

HIV/AIDS in the Foreign-born population  
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Purpose of the Study

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- ▶ To assess the epidemiology of HIV infection and AIDS among the foreign-born population in Lexington, KY.
  
  - ▶ To observe differences between foreign-born and U.S.-born HIV patients
    - ▶ Late Testing
    - ▶ Opportunistic Infections (OIs)
    - ▶ AIDS Diagnosis
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## Introduction

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- ▶ **Human Immunodeficiency Virus (HIV)** is a retrovirus that infects the T cells of the immune system, resulting in immunodeficiency.
  - ▶ **Between 2005 and 2007, Kentucky had a total of 1012 HIV Infections.**
    - ▶ Of these, 248 (25%) were concurrently diagnosed with AIDS
  - ▶ **In 2007, there 201 new Acquired Immune Deficiency Syndrome (AIDS) cases**
    - ▶ As of today, there are around 4,647 AIDS cases reported, with 2802 cases still presumed to be living.
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## Late versus Early Testing

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- ▶ **Late versus Early Testing**
    - ▶ Late tester defined as having an AIDS diagnosis within one year of their HIV diagnosis
    - ▶ Early tester defined as having an AIDS diagnosis greater than 5 years of their HIV diagnosis
  - ▶ **In 2005, it was estimated that around 1.2 million people were living with HIV. Of these, 24% to 27% were unaware of their infection.**
  - ▶ **Early testing: key component in nation's HIV prevention efforts.**
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## Late versus Early Testing

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- ▶ **Benefits of Early Testing:**
    - ▶ Initiation of Treatment
    - ▶ Reduction in HIV-transmission Risk Behaviors
    - ▶ Early Education Interventions
    - ▶ Decreased risk of an Opportunistic/AIDS-defining Illness
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## Opportunistic Infections

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- ▶ OIs are the major clinical manifestation of HIV infection
  - ▶ The diagnostic hallmark of AIDS is the development of OIs secondary to the immunocompromise caused by HIV infection
  - ▶ According to the CDC, there are 26 total OIs or AIDS defining illnesses.
  - ▶ Can cause substantial morbidity, result in hospitalization, necessitate toxic and expensive therapies, and shorten the survival of people with HIV infection
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## Opportunistic Infections

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- ▶ **The three most common OIs:**
    - ▶ Pneumocystis Carinii Pneumonia (PCP)
    - ▶ Candidal Esophagitis
    - ▶ Mycobacterium Avium Complex (MAC)
  - ▶ **There are differences in OIs due to sex and mode of transmission**
    - ▶ Kaposi's Sarcoma in Men Who Have Sex With Men (MSM)
    - ▶ Esophageal Candidiasis, Tuberculosis (TB), and Toxoplasmosis in Injecting Drug Users (IDU)
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## Opportunistic Infections

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- ▶ **Risk increases as immunosuppression progresses:**
    - ▶ CD4+ count:
      - ▶  $\leq 200$  cells/mm<sup>3</sup> PCP
      - ▶  $< 50$  cells/mm<sup>3</sup> MAC
      - ▶ Moderate immunosuppression Herpes and Candida
  - ▶ **Risk For OIs:**
    - ▶ Late HIV Diagnosis
    - ▶ No recent care
    - ▶ Race/Ethnicity
      - ▶ Blacks have a higher risk compared to Hispanics and Whites
    - ▶ IDU
    - ▶ Age
      - ▶ The older you get (60+)
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## Overview of the Literature

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### ▶ AIDS

- ▶ Defined as an HIV-infected adolescent or adult aged greater than or equal to 13 years who has either:
    - a. Less than 200 CD4+ T-lymphocytes/ $\mu$ L
    - b. CD4+ T-lymphocyte percentage of total lymphocytes of less than 14%
    - c. Any of the 26 OIs
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## Overview of the Literature

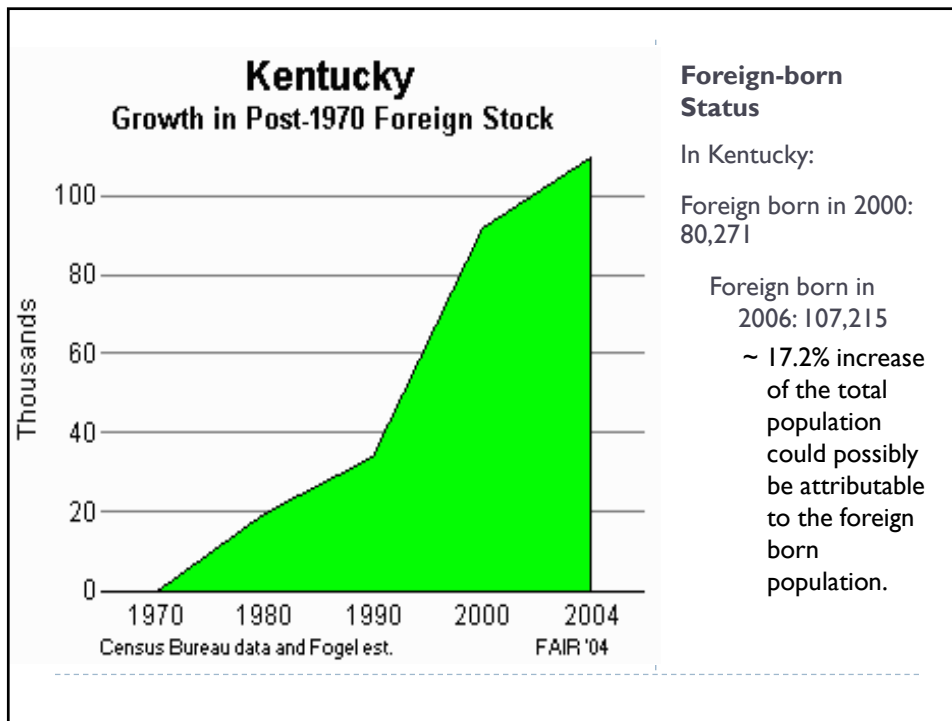
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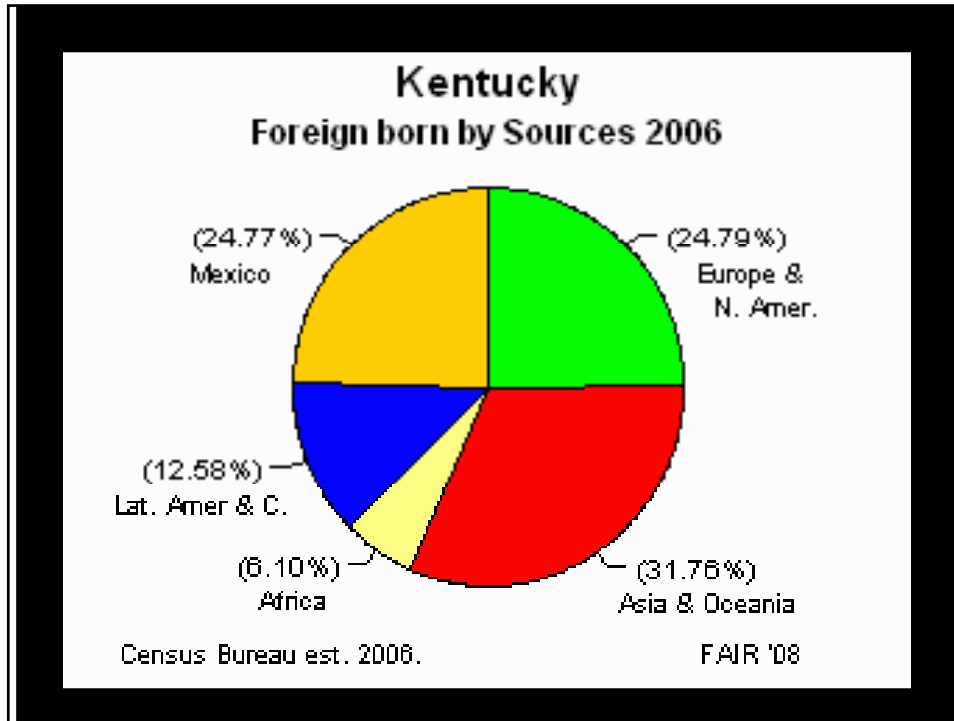
### ▶ Mode of Transmission

- ▶ Men Who Have Sex With Men (MSM)
  - ▶ Heterosexual Contact
  - ▶ Injecting Drug Use (IDU)
  - ▶ Receipt of Blood
  - ▶ Unidentified
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## Overview of the Literature

- ▶ U.S. Census Bureau defines a foreign born person as someone who indicates that they are either a U.S. citizen by naturalization or they were not a citizen of the U.S.
- ▶ In the U.S., 12.6% of the total population is foreign born
- ▶ In Kentucky, 2.5% of the total population is foreign born





### Overview of the Literature

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- ▶ Several factors may reduce or enhance foreign-born populations' HIV risk compared with that of native-born populations:
    - ▶ Deficiencies in HIV/AIDS Knowledge
    - ▶ Lack of access to health care
    - ▶ Delays in accessing HIV-related testing
    - ▶ High risk sexual practices
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### Overview of the Literature

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- ▶ Harawa et al. (2002) suggest that the HIV prevalence among clients born outside of the U.S. were similar to that of U.S.-born clients
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### Overview of the Literature

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- ▶ Korner (2007) suggested that marginalized groups (immigrants) were more at risk to be diagnosed late for HIV
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## Overview of the Literature

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- ▶ **Levy et al. (2007)** suggested that compared to U.S.-born patients, foreign-born patients:
    - ▶ Presented with lower CD4+ counts
    - ▶ More likely to have an OI at HIV diagnosis
    - ▶ More likely to be hospitalized at HIV diagnosis
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## Overview of the Literature

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- ▶ **Bouckenooghe & Shandera (2002)** suggested:
    - ▶ The most common method of HIV transmission is Heterosexual contact
    - ▶ OIs varied by geographic region
    - ▶ Pneumocystosis, Toxoplasmosis, and Tuberculosis are the three most common OIs
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## Overview of the Literature

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- ▶ **Wohl et al. (2003) suggested:**
    - ▶ The percentage of multiple OIs were statistically higher among U.S.-born Latinos compared to Central American-born Latinos
    - ▶ PCP and esophageal candidiasis
    - ▶ Higher rates of OIs were found among U.S.-born women compare to Central American-born women
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## Study Design

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- ▶ **Retrospective**
  
  - ▶ **Case Comparison Analysis**
    - ▶ Case defined as an individual diagnosed with HIV
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## Study Sample

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- ▶ Individuals diagnosed with HIV ≥ 13 years of age.
  - ▶ Enrolled into the Bluegrass Care Clinic (BCC) from June 1, 2003 to June 1, 2008.
  - ▶ Country of origin and HIV diagnosis date recorded
  - ▶ Individuals diagnosed prior to 1998 were excluded from the study
  - ▶ 1070 eligible patients
  - ▶ U.S. born individuals were randomly selected into the study
  - ▶ 248 individuals met the inclusion/exclusion criteria
    - ▶ 65 foreign-born
    - ▶ 183 U.S.-born
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## Data Collection Methods

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- ▶ Study approved by the University of Kentucky Institutional Review Board
  - ▶ Primary Data Collection
  - ▶ Data collected from the Bluegrass Care Clinic (BCC)
  - ▶ Two Sources
    - ▶ Lab Tracker Patients' Record Database
    - ▶ Medical Chart Review
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## Outcome Measures

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- ▶ **Three Main Outcome Measures were:**
    - ▶ Multiple Opportunistic Infections (OIs)
      - ▶ Individuals having 2 or more OIs.
    - ▶ Late vs. Early Testing
      - ▶ Late testing defined as having an AIDS diagnosis within 12 months of their HIV diagnosis
      - ▶ Early testing defined as having an AIDS diagnosis within 5 years or greater of their HIV diagnosis
    - ▶ Progression to AIDS Diagnosis
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## Other Measures

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- ▶ **Other Variables of Interest:**
    - ▶ Age at Diagnosis
    - ▶ Sex (male/ female)
    - ▶ Race (White, Black, Hispanic, Other)
    - ▶ Mode of Transmission
    - ▶ CD4+ Count on Enrollment
    - ▶ CD4+ Count on Initiation of Therapy
    - ▶ Insurance Status (Yes, No, Medicare/Medicaid)
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## Data Analysis

- ▶ Data was analyzed using the Statistical Analysis Software, SAS version 9.1; SAS Institute, Cary North Carolina
- ▶ Descriptive Statistics were performed for the sample
  - ▶ Means, Medians, and ranges
  - ▶ Frequencies and Percentages
- ▶ Bivariate:
  - ▶ Chi Square test of Independence
  - ▶ Independent T-tests
- ▶ Multivariate:
  - ▶ Multiple Logistic Regression
  - ▶ Cox Regression
    - ▶ Kaplan Meier Curves
    - ▶ Log Rank Tests

## Results: Univariate Analysis

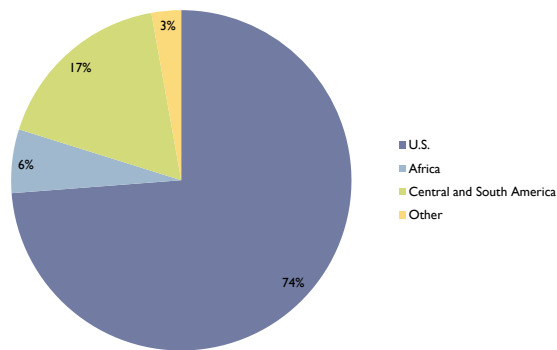
**Table 1.** Demographic Characteristics of the Entire Study Sample Enrolled at the BCC between June 1<sup>st</sup>, 2003 and June 1<sup>st</sup>, 2008

Characteristics	Entire Sample (N=248)	
	no.	%
<b>Age at Diagnosis</b>		
N		248
Mean (SD)		35.08 (9.8)
Median (min, Max) (Q1, Q3)		33.79 (16.02, 68.64) (28.22, 41.18)
<b>Sex</b>		
Male	197	79.44
Female	51	20.56
<b>Race</b>		
White-non-Hispanic	151	60.89
Black-non-Hispanic	51	20.56
Hispanic	43	17.34
Other	3	1.21
<b>Mode of Transmission</b>		
Heterosexual Contact	106	42.74
MSM	114	45.97
IDU	8	3.23
Receipt of Blood	9	3.63
Unidentified	11	4.44
<b>Insurance Status</b>		
No	112	52.09
Medicaid/Medicare	40	18.6
Yes	63	29.2

## Results: Bivariate Analysis

- ▶ **Age at HIV Diagnosis**
  - ▶ 31 years for foreign-born vs. 36 years for U.S. born ( $p=0.0046$ )
- ▶ **Race/Ethnicity**
  - ▶ 63.08% of foreign-born were Hispanic (1.09% for U.S.-born)
  - ▶ 80.87% of U.S.-born were White (4.62% for foreign-born)
  - ▶ ( $p < 0.0001$ )
- ▶ **Mode of Transmission**
  - ▶ 67.69% of foreign-born reported Heterosexual contact compared to 33.88% of U.S.-born
  - ▶ 18.46% of foreign-born reported Men who have sex with Men (MSM) compared 55.74% of U.S.-born
  - ▶ ( $p < 0.0001$ )

### Sample Divided into Geographic Regions



### Results: Regions

Central and South America

>Mexico = 60%

Africa

>Liberia = 20%

Other

>Haiti = 57%

## Results: Clinical Characteristics

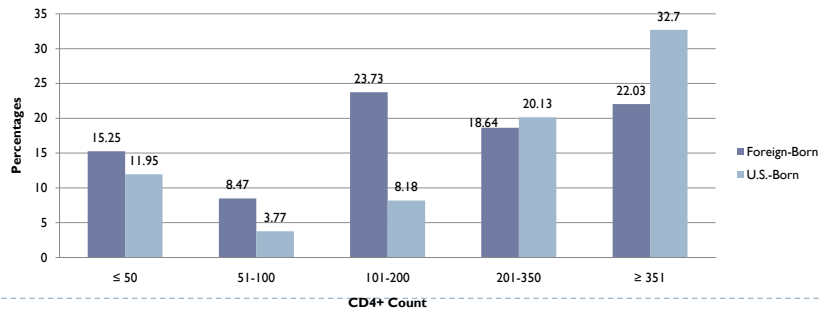
### CD4+ Count on Enrollment

- 50.79% of Foreign-born and 32.5% of U.S.-born patients had Counts <200 (p=0.011)

### HIV Therapy

- 87.5% of Foreign-born and 79.01% of U.S.-born patients received therapy (p=0.135)

**CD4+ Count on Initiation of Therapy by Birth Status**



## Results: Opportunistic Infections

**Table 5. Status of Opportunistic Infections among Foreign Born compared to U.S. Born**

	Foreign Born (n=63)		U.S. Born (n=181)		Entire Sample (n=244)		p-value
	no.	%	no.	%	no.	%	
<b>Opportunistic Infections</b>							
Yes	34	53.97	80	44.2	114	46.72	0.1807
No	29	46.03	101	55.8	130	53.28	
<b>OI at HIV Diagnosis</b>							
Yes	9	14.29	26	14.36	35	14.34	0.9877
No	54	85.71	155	85.64	209	85.66	
<b>Multiple OIs</b>							
0-1	44	68.75	148	81.77	192	78.37	0.0297
2+	20	31.23	33	18.23	53	21.63	
<b>Days to OI Diagnosis</b>							
N	34		80		114		0.65
Mean (SD)	413.88 (722.933)		488.61 (849.314)		465.44 (810.77)		
Median (min, Max) (Q1, Q3)	104 (0,2751) (0,546)		40.5 (0, 3180) (0,534)		43 (0, 3180) (0, 546)		

Note: P-values obtained using two group independent t-tests and chi-square test of independence to make comparisons of means and percentages between both groups.

## Results: Opportunistic Infections

### ▶ Three main OIs for foreign-born

1. Thrush (35.2%)
2. Herpes Simplex Virus (HSV) (26.4%)
3. Cryptococcus Meningitis (14.7%)

### ▶ Three main OIs for U.S.-born

1. Thrush (37.5%)
2. PCP (27.5%)
3. HSV (18.75%)

## Results: Multiple Logistic Regression

**Table 8.** Multiple Logistic Regression Model for Regions predicting Multiple OIs

Variable	Estimated Odds Ratio (OR)	95% CIs
<b>Region</b>		
U.S.	Referent	
Central and South America	1.76	(0.56, 5.58)
Africa	0.47	(0.04, 5.32)
Other	1.59	(0.05, 48.58)
<b>Age at Diagnosis</b>	0.86	(0.54, 1.36)
<b>Sex</b>		
Male	Referent	
Female	1.32	(0.39, 4.42)
<b>Mode of Transmission</b>		
Heterosexual	1.003	(0.34, 2.96)
MSM	Referent	
Other	1.37	(0.28, 6.86)

Note: Model adjusted for Insurance status and CD4+ Count on enrollment and Initiation of Therapy. Age at diagnosis was broken down into groups of 10 years.

## Results: AIDS Diagnosis

**Table 9.** Status of AIDS and Late Diagnosis among Foreign Born compared to U.S. Born HIV patients

	Foreign Born (n=65)		U.S. Born (n=183)		Entire Sample (n=248)		p-value
	no.	%	no.	%	no.	%	
<b>AIDS Diagnosis</b>							
Yes	43	66.15	81	44.26	124	50	0.0024
No	22	33.85	102	55.74	124	50	
<b>AIDS at HIV Diagnosis</b>							
Yes	24	36.92	41	22.4	65	26.21	0.022
No	41	63.08	142	77.6	183	73.79	
<b>Late Testers</b>							
Late	35	53.85	60	32.79	95	38.31	0.0058
Middle	6	9.23	14	7.65	20	8.06	
Early	24	36.92	109	59.56	133	53.63	
<b>Days to AIDS Diagnosis</b>							
N	43		81		124		0.36
Mean (SD)	265.55 (550.50)		378.69 (712.186)		339.46 (660.52)		
Median (min, Max)	0 (0,1927)		0 (0,2661)		0 (0, 2661)		
(Q1, Q3)	(0,96)		(0,366)		(0,307)		

Note: P-values obtained using two group independent t-tests and chi-square test of independence to make comparisons of means and percentages between both groups.

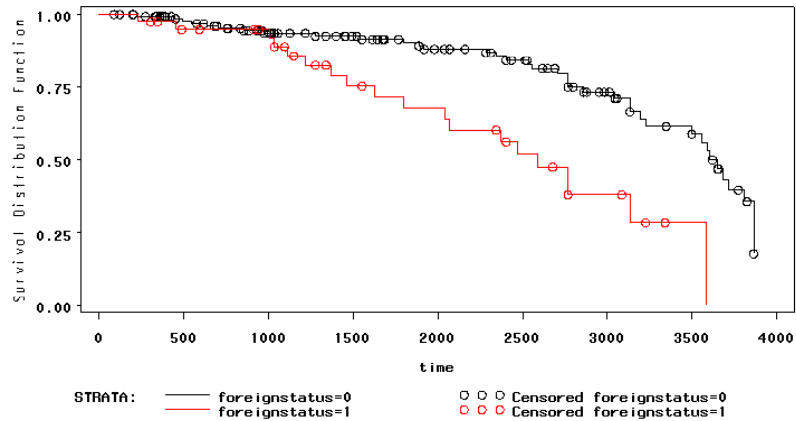
## Results: Multiple Logistic Regression

**Table 10.** Multiple Logistic Regression Analysis of Late versus Early Testing for Foreign-born and U.S.-born patients

Variable	Estimated Odds Ratio (OR)	95% CIs
<b>Foreign Status</b>		
Yes	2.52	(1.05, 6.06)
No	Referent	
<b>Age at HIV Diagnosis</b>		
	1.77	(1.31, 2.40)
<b>Sex</b>		
Male	2.14	(0.99, 4.63)
Female	Referent	
<b>Race</b>		
White	Referent	
Non-White	1.31	(0.60, 2.86)
<b>Mode of Transmission</b>		
Heterosexual	2.41	(1.22, 4.75)
MSM	Referent	
Other	0.794	(0.30, 2.13)

Note: Race was dichotomized into two groups, white vs. non-white. Age at diagnosis was broken down into groups of 10 years.

## Kaplan-Meier Curve



## Results: Cox Regression

**Table 11.** Cox Proportional Model for foreign status predicting progression to AIDS

Variable	Estimated Hazard Ratios (HR)	95% Confidence Limit	p-value
<b>Foreign Status</b>			
Yes	3.56	(1.18, 10.81)	0.0248
No	Referent		
<b>Age at HIV Diagnosis</b>			
Risk	1.07	(0.65, 1.75)	0.7990
<b>Risk</b>			
MSM	Referent		
Heterosexual	0.97	(0.38, 2.51)	0.9497
Other	0.93	(0.15, 5.65)	0.9324
<b>Race</b>			
White	Referent		
Non-White	0.85	(0.26, 2.81)	0.7891
<b>Sex</b>			
Male	4.30	(1.16, 15.98)	0.0296
Female	Referent		

Note: Model adjusted for OIs, CD4+ Count on Enrollment, and CD4+ Count on Initiation of Therapy. Age at diagnosis was broken down into groups of 10 years.

## Study Limitations

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- ▶ Study can not be generalized to the foreign born population
  - ▶ Small sample size compared to other studies conducted
  - ▶ Time spent in the U.S. not considered
  - ▶ Medical Chart Review/Lab Tracker Patient's Record Database
    - ▶ Income level
    - ▶ Education level
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## Conclusion

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- ▶ There are differences between foreign-born HIV patients and U.S.-born HIV patients in regards to age at HIV diagnosis, mode of transmission, CD4+ count on enrollment, and CD4+ count at initiation of therapy
  - ▶ Although not significant, patients born in Central and South America have a greater odds of acquiring multiple OIs compared to those born in the U.S.
  - ▶ Foreign-born HIV patients are more likely to progress to an AIDS diagnosis and have a greater odds of testing late for HIV compared to U.S.-born HIV patients
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## Questions????



## Supplemental Tables and Charts

**Table 11.** Cox Proportional Model for foreign status predicting progression to AIDS

Variable	Estimated Hazard Ratios (HR)	95% Confidence Limit	p-value
<b>Foreign Status</b>			
Yes	1.90	(0.59, 6.11)	0.28
No	Referent		
<b>Age at HIV Diagnosis</b>			
	0.81	(0.47, 1.39)	0.44
<b>Risk</b>			
MSM	Referent		
Heterosexual	1.11	(0.42, 2.96)	0.82
Other	1.50	(0.27, 8.13)	0.64
<b>Race</b>			
White	Referent		
Non-White	1.03	(0.32, 3.40)	0.96
<b>Sex</b>			
Male	3.90	(0.99, 15.32)	0.052
Female	Referent		

Note: Model adjusted for OIs, Late Testing, CD4+ Count on Enrollment, and CD4+ Count on Initiation of Therapy. Age at diagnosis was broken down into groups of 10 years.

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