Early Detection Of Alzheimer's Disease In The Military Population & Public Health Field Experience: HIV Prevention Using Pre-exposure Prophylaxis

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Early Detection Of Alzheimer's Disease In The Military Population

Outline

- Capstone project: Early Detection of Alzheimer's Disease in the Military Population
  - Background
  - DOD ADNI Description
  - Statistical Analysis
  - Results
  - Discussion

There are more than 5 million Americans living with Alzheimer’s disease (AD) and by 2050 it is estimated that this number will rise up to 16 million

-Alzheimer's Association

Background

- Alzheimer's disease (AD)- most common form of dementia
  - An irreversible and neurodegenerative disease
- Costs:
  - AD and other dementias will cost Americans 259 million dollars
  - Costs could rise as high as 1.1 trillion dollars by 2050
  - Most expensive disease in America
- Therefore, which specific group/population is being the most affected with AD?

Military Population

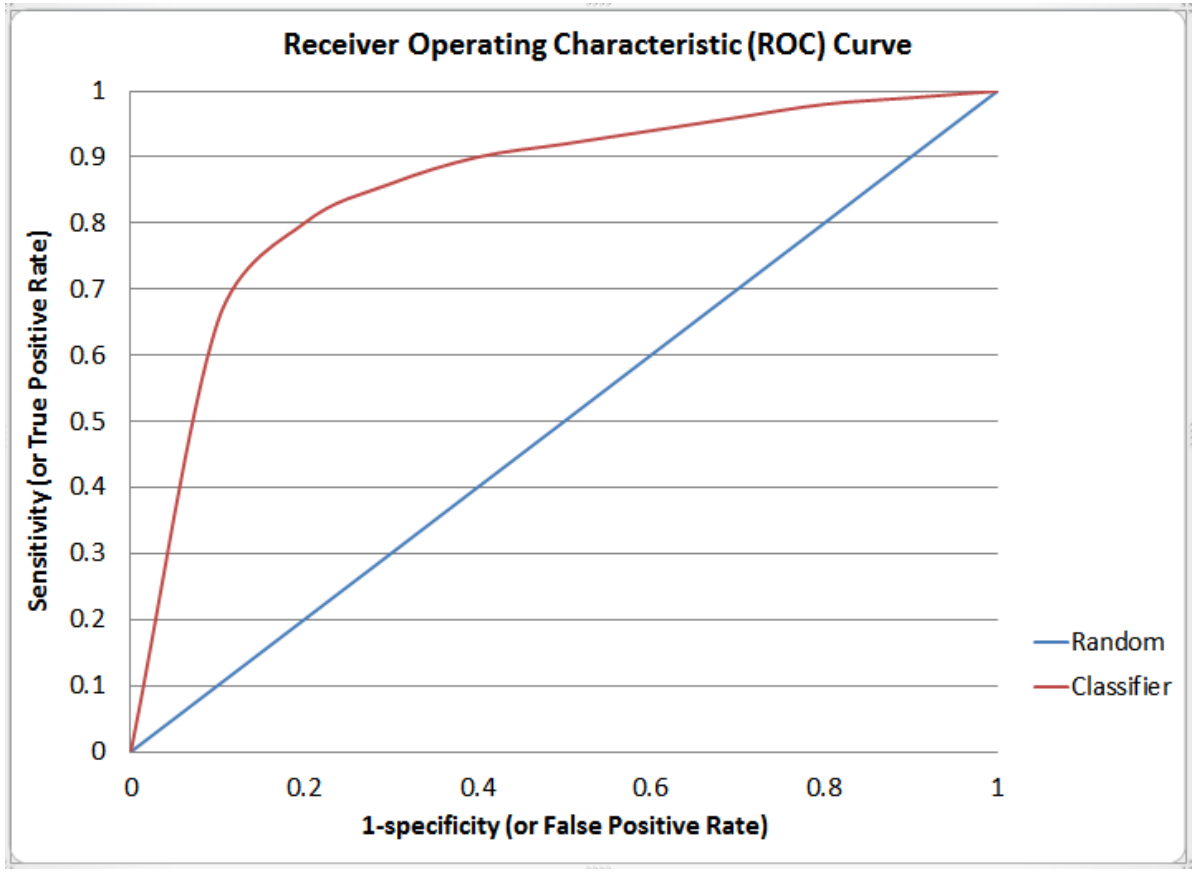
- One of the populations most affected with AD
- Subjected to the same risk factors as the general population for AD and other dementias
- Some of the potential military risk factors include:
  - Traumatic brain injury (TBI)
  - Post-traumatic stress disorder (PTSD)
  - Chemicals,
    - such as pesticides
  - Lifestyle
    - such as depression

Capstone Objective

- Use existing statistical classifications methods to be able to detect AD at an early stage
  - Su and Liu's combination methods based on AUC (area under the curve)
  - Stepwise method proposed by Kang et al (2014)
- Identify the most important biomarkers for the military population

Statistical Analysis Based On AUC

- The area under the ROC curve (AUC)
  - Classification analysis typically used for biomarker selection and evaluation
  - A greater AUC indicates a stronger classifier
  - The most prevalent diagnostic accuracy index used by many researchers



http://www.simafore.com/blog/bid/57470/How-to-evaluate-classification-models-for-business-analytics-Part-2

DOD ADNI Description

- Department of Defense (DOD) Alzheimer's Disease Neuroimaging Initiative (ADNI)
- A longitudinal study launched in 2003
- The biomarkers considered for our classification analysis:
  - Mini-Mental State Exam (MMSE)
  - The volume of hippocampus
  - The apolipoprotein gene (APOE ε4)
  - TBI
  - PTSD

Data Structure for the Classification Analysis

Biomarkers at Baseline

Biomarkers	Sample size	Mean	Standard Deviation	Missing Data Rates
MMSE (scale of 24-30)	441	28.84	1.38	7.03%
Hippocampal Volumes (MRI scans)	411	7251.08	987.29	0.24%
APOE ε4 (number of genes)	440	0.35	0.55	6.79%
TBI (numbers encountered during service)	69	1.64	1.64	83.25%
PTSD (scale of 24-30)	32	47.34	36.98	92.22%

Results: AUC of Various Biomarker Profile Using Two Classification Methods

	3 Biomarkers	*3 Biomarkers + TBI*	*3 Biomarkers + PTSD*	*3 Biomarkers+ TBI + PTSD*
	$N_h = 375$	$N_h = 57$	$N_h = 26$	$N_h = 12$
	$N_d = 37$	$N_d = 6$	$N_d = 5$	$N_d = 2$
		AUC		
Su and Liu's Method	0.8888	0.8567	0.8000	0.9583
Stepwise Method	0.8509	0.8567	0.8000	1.0000

3 Biomarkers: MMSE, Hippocampal Volumes, APOE ε4

Conclusion

- TBI is better than PTSD as a predictive biomarker
- Early detection can leady to early treatment
- Future treatment development
- Limitation: missing data
- To overcome this limitation -adapting existing imputations methods

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Field Experience: HIV Prevention Using Pre-Exposure Prophylaxis

Outline

- Background
- Epidemiology of HIV in Kansas
- Field Experience
- Implementing PrEP
- Future Outlook

At the end of 2013, there were approximately 1.2 million people in the United States living with human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS) from the age of thirteen and older

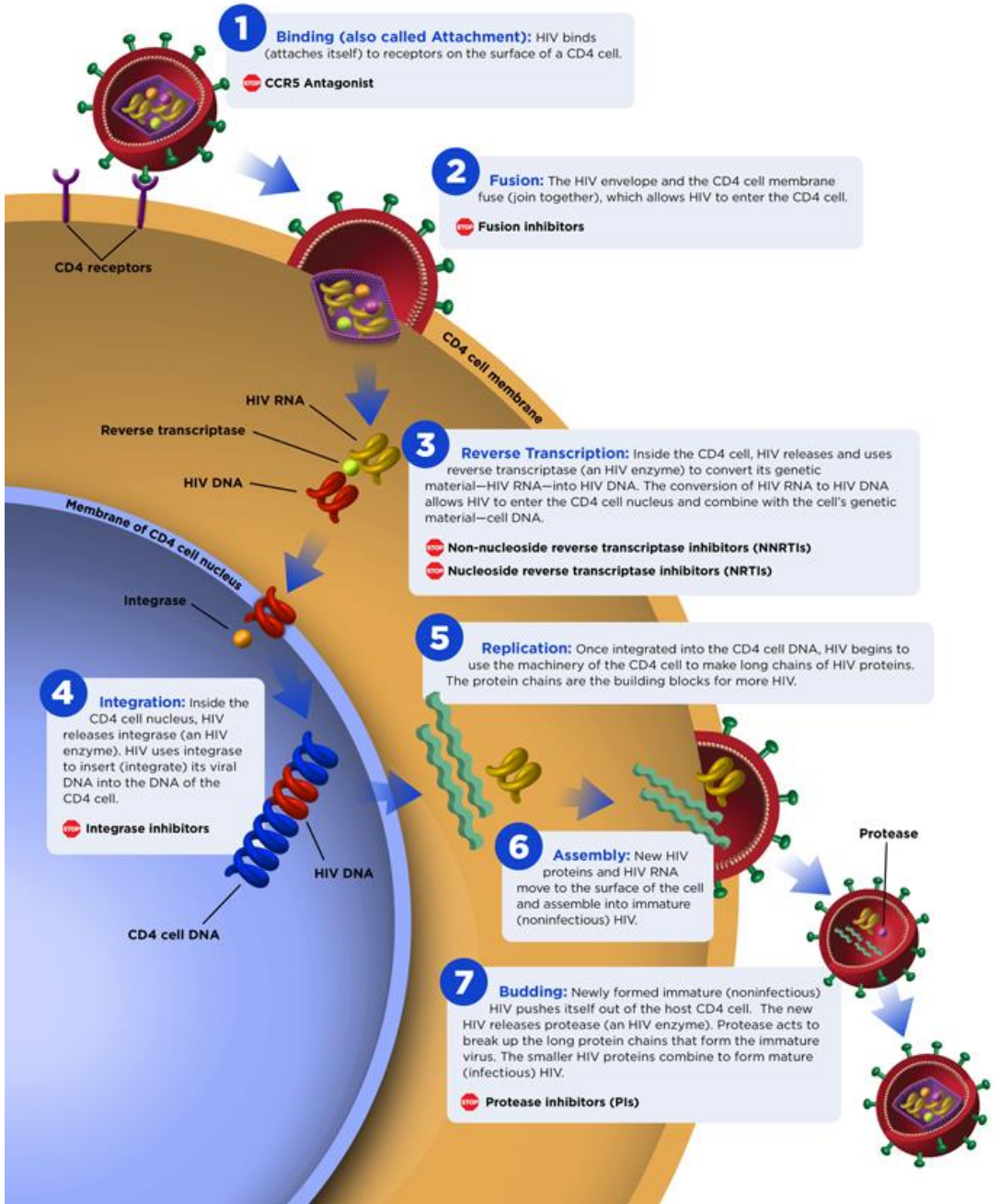
-Centers for Disease Control and Prevention (CDC)

Background

- Caused by retrovirus HIV-1 & HIV-2
- Progressive immunologic weakening
- End Stage→ Acquired Immunodeficiency Syndrome
- HIV life cycle

The HIV Life Cycle

HIV medicines in six drug classes stop HIV at different stages in the HIV life cycle.



Opportunistic Infections & Treatment

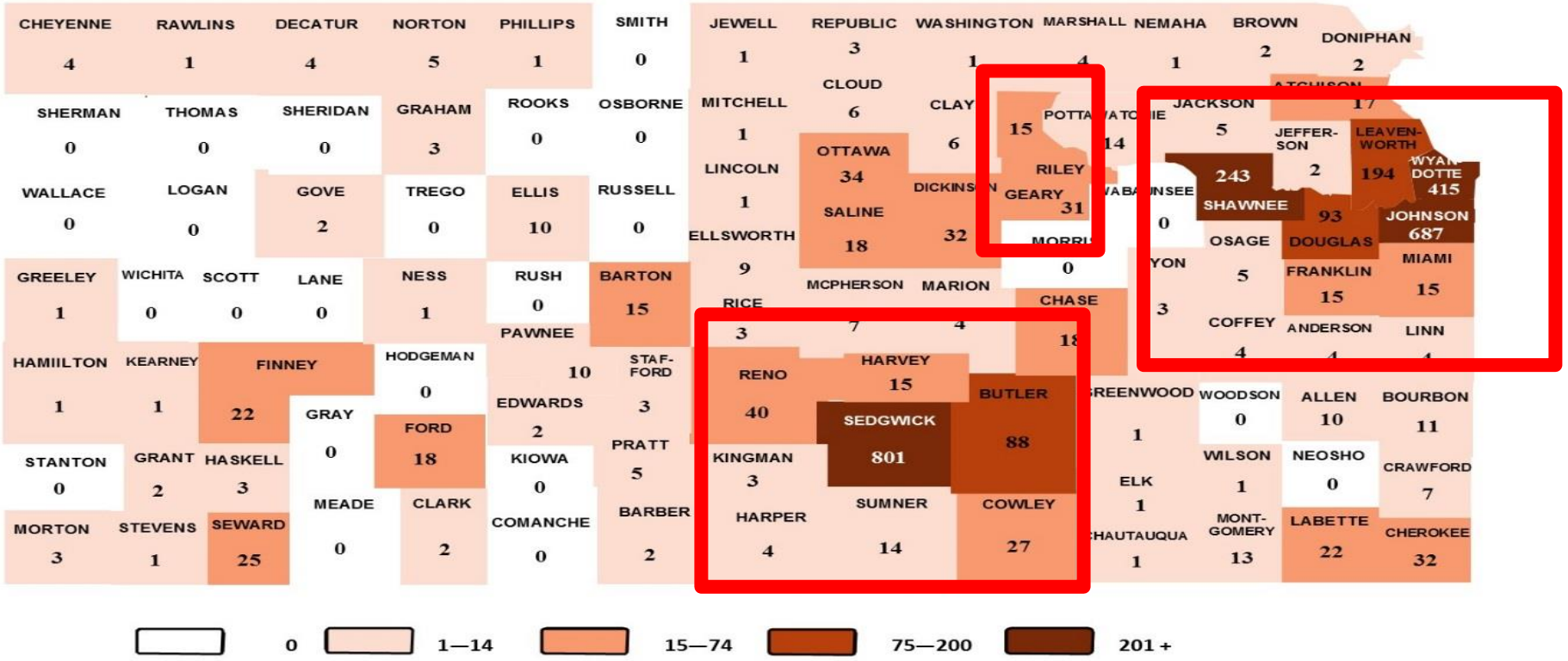
- Main targets: Helper T cells
- Weakening of the immune system
  - Opportunistic infections
- Antiretroviral medications
  - Reduce amount of HIV(control) but do not eliminate it completely
  - Drugs inhibit:
    - Attachment to cell
    - Reverse transcriptase
    - Protease inhibitors
    - Integrase inhibitors

Epidemiology of HIV in Kansas

Kansas Department of Health and Environment

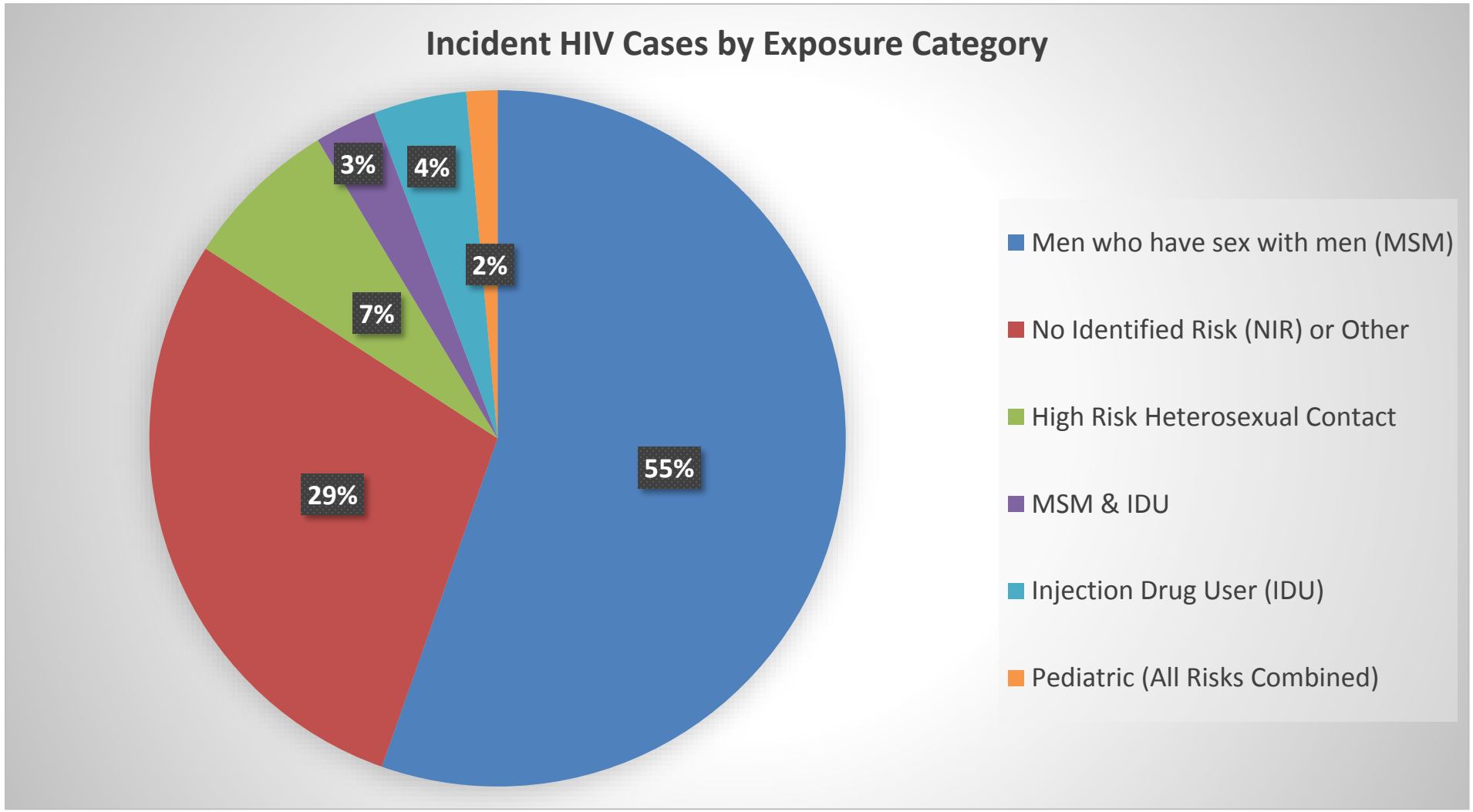
02/22/2017

Number of People Living with HIV by County for the State of Kansas as of December 31, 2016

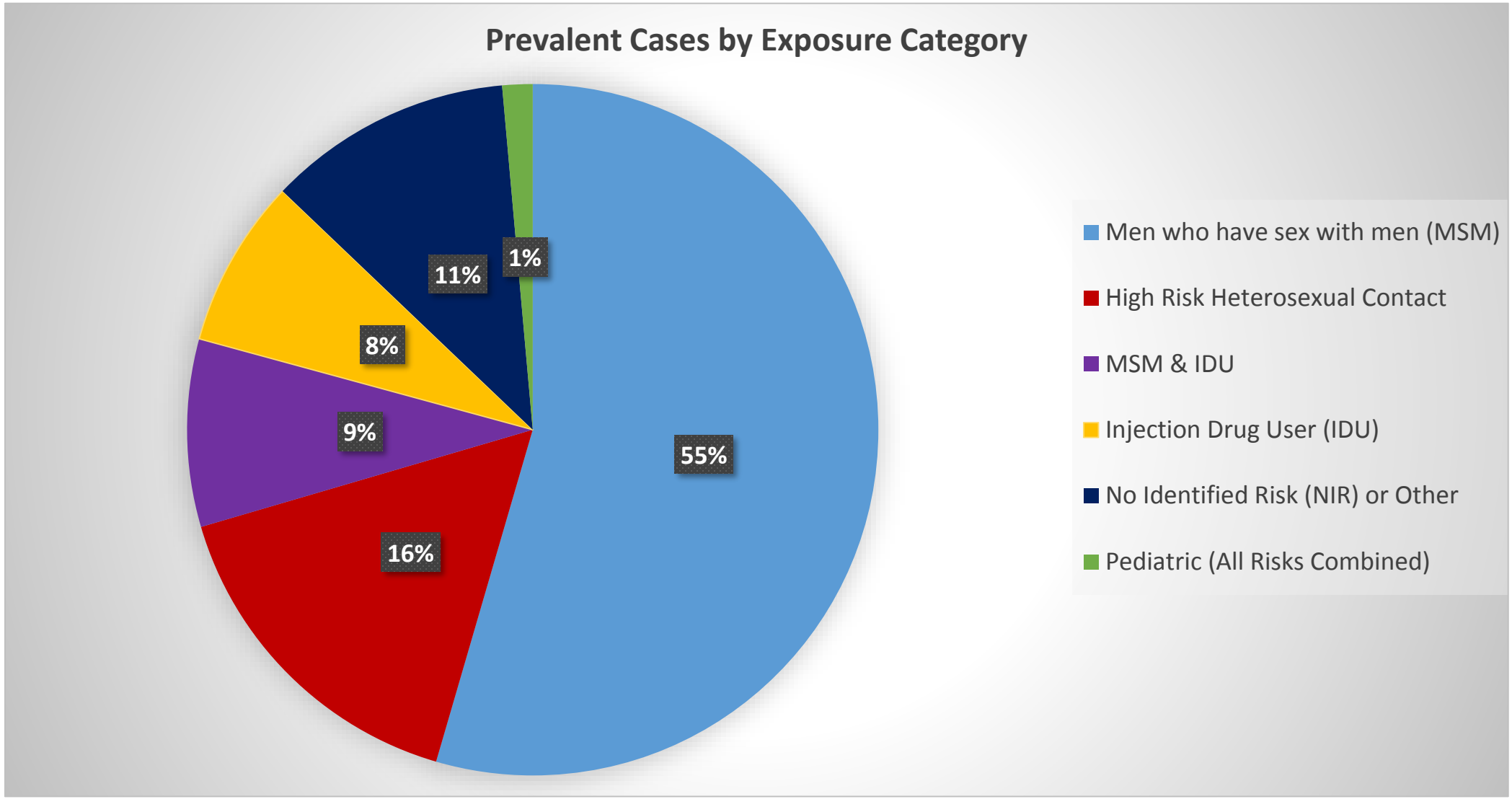


This map reflects the number of persons living in Kansas who have been diagnosed with HIV. Last reported address was utilized to determine residency. If the last reported county variable was unknown, that individual will not be reflected in this map.

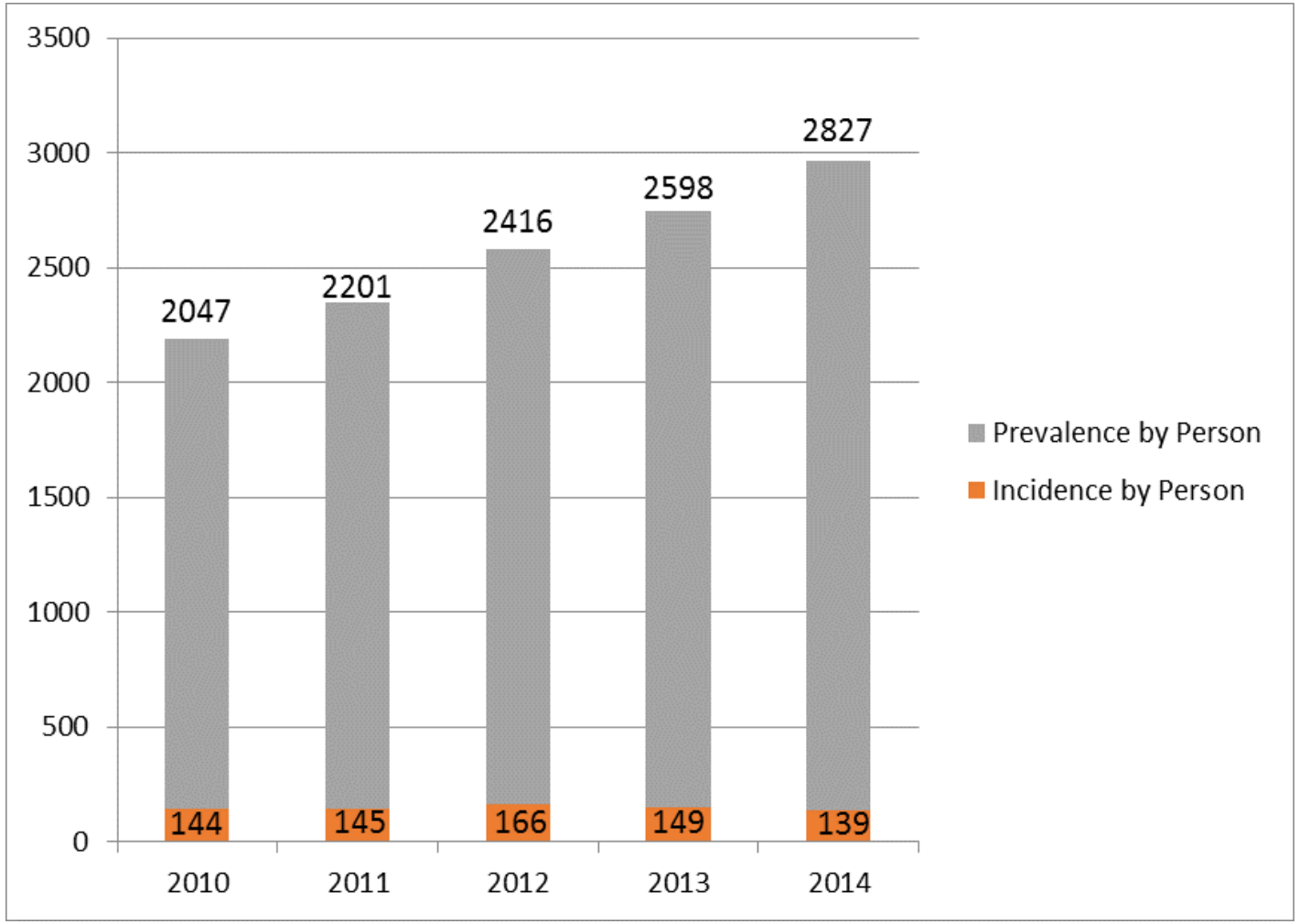
Incident HIV Cases by Exposure Category (2010-2014)



Prevalent Cases by Exposure Category (2010-2014)



Incidence and Prevalence in Kansas (2010-2014)



Field Experience

- Location: Kansas Department of Health & Environment (KDHE), Topeka, KS
  - The Bureau of Disease Control and Prevention under the division of Public Health
    - Sexually Transmitted Infection/ Human Immunodeficiency Virus (STI/HIV) Section
    - February 6, 2017- March 31, 2017
- Field Experience Objective: create a pre-exposure prophylaxis (PrEP) toolkit for providers

Pre-Exposure Prophylaxis

- An oral antiretroviral medication was approved by the U.S. Food and Drug Administration (FDA) as pre-exposure prophylaxis – 2012
- Pre-exposure prophylaxis—PrEP—is used as an HIV prevention tool for those who are HIV uninfected, but are at a high risk of HIV acquisition
- A prevention tool that should be taken every day to obtain high adherence
- Most counties in Kansas do not offer PrEP
  - As an HIV preventive intervention: reduce the incidence in Kansas

Implementing PrEP

Courses

- Completed HIV 101 Course online
- Completed the National LGBT Health Education Center webinars

Research

- Basic information about PrEP
- Clinical trials conducted for PrEP
- How to pay for PrEP
- Current reviews on PrEP provided by consumers & providers
- Recommendations from the DIS in Kansas

Production

- Created educational materials for providers & consumers
- Created a PrEP website for KDHE
- Created a provider directory

Individuals at High-Risk

- Gay or bisexual man who have had anal sex without condoms
- Those who use injection drugs
- Those who have had an STI within the past 6 months
- Those with an HIV-positive partner
- Those with a partner whose HIV status is unknown
- Those who are not in a mutually monogamous relationship
- Those who exchange sex for commodities

How do we identify these individuals at high-risk?

- Sexual Histories
  - Identifying these individuals when conducting sexual histories
  - PrEP is a preventive intervention; therefore, primary care providers should be prescribers of PrEP
- Studies show that less than 40% of providers conduct sexual histories in their practice (Lanier et al., 2014)
- As stated in *The Hidden Epidemic,* "Ironically, it may require greater intimacy to discuss sex than to engage in it

Sexual History Form

Patient Name: _____ **DOB:** _____

Please take a few minutes to fill this form regarding your sexual health. Sexual health is an important part of your general health. Your information is strictly confidential.

1. **When was the last time you had sex (genital, anal, or oral)?**

☐ Date:_____ ☐ Never

2. **How many sex partners have you had in the past 12 months?**

☐ No partners ☐ One partner ☐ More than one partner:_____

3. **When was the last time you had sex with a male?** Date: _____

4. **When was the last time you had sex with a female?** Date: _____

5. **When was the last time you had any of the following:**

☐ Genital sex(penis in vagina)/Date:_____ ☐ Anal sex(penis in anus)/Date:_____ ☐ Oral sex(mouth on penis, vagina, anus)/Date:_____

6. **When was the last time you received/given money for drugs or sex?**

☐ Date:_____ ☐ Never

How do we identify these individuals at high-risk?

- Disease Intervention Program
- Disease Intervention Specialists (DIS)
- According to the CDC, it has been shown that people with an STI have a higher chance of acquiring HIV, when compared to people who do not have an STI

PrEP Points

Studies have shown that PrEP reduces the risk of getting HIV from sex by up to 92% when used consistently.

1pill/day, **every day**.
Skipping doses reduces effectiveness.

Some possible side effects: upset stomach, nausea, loss of appetite, vomiting, fatigue and dizziness. Most side effects are mild and usually go away within the first month.

Client will need repeat STI/HIV tests every 3 months.

PrEP does **NOT** protect against STI's or pregnancy, so condoms should still be used for additional protection.

Is PrEP right for your client?

Ask and Explore:

- How would taking a pill everyday fit or not fit in your life right now?

Summarize Strengths and Challenges:

- Some strengths are:
  - takes a med daily, easy link to daily event, positive attitude
- Some challenges you have with daily pill taking are:
  - away from home, busy schedule, substance use, toxicity concerns

Identify and Strategize:

- Given what we just talked about, what kinds of things need to happen for you to take PrEP every day?
- Generate menu of options.

Moving Forward:

- You said you'll use this strategy. Let's find a provider nearest to you who will prescribe PrEP for you.

Menu of Strategies:

-Link PrEP to daily routine
-Identify what to do if missed
-Pillbox
-Understand side effects
-Disclose PrEP use to significant other
-Plan for intentional discontinuation
-Link dose to event (like brushing teeth)
-Alarms/texts

PrEP Yourself

What is PrEP?

PrEP is an HIV prevention pill that should be taken *every day*. It only works for those individuals that are HIV-negative and are at high risk of getting HIV.

Reduces the risk of getting HIV from sex by up to 92%

Where Can I Get PrEP?

Name of Physician:_____

Phone:_____

More PrEP info:

- whatisprep.org
- cdc.gov/hiv/basics/

Is PrEP Right For Me?

- Is your partner HIV-Positive or HIV status unknown?
- Not in a mutually monogamous relationship?
- Do not consistently use condoms?
- A gay or bisexual man who have had anal sex without a condom?
- Been recently diagnosed with an STI?

If you answered YES to any of these questions, you should discuss PrEP with your doctor.

How Do I Pay for PrEP?

If you have insurance – You many be able to save on co-pay, deductibles, or co-insurance for TRUVADA prescription with the following:

- Gilead Advancing Access Co-pay Card- gileadcopay.com- 877-505-6986
- Patient Access Network Foundation/ panfoundation.org/hivtreatment-and-prevention—866-316-7263

If you do not have insurance – The following provide assistances for people who cannot afford to pay for TRUVADA:

- Gilead U.S. Advancing Access Program– GileadAdvancingAccess.com—800-266-2056
- Partnership for Prescription Access (PPA) Program– PPARX.org

PrEP Toolkit

- PrEP Brochure for Patients
- PrEP Brochure for Providers
- PrEP Patient Referral Card
- Why a Sexual History is Important Brochure
- Sexual History Patient Form
- Paying for PrEP Brochure
- CDC PrEP Posters
- Truvada® Medication Information Sheet (English & Spanish)
- Initiation of Truvada®:Checklist for Prescribers
- Taking a Pill Everyday Brochure
- Kansas Notifiable Disease Form
- Linkage to Care (LTC) Coverage Map
- Disease Intervention Specialists (DIS) Assignment Areas


Are You PrEP Ready?
KANSAS DEPARTMENT OF HEALTH & ENVIRONMENT

Future Outlook

- Keep in contact with family medicine & infectious disease specialists
- Arrange follow-ups
- Overall objective: recruit providers to offer & prescribe PrEP
  - Decrease the number of HIV cases per year

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Core Competencies

- Epidemiology
  - Incidence and Prevalence of HIV
- Environmental Health
  - DIS: social economics and poverty
- Fundamental Methods of Biostatistics
  - Interpreting AD data
  - SAS
- Administration of Health Care Organizations
  - Funding
  - Paying for PrEP
- Social and Behavioral Bases of Public Health
  - Risk factors
  - Patterns of transmission in Kansas

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