*MIS)**
  - Health care providers and laboratories reported syphilis, chlamydia, gonorrhea, chancroid, hepatitis
- **SC Revenue and Fiscal Affairs Health Statistics**
  - State law required reporting from all ED, hospital inpatient facilities, ambulatory care facilities, outpatient surgery facilities
  - Data collected includes ICD codes, admission dates, payment source, physician specialty code, location of the facility
  - 66 emergency departments, 64 inpatient, 156 ambulatory facilities

Data Linkage/Safety

- Data files were linked using patient name, DOB, gender, race/ethnicity, SSN (if available), and county of residence.
- Date 1st positive HIV test used to identify HCF encounters before HIV diagnosis
- Authorized persons trained in eHARS security guidelines and HIPAA confidentiality procedures linked the data
- Maintained in a secured, password protected, location
- Identifiers removed, only de-identified data provided to investigators

Study Design: Missed Diagnosis

- Population-based, retrospective study
- Included **all** newly diagnosed HIV-infections and >18 years, between January, 2013 – December, 2016
  - Late testers: initial CD4 <= 200
  - Non-Late testers: initial CD4 > 200
- Health care facility (HCF) visits from **2005** to date of HIV diagnosis
  - Late testers: HCF visits within 8 years of HIV diagnosis were included
  - Non-late testers: HCF within 3 years were included

Study Design: Missed PrEP

- Second analysis, “Missed PrEP”
- Included individuals with initial CD4 count ≥500 cells and ≥13 years, between 1/2013 – 12/2016
  - Recently infected individuals
- Health care facility (HCF) visits from 2011 to date of HIV diagnosis analyzed
  - After time of CDC interim PrEP guidance

Statistical Analysis

- Two-tailed chi-square statistics with a significant threshold of $p<0.05$ in SAS to investigate the association between missed opportunities and patient factors including demographics, behavioral risk, visit setting (IP, OP or ED), frequency of previous visits, and residence at diagnosis

- Multivariate logistic regression models to analyze factors associated with missed opportunities.

Variables

- Demographics (age, race, sex)
- Behavioral risk group: MSM or MSM/IDU [MSM] ; IDU, Heterosexual, No identified risk [NIR]
- Visit settings: Inpatient [IP], Outpatient [OP] or Emergency department [ED]
- Visit type: Trauma, urgent or elective
- Insurance: Self-pay [SP], Any Insurance [I]
- Frequency of healthcare visits
- Residence at diagnosis: urban or rural
- ICD-9 and ICD-10 codes
- Physician specialty

Overall Study Population

- 2693 individuals were newly diagnosed with HIV
  - 885 with initial CD4 ≥500 cells (PrEP eligible)
- 743 (27.6%) were late testers
- 78% male, 69% Black, 22% White, 44% <30 years, 59% MSM and 17% resided in rural areas

Health Care Visits Prior to HIV Diagnosis

Entire Cohort
2693 new HIV diagnosis in SC

Non-late Testers: 1950 (72.4%)
Late Testers: 743 (27.6%)

1978 (73.4%) visit HCF prior to HIV diagnosis

PrEP Eligible (CD4 >500): 885

582 (65%) visited HCF

Characteristic of Health Care Visits

	All New HIV Diagnosis	**PrEP Eligible**
Total Number Visits	12,243	4,029
Mean Number visit	6.2	6.9
Type of Visit, n (%)		
• Emergency	10,109 (82.57%)	3,102 (84%)
• Inpatient	990 (8.09%)	247 (6%)
• Outpatient	831 (6.79%)	280 (7%)
• Other visits	313 (2.55%)	111 (3%)

Baseline Characteristics of Late Testers versus Non-Late Testers

Characteristic	Late testers (N=743)	Non-Late testers (N=1950)	p-value
Age group, n (%)			<.0001
< 50 years	520 (70)	1649 (85)	
≥50 years	**223 (30)**	301 (15)	
Transmission risk, n (%)			<.0001
MSM	351(47)	**1243 (64)**	
Heterosexual	111 (15)	272 (14)	
NIR	**281 (38)**	435 (22)	
STI, n (%)			<.0001
No	**683 (92)**	1683 (86)	
Yes	60 (8)	267 (14)	
Missed Opportunity, n (%)			<.0001
No	120 (16)	595 (30)	
Yes	**623 (84)**	1355 (70)	

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No difference by sex, race, or rural/urban residence

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In multivariate analysis "Missed Opportunity" was greatest predictor of late diagnosis
aOR 2.82 (CI 2.83,3.57)

Predictors “Missed Opportunities”

	Unadjusted model		Adjusted model	
	Odds Ratio	95% CI	Odds Ratio	95% CI
Gender				
Female	1.00	–	1.00	–
Male	0.42	(0.33,0.54)	0.42	(0.31, 0.57)
Race				
White	1.00	–	1.00	–
Black	1.76	(1.44,2.15)	1.56	(1.25,1.95)
Hispanic	0.44	(0.31,0.63)	0.39	(0.26,0.57)
Age Category				
18-24	1.00	–	1.00	–
25-29	0.72	(0.55,0.94)	0.67	(0.51,0.89)
30-39	0.72	(0.55,0.93)	0.65	(0.49,0.87)
40-49	0.62	(0.47,0.81)	0.49	(0.36,0.66)
50+	0.75	(0.58,0.98)	0.54	(0.39,0.73)
STI				
No	1.00	–	1.00	–
Yes	1.59	(1.19,2.13)	1.58	(1.16,2.15)
Late Tester				
No	1.00	–	1.00	–
Yes	2.28	(1.83,2.83)	2.86	(2.26,3.61)

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Person with missed opportunities for HIV testing were more likely to be:

- Female
- Black race
- Younger
- Had a prior STI
- A late tester

PrEP Eligible: Predictors of Missed Opportunity

Characteristic	OR (95% CI)	aOR (95% CI)
Gender		
Male	*Ref*	*Ref*
Female	**2.75 (1.87, 4.06)**	**3.35 (2.04, 5.51)**
Race/Ethnicity		
White	*Ref*	*Ref*
Black	**1.83 (1.33, 2.53)**	**1.59 (1.12, 2.25)**
Hispanic/Latino	**0.26 (0.12, 0.52)**	**0.25 (0.12, 0.53)**
Age(Years)		
13-29	*Ref*	*Ref*
≥30	**0.59 (0.44, 0.79)**	**0.58 (0.42, 0.81)**
Transmission Risk Group		
MSM/MSM PWID	*Ref*	*Ref*
Heterosexual	**1.58 (1.01, 2.48)**	0.87 (0.48, 1.56)
PWID	0.89 (0.40, 2.01)	0.77 (0.30, 1.96)
NIR	1.15 (0.82, 1.59)	0.83 (0.55, 1.27)
Residence HIV diagnosis		
Urban	*Ref*	*Ref*
Rural	0.85 (0.62, 1.18)	0.86 (0.61, 1.22)

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- Female,
- Black race
- Younger than 30 years

Hispanics were less likely to have had a prior HCF

PrEP Eligible: Insurance Coverage and Prior STI

- 54% of the 4,028 visits were covered by insurance
  - 33% Medicaid or Medicare
  - 18% Commercial insurance
  - 3% Other government insurance
- 45% Self-pay or Indigent/Charitable pay

- 25% had a diagnosis of STI prior to HIV diagnosis

Limitations

- Retrospective analysis based on surveillance data
- Missing data from some HCF visit
- No data on PrEP prescription or prior HIV testing
- No documentation that PrEP was offered but refused or the individual was prescribed PrEP but was non-adherent
- Possible some individuals already were HIV infected during prior visit

Summary of Missed Opportunities

- 27% were late HIV diagnosis (CD4 <200)
- Prior HCF visits was the biggest predictor of a late HIV diagnosis
    - **Missed Opportunity for HIV testing**
- Female, Black race, younger age and STI were more likely to have prior HCF visits
- Where as men, Hispanic ethnicity and older age were less likely to have visited a HCF prior to HIV diagnosis

PrEP Eligible Cohort

- Person with missed opportunities for PrEP were more likely to be female, Black race and younger than 30 years
- Hispanics were less likely to have had a prior HCF
- 25% of the PrEP Eligbile Cohort had and STI diagnosis prior to HIV diagnosis

Summary

- Nearly 2/3rd PrEP eligble cohort had visited a HCF prior to their HIV diagnosis
  - Presumably prior to HIV infection
  - Represent missed opportunities for PrEP prescribing
- Similarly, >2/3 total cohort had had visited a HCF prior to their HIV diagnosis
  - Missed opportunities for early HIV diagnsosis
- Over 80% of missed opportunities occurred in the ED

Putting Data Into Action

- Given the high rates of "missed opportunities" in the ED we leveraged this data to introduce several new initiatives
  - Outreach to the ED to increase risk-based, clinical HIV testing
    - STI or STI encounters, IVDU, clinical indications
  - Protocol for all positive HIV results to be reported directly to HIV service
  - Rapid HIV engagement contact team
    - Rapid engagement team to contact patient to provide test results and linkage to care

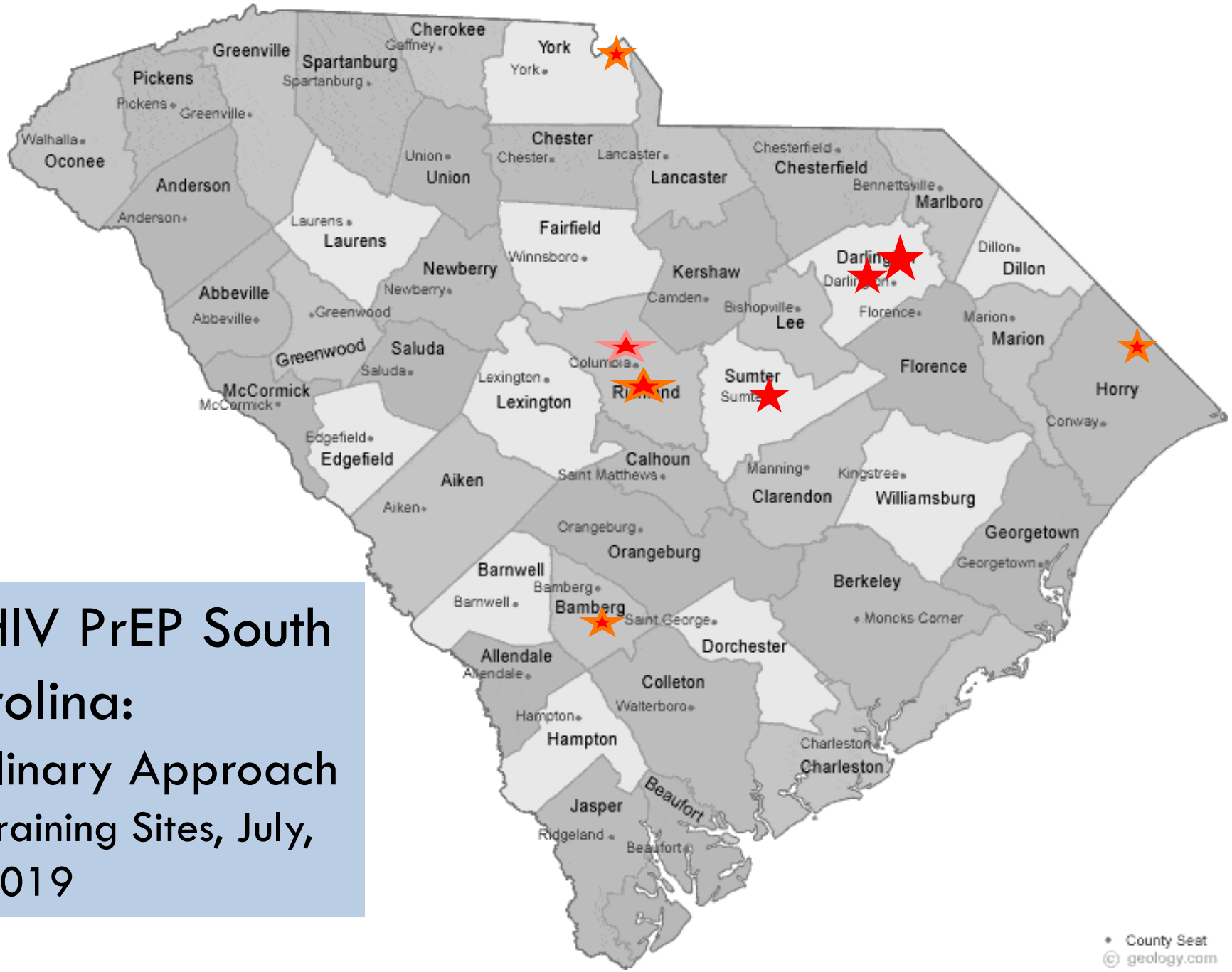
Putting Data Into Action

- Piloted HIV tester and PrEP navigator in rural ED
  - Opt-out HIV testing
  - Linkage to care or PrEP
  - Expanding to several other rural ED
- Initiated a comprehensive PrEP education program
  - Monthly, tele-Health PrEP education
  - Mini-PrEP symposium
  - On site PrEP training, “PrEP detailing”
  - Developed PrEP provider toolkit tailored to the needs of SC providers

Increasing HIV PrEP South Carolina:

An Interdisciplinary Approach

On Site PrEP Training Sites, July, 2019



Future Directions

- Exploring avenues to reach populations who are not accessing HCF prior to HIV diagnosis
  - Hispanic
  - Older
- Using machine learner to make more precise and individual level predictions of missed opportunities

- Questions