

Using Hospital Admission and Readmission Patterns to Improve Outreach to Persons Living with HIV/AIDS in Pennsylvania

July 1, 2010 – September 30, 2012



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EXECUTIVE SUMMARY

The goal of this study is to characterize the hospital admissions and readmissions of HIV-positive patients over a two year period to provide information that can help policy makers, healthcare providers and community-based AIDS service organizations improve outreach to and care of Pennsylvania's (PA) HIV-positive community. Using both hospital discharge and population data, the study characterizes those most at risk for admission and readmission, a portion of which are presumed to be preventable.

Between July 1, 2010 and September 30, 2012, a third of Pennsylvania's 31,396 people living with HIV/AIDS (PLWHA) was hospitalized at least once; of these, 44% had two or more admissions. Three quarters of hospitalized HIV-positive patients were covered by Medicare and/or Medicaid. The overall 30-day readmission rate was 28% – substantially higher than the average for all medical admissions (15%) or for Medicare patients (19.6%). One or more of 10 diagnostic groups was present on 87% of all HIV-positive admissions. Among these are depression and substance use disorders – behavioral health comorbidities that were present on 35% of all admissions.

Those overrepresented among hospitalized patients include women (36% of hospitalized patients, but 29% of the HIV-positive population) and patients 65 years of age and older (41% of hospitalized patients, but 10% of population). Groups most likely to be readmitted within 30 days included patients who were dually eligible for Medicare and Medicaid (34%), patients transferred to another hospital or long-term care facility (65%), patients with anemias (36%), chronic renal failure (41%) and hypertensive chronic kidney disease (41%). Behavioral health comorbidities substantially increase the risk of 30-day readmissions for patients with anemias, chronic renal failure and hypertensive chronic kidney disease. While African Americans are disproportionately HIV-positive (56% of the HIV-positive population vs. 11.4% of the overall PA population), they are 59% of hospitalized HIV-positive patients. Moreover, their 30-day readmission rate (29%) is roughly similar to that of Caucasians (27%).

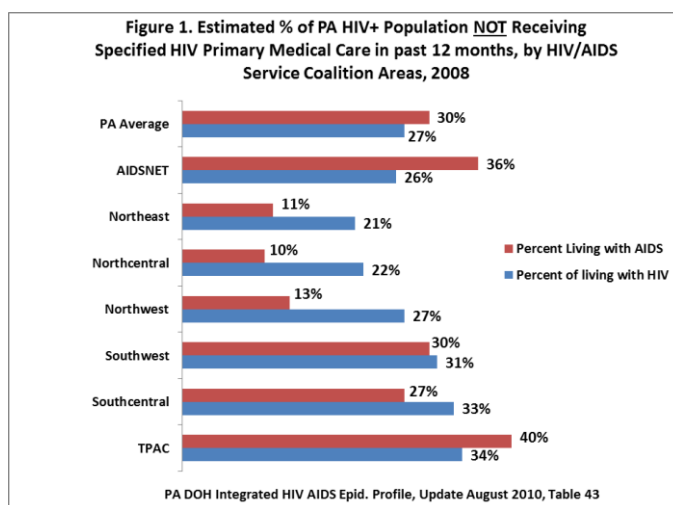
Half of PLWHA in Pennsylvania live in the Philadelphia area. The study documented variation in readmission rates for the ten HIV-positive admitting hospitals in PA that accounted for half of all PA HIV-positive admissions (nine of which are in the Philadelphia area). Finally, while efforts to improve outreach to PLWHA in urban areas will reach larger numbers of PLWHA, our analyses indicate that opportunities to improve outreach to the HIV-positive population are important in small, rural counties as well – particularly those that border counties with relatively large HIV-positive populations.

Purpose

Improving HIV-related health outcomes, reducing disparities and preventing HIV transmission are the overarching goals of the Minority AIDS Initiative (MAI). Among the central objectives of this national effort is, therefore, to ensure that people living with HIV/AIDS maintain close connections to appropriate healthcare providers who will help with disease management. In particular, keeping viral load suppressed is critical for minimizing the health impact of HIV and its treatment side effects; avoiding costly, preventable hospital admissions and readmissions; and supporting the critical public health goal of reducing further HIV transmission.

Between 27% and 30% of PLWHA in Pennsylvania did NOT receive recommended HIV primary care, more if they were publicly insured.

The challenge in Pennsylvania is clear: In 2011, there were an estimated 31,396 PLWHAs in the Commonwealth of Pennsylvania, and, as indicated in Figure 1, an estimated 27% to 30% did *not* receive recommended HIV primary medical care.¹ There are striking variations in these percentages across service coalition areas and for those with HIV vs. AIDS. Moreover, just 10% of those with commercial insurance are estimated to have gone without needed care, compared to 32%-37% of those with public insurance.²



The goal of this study is to provide information that would help policy makers, healthcare providers and community-based AIDS service organizations improve this situation by targeting their outreach to and care of the PLWHA community in Pennsylvania.³ Because some hospital admissions and readmissions represent failures to *prevent* acute health conditions for those managing chronic diseases like HIV, characteristics of hospital admissions and readmissions can reveal important information about the kinds of patients experiencing gaps in care – information that can then form the basis of corrective strategies. Towards that end, this study asks the following questions:

- What are the characteristics of PLWHA most likely to have experienced hospital admissions?
- What are the characteristics of PLWHA most likely to be readmitted following discharge?
- Are there variations in admissions and readmissions by admitting hospitals that point to improvement opportunities?
- Are there geographic patterns of admissions and readmissions that point to improvement opportunities at the county level?

Methodology

This study utilizes all-payer, inpatient discharge claims data collected by the Pennsylvania Health Care Cost Containment Council (PHC4)⁴ on all discharges of HIV-positive patients between July 1, 2010 and September 30, 2012 from any of 210 acute care hospitals. The data include information about patient demographics, insurer, primary and secondary diagnoses and discharge status. To provide context for hospital admissions data and to identify who is overrepresented among those being admitted and readmitted, we compare characteristics of HIV-positive hospital patients to characteristics of the larger HIV-positive population archived by the Pennsylvania Department of Health.

Overview of Hospital Admissions and Readmissions

Hospital admissions, and especially readmissions, may point to inadequacies in the current continuum of care, including appropriate primary care, needed to keep HIV-positive individuals healthy. Between July 1, 2010 and September 30, 2012, 9,951 HIV-positive men and women were hospitalized at least once – for a total of 23,498 admissions. Using PA data on the HIV-positive population, this means that roughly a third of the HIV-positive population was hospitalized during our study period. Slightly less than half of hospitalized patients had two or more admissions and, among those who were hospitalized, 28% were readmitted within 30 days, and more than half (56%) were readmitted within a year.

Roughly a third of PLWHA in Pennsylvania was hospitalized at least once between 2010 and 2012. Of this group, 28% were readmitted within 30-days of discharge.

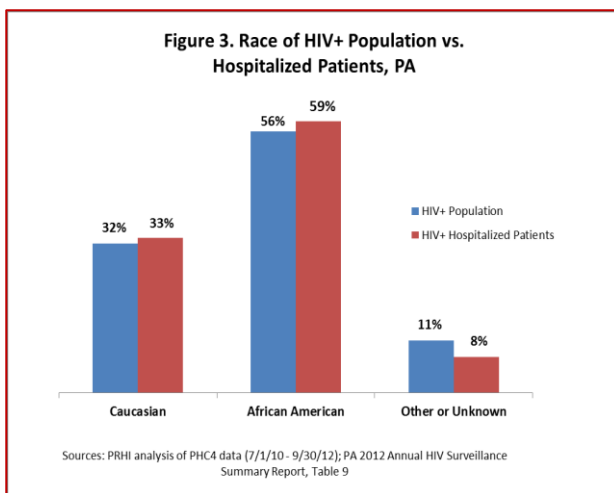
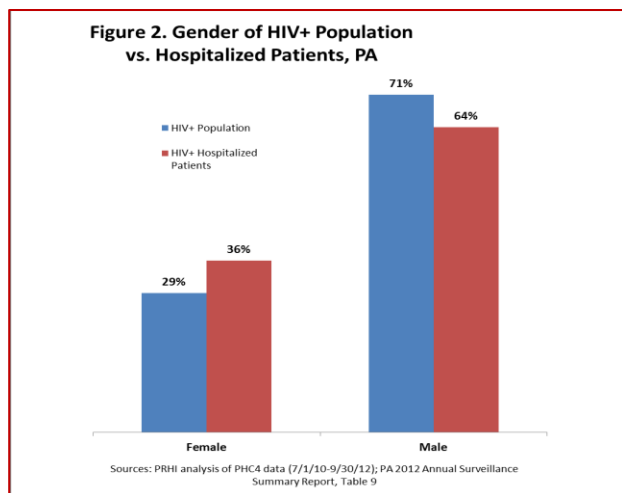
PA HIV-Positive Population (2010)	31,396
Total HIV-Positive Hospitalized Patients	9,951
Percent of PA's HIV-Positive Population Hospitalized at Least Once	32%
Total HIV-Positive Admissions	23,498
Percent of Hospitalized Patients with 2+ Admissions	44%
Average 30-day Readmission Rate	28%
Average 12-month Readmission Rate	56%

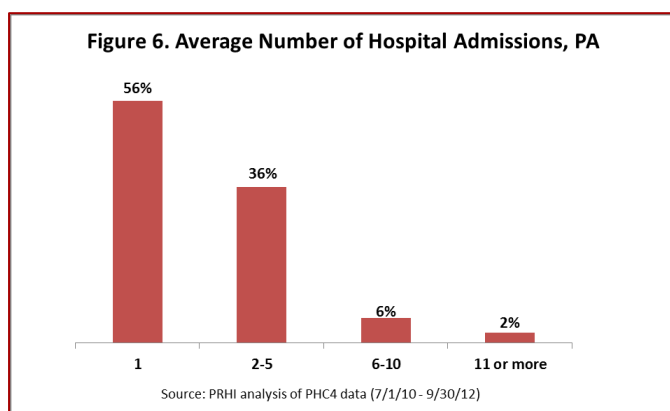
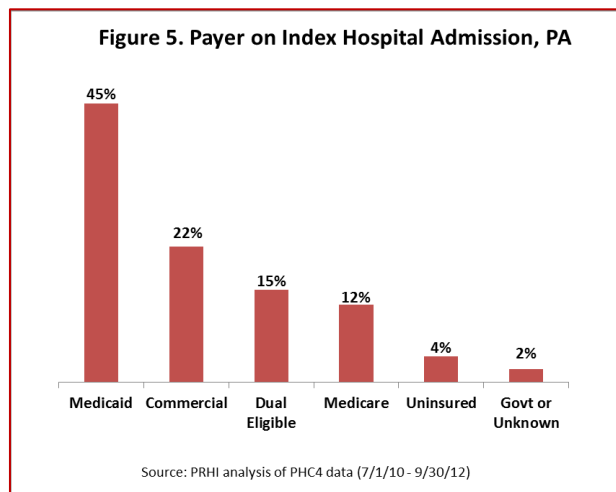
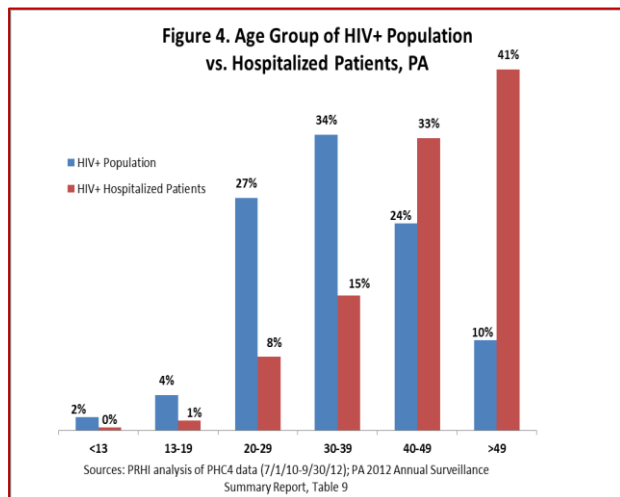
Characterizing Patients Experiencing Hospital Admissions

Patient Demographics

The broad overview in Table 1 conceals much complexity. Below we examine characteristics of the HIV-positive population hospitalized at least once between July 1, 2010 and October 1, 2012. Using information culled from a patient's first hospitalization, we are able to broadly characterize the 9,951 HIV-positive patients. The following list summarizes the details presented in Figures 2 through 4:

- Although women represent a smaller share of people living with HIV/AIDS (29%), they are over-represented among the hospitalized HIV-positive population (36%) (Figure 2).
- African Americans are over-represented among people living with HIV/AIDS. While African Americans accounted for 11.4% of the total PA population in 2012, they represented more than half (56%) of PA's total HIV-positive population and 59% of all hospitalized HIV-positive patients (Figure 3).
- The older population is over-represented among hospitalized HIV-positive patients. While individuals age 50 or older accounted for just 10% of PA's total HIV-positive population, they represented 41% of all hospitalized HIV-positive patients (Figure 4).
- An estimated 75% of HIV-positive patients were covered by public payers (Medicare and/or Medicaid) in Pennsylvania in 2008.⁵ While the PA Department of Health sources don't provide the detail available from PHC4, this percentage closely aligns with the PHC4 data showing that 72% of hospitalized HIV-positive patients between 2010 and 2012 were publicly-insured by Medicare and/or Medicaid (Figure 5).





The 9,951 patients hospitalized in Pennsylvania between July 2010 and October 2012 had a total of 23,498 admissions. As seen in Figure 6, more than half of the HIV-positive patients had only one admission and just 8% had six or more admissions. The number of admissions varied by insurer; patients dually eligible for both Medicare and Medicaid had the highest average number of admissions in the two years of data (see Table 2).

Table 2. Average Number of Admissions, by Payer on Index Admission	
Dual Eligible	3.1
Medicaid	2.4
Medicare	2.4
Commercial	1.9
Uninsured	1.8
Government	1.7

Discharge Status

Consistent with the complexity of this population is the fact that 19% of patients are discharged to non-home care settings (compared to 15% of PA patients more generally⁶). These settings provide additional health support after their index admission (see Table 4).

While generally all the discharge groups share the same top diagnoses groups, **two diagnosis groups appear among the top 10 code groups only for HIV-positive patients discharged to another facility or to long term care:**

- *Acute renal failure* – present on 16% of admissions
- *Drug dependence* – present on 15% of admissions

Home	70%
Home with health care	11%
Discharged or transferred to another type of facility	3%
Further hospital-related or long-term care	5%
Nursing facility	5%
Left against medical advice	4%
Hospice	1%
Patient died	2%

Common Diagnoses

For each admission, a diagnostic ICD-9 code is provided for the principal reason a patient was hospitalized. In addition, there are up to seventeen ICD-9 codes for comorbidities or secondary diagnoses that were present on admission. All HIV-positive patients receive an ICD-9 diagnosis code indicating the presence of HIV infection (generally 08/asymptomatic HIV infection status, or 042/HIV disease). These codes, however, do not convey the reason for the hospital admission.

To provide a high level picture of the health issues common to HIV-positive patients, Table 3 looks at the most prevalent non-HIV diagnoses across all 23,498 admissions – as either primary or secondary diagnoses – using ICD-9 code groups.⁷ One or more of these top diagnosis groups was present on 87% of all HIV-positive admissions. Note that a patient, on the same admission, could have codes on his/her medical record with more than one of these diagnoses.

Table 3. Top ICD-9 Code Group	Code	Number of Admissions	Percent of Admissions
Essential hypertension	401	6,342	27%
Viral hepatitis*	070	6,098	26%
Disorders of fluid electrolyte and acid-base balance	276	5,782	25%
Other and unspecified anemias	285	4,574	19%
Nondependent abuse of drugs (excluding tobacco)**	305	4,486	19%
Chronic renal failure	585	4,169	18%
Other personal history presenting hazards to health	V15	4,164	18%
Diabetes mellitus	250	4,163	18%
Asthma	493	3,746	16%
Hypertensive chronic kidney disease	403	3,363	14%
Episodic mood disorders	296	3,344	14%

* Includes all forms of hepatitis

** ICD-9 code group 305 here excludes ICD-9 3051 (tobacco use)

The picture that emerges is of patients whose care is complicated by the presence of multiple acute and chronic co-morbid conditions, some associated with HIV infection and its treatment. Key observations include:

- **Among these top ICD-9 code groups, half are related to chronic health conditions**, including *essential hypertension* (present on 27% of admissions), *chronic renal failure* (18%), *diabetes* (18%), *asthma* (16%) and *hypertensive chronic kidney disease* (14%). As noted in a previous PRHI publication,⁸ **many HIV-positive individuals are now developing chronic health conditions associated with aging. However, HIV infection and its treatment also increase the risk of cardiovascular disease, renal disease, liver disease and malignancies.**⁹ Renal failure, for example, can be related to HIV nephropathy or a side effect from medication. Similarly, diabetes in HIV-positive patients may be a long-term side effect of certain AIDS medications, especially protease inhibitors.¹⁰
 - **It is important to note that while symptoms associated with HIV or its treatment are common, some conditions may be almost eliminated with suppressed viral load.** For example, while an estimated 30% of people living with HIV/AIDS have abnormal kidney function (detected with a simple urinalysis), it is very uncommon among individuals with suppressed viral load.¹¹
- The prevalence of *viral hepatitis* (26% of admissions) is consistent with high rates of Hepatitis C (25% co-infection rates) and Hepatitis B (10% co-infection rates) among

One or more of the top 10 diagnoses in Table 3 was present on 87% of all HIV+ admissions.

HIV-positive individuals.¹² It may be related to other risk-taking behaviors, such as non-dependent abuse of drugs (19% of admissions), including both episodic and continual abuse of alcohol, cocaine and other drugs.

- *A disorder of fluid, electrolyte and acid-base balance (25% of hospitalizations)* is often related to clinical dehydration. Nausea and vomiting are common symptoms in HIV-positive patients, and may be a marker of intolerance to HIV medications,¹³ hepatitis or substance abuse, among other reasons.

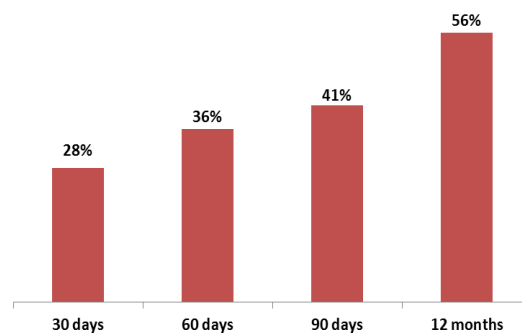
Characterizing Patients Experiencing Hospital Readmissions

Hospital readmissions are often considered a marker for missed care opportunities, particularly for patients with chronic conditions like HIV that can be managed effectively in outpatient settings. Although not all readmissions can be prevented, researchers estimate that, generally, as many as one in five readmissions can be prevented with better outpatient care and better transitions between hospital and community.

The average 30-day readmission rate for HIV-positive patients in PA is 28% compared to a PA-wide readmission rate for medical diagnoses of 15%.

Figure 7 shows overall PA readmission rates for HIV-positive patients. On average, more than a quarter (28%) of admissions are followed by a readmission with 30 days; and more than half (56%) are followed by a readmission within a year. To put the rates in Figure 7 in perspective, in 2010, the average PA 30-day readmission rate for medical diagnoses was 15.3%. For common chronic diseases, the average PA 30-day readmission rates ranged from 11.3% for coronary artery disease or chest pain to 20.2% for COPD to 24.3% for heart failure.¹⁴ The readmission rate for HIV-positive patients is higher than the rate for heart failure patients. Moreover, the overall Medicare readmission rate – reflecting the health status of those 65 years and older – was 19.6% at 30 days (43% less than that of HIV-positive PA patients) and 34% at 90 days (21% less than that of HIV-positive PA patients).¹⁵

Figure 7. Overall HIV+ Readmission Rates, PA



Source: PRHI analysis of PHC4 data (7/1/10 - 9/30/12)

While we do not have in-depth clinical data that would allow us to accurately determine whether some patients are sicker, we can look at readmission rates among various patient subgroups to identify those most at risk of a readmission.

Patient Demographics

Figure 8 tracks readmission rates at 30, 60 and 90 days, and at 12 months, by race.

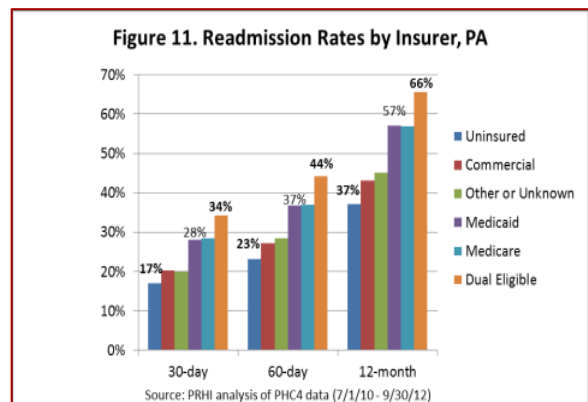
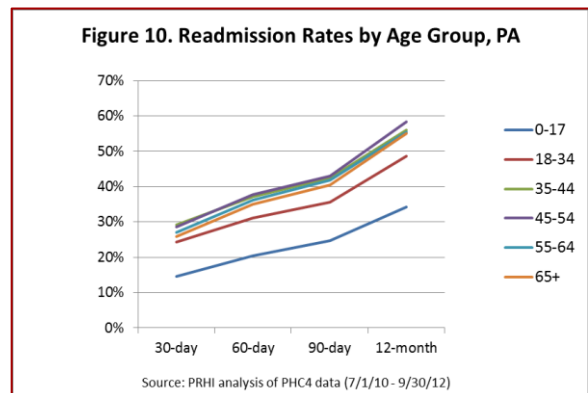
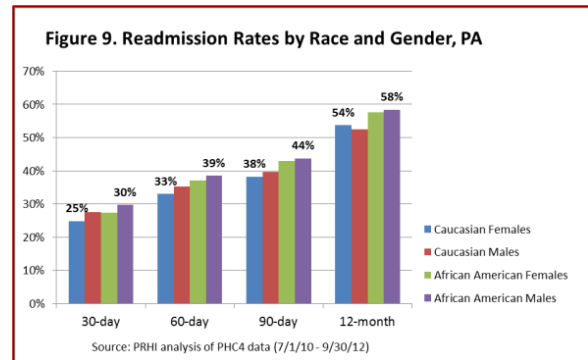
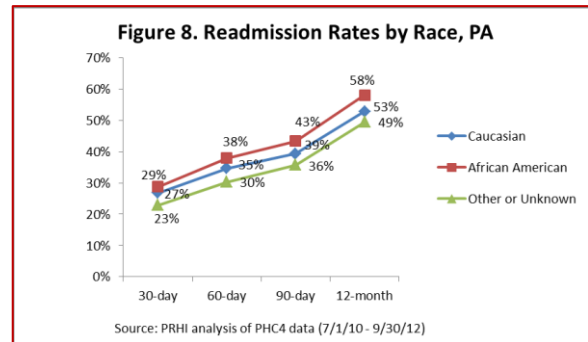
Readmission rates are higher overall for African Americans than for Caucasians, a difference that grows slightly wider over time, although the increase is roughly the same across groups.

In Figure 9, gender is added, and shows that the 30-day readmission rates range from 25% for Caucasian females to 30% for African American males. Within race, gender differences are slight, but African Americans – both male and female – have overall higher rates than Caucasians.

Across age groups, Figure 10 shows that readmission rates clustered fairly tightly for those 35 and older. The **highest rates were for 45-64 year olds.**

Figure 11 indicates that admissions in which patients were covered by public insurance (Medicare and/or Medicaid) were most likely to result in readmission – with **rates for patients eligible for both Medicare and Medicaid (dual eligible) at a very high 34%.** These three groups account for almost three-quarters of Pennsylvania’s HIV-positive patient hospitalizations (see Figure 5).

Readmissions also vary between patients discharged in different ways. Table 5 reports the 30-day readmission rates for admissions discharged to various settings. Patients discharged to home settings represent the vast majority of total admissions. They are readmitted to the hospital less often than the overall average for the HIV-positive population (28%). Patients discharged to all non-home settings represent a smaller portion of admissions but have a substantially higher readmissions rate.



Discharge Status

Figure 12 expands the focus to both 30-day and 12-month readmissions and shows **the highest readmission rates were among patients who were transferred to another hospital or long-term care facility** (65% at 30 days), and in which the patient left the hospital against medical advice (41% at 30 days) – together accounting for almost 10% of discharges.

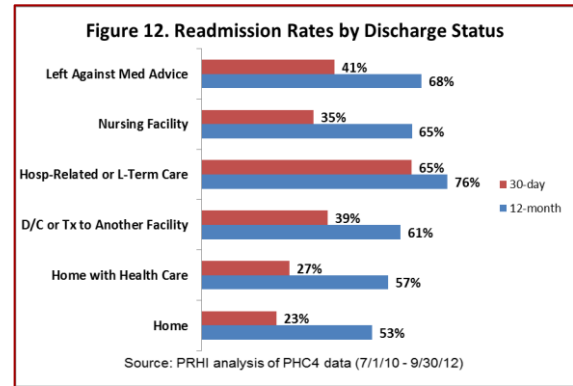


Table 5. Discharge Status	Percent of Admissions	30-day Readmission Rate
Home	70%	23%
Home with health care	11%	27%
D/C or transferred to another type of facility	3%	39%
Further hospital-related or long-term care	5%	65%
Nursing facility	5%	35%
Left against medical advice	4%	41%
Overall	-	28%

*excludes patients discharged to hospice and those who died during the hospitalization

Prevalent Diagnoses

We saw in Figure 7 that the overall 30-day readmission rate for admissions of HIV-positive patients was 28% and more than half of the admissions resulted in a readmission within 12 months. Table 6 shows the most common diagnosis groups (identified in Table 3), and highlights the variation in the readmission rates across these groups. In six of these code groups, the 30-day readmission rate exceeded 30%.

Three-quarters of admissions for chronic renal failure or hypertensive kidney disease are followed within 12 months of discharge by another hospitalization. Overall, more than half of all admissions of HIV-positive patients, across all diagnoses, result in another hospitalization within 12 months of discharge.

Table 6. ICD-9 Code Group	Code	30-day Readmit Rates	60-day Readmit Rates	12-Mo Readmit Rates
Essential hypertension	401	25%	34%	54%
Viral hepatitis*	070	31%	41%	62%
Disorders of fluid electrolyte and acid-base balance	276	31%	41%	59%
Other and unspecified anemias	285	36%	46%	64%
Nondependent abuse of drugs **	305	29%	38%	58%
Chronic renal failure	585	41%	53%	73%
Other personal history presenting hazards to health	V15	31%	41%	60%
Diabetes mellitus	250	29%	38%	60%
Asthma	493	28%	36%	57%
Hypertensive chronic kidney disease	403	41%	54%	74%
Episodic mood disorders	296	28%	37%	58%
All HIV-positive hospitalizations	-	28%	36%	56%

* Includes all forms of hepatitis

** Excludes ICD-9 3051 (tobacco use)

Behavioral Health Comorbidities

This section examines the prevalence of behavioral health comorbidities (depression and/or substance use disorders (SUDs), excluding tobacco use) and their association with readmissions.

Table 7 shows the high degree to which depression and/or SUD were comorbid with the top ICD-9 code groups.¹⁶ Overall, comorbid depression was documented on 21% of HIV-positive admissions, comorbid SUDs on 19% of HIV-positive admissions and either depression or SUD on 35% of admissions.

Comorbid depression and SUD are associated with higher likelihood of readmission, especially for patients with diagnosed anemias, chronic renal failure, and hypertensive chronic kidney disease.

Behavioral health comorbidities (depression and/or substance use disorders) are present on 35% of all admissions – a prominent reality for HIV-positive patients.

Table 7. Top ICD-9 Code Group	Percent of Admits with Comorbid Depression	Percent of Admits with Comorbid SUD (excluding tobacco)	Percent of Admits with Depression and/or SUD (Excluding tobacco)
Essential hypertension	23%	20%	37%
Viral hepatitis	23%	27%	43%
Disorders of fluid electrolyte and acid-base balance	17%	17%	31%
Other and unspecified anemias	17%	14%	29%
Nondependent abuse of drugs (excluding tobacco)	27%	100%	100%
Chronic renal failure	14%	13%	25%
Other personal history presenting hazards to health	22%	25%	40%
Diabetes mellitus	20%	15%	30%
Asthma	24%	21%	39%
Hypertensive chronic kidney disease	14%	13%	24%
Episodic mood disorders	38%	32%	58%
All HIV-positive hospitalizations	21%	19%	35%

Ignoring diagnoses of episodic mood disorders and nondependent abuse of drugs (in which comorbid depression and/or SUDs would be expected), **comorbid depression and/or SUD were documented in between 24% (*hypertensive chronic kidney disease*) and 43% (*viral hepatitis*) of admissions for the other top diagnoses.** These data indicate the degree to which behavioral health comorbidities are a prominent reality for the hospitalized HIV-positive population.

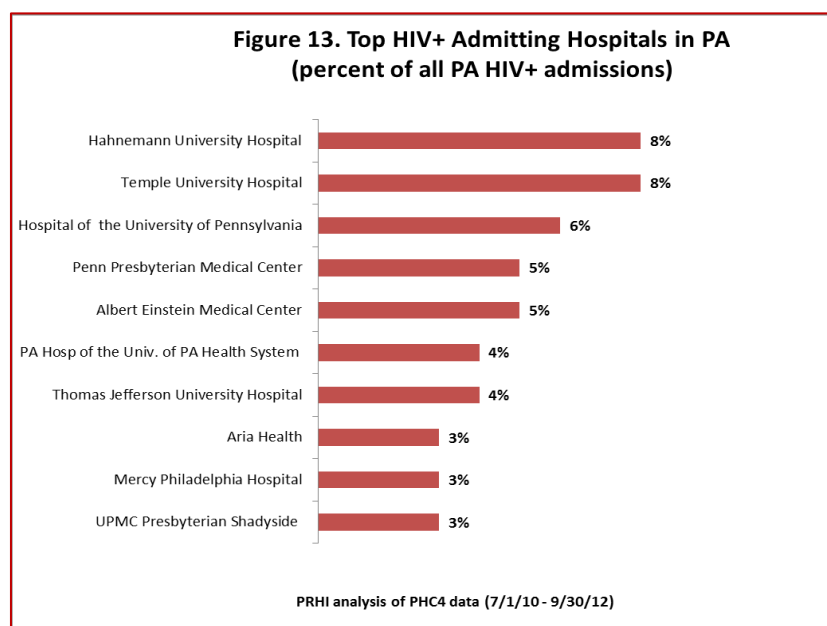
Table 8 uses *odds ratios (OR)* to examine whether there is a difference in 30-day readmission rates in the presence of co-morbid depression and SUD. For example, an OR of 1.0 for SUD for a given diagnosis means that the readmission rate with SUD is identical to the rate without SUD. Likewise, an OR of 1.8 for depression means that the readmission rate with depression is 80% higher than it is without depression. For three diagnoses, the probability of a readmission when comorbid depression is present ranges from 60% higher (*anemias*) to approximately 100% higher (for *chronic renal failure* and *hypertensive chronic kidney disease*).

Table 8. Top ICD-9 Code Group	30-day Readmission Rate with Comorbid Depression	30-day Readmission Rate with Comorbid SUD*
Essential hypertension	26% (Odds ratio: 0.9)	31% (Odds ratio: 1.0)
Viral hepatitis	33% (Odds ratio: 1.3)	34% (Odds ratio: 1.2)
Disorders of fluid electrolyte and acid-base balance	39% (Odds ratio: 1.2)	38% (Odds ratio: 1.0)
Other and unspecified anemias	40% (Odds ratio: 1.6)	43% (Odds ratio: 1.6)
Nondependent abuse of drugs (excluding tobacco)	28% (Odds ratio: 1.1)	29%
Chronic renal failure	48% (Odds ratio: 2.0)	52% (Odds ratio: 2.0)
Other personal history presenting hazards to health	30% (Odds ratio: 1.2)	32% (Odds ratio: 1.2)
Diabetes mellitus	30% (Odds ratio: 1.2)	35% (Odds ratio: 1.2)
Asthma	27% (Odds ratio: 1.0)	31% (Odds ratio: 1.1)
Hypertensive chronic kidney disease	46% (Odds ratio: 1.9)	52% (Odds ratio: 2.1)
Episodic mood disorders	27% (Odds ratio: 1.0)	30% (Odds ratio: 1.1)

* Excluding tobacco

Variation among Top Pennsylvania Admitting Hospitals

Out of the 210 Pennsylvania hospitals with at least one HIV-positive admission, **just ten hospitals accounted for half of all Pennsylvania HIV-positive admissions** during the two years of our data (see Figure 13). These top 10 admitting hospitals are – with one exception (UPMC Presbyterian Shadyside in southwestern PA), all located in southeastern PA – where the vast majority of those living with HIV in PA (65%) reside.¹⁷

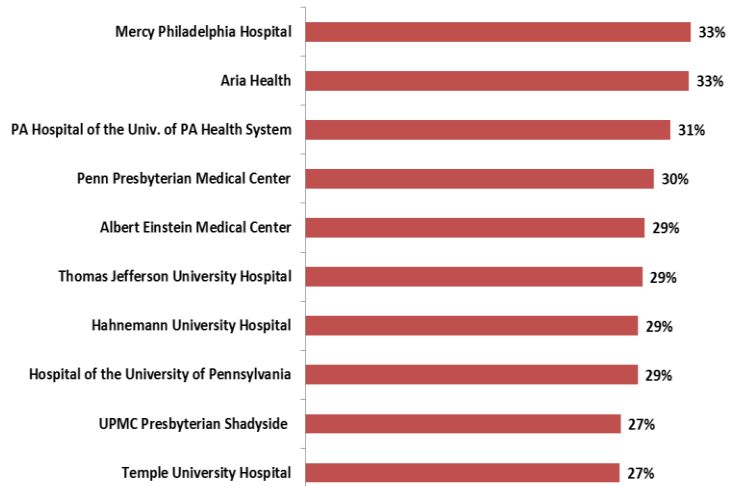


Readmission rates vary across these hospitals,

as can be seen in Figures 14. Between 27% and 33% of discharges resulted in a readmission within 30 days in these hospitals (recall that the PA average for HIV-positive admissions is 28%), although the patient may not have returned to the same hospital from which they were discharged. While these rates are not risk-adjusted for patient mix, work by the Pittsburgh Regional Health Initiative and an outpatient HIV/AIDS clinic with which PRHI

has partnered suggest that readmissions can be significantly reduced.¹⁸ Exploring underlying reasons for these variations is beyond the scope of the present analysis.

Figure 14. 30-day Readmission Rates by Top Admitting Hospitals, PA



Source: PRHI analysis of PHC4 data (7/1/10 - 9/30/12)

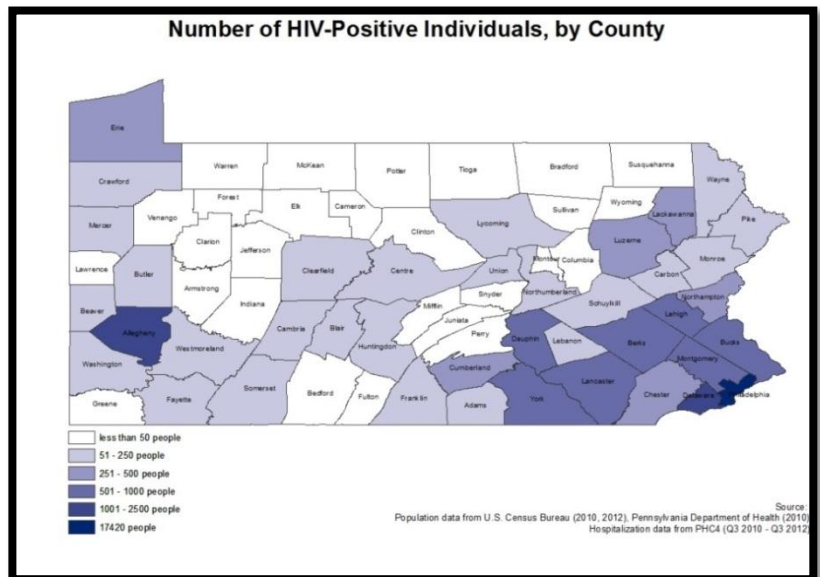
Geographic Patterns of Admissions and Readmissions

On the right is a map showing the distribution of the PLWHA population in PA as of 2010. More than half (17,420 people) reside in Philadelphia County. **Only ten counties have more than 500 PLWHA; nine are clustered around Philadelphia in the east, and one (Allegheny County) is in the west.**

While absolute numbers give us an overall picture of the distribution of PLWHA in Pennsylvania, their numbers relative to overall county population is also instructive.

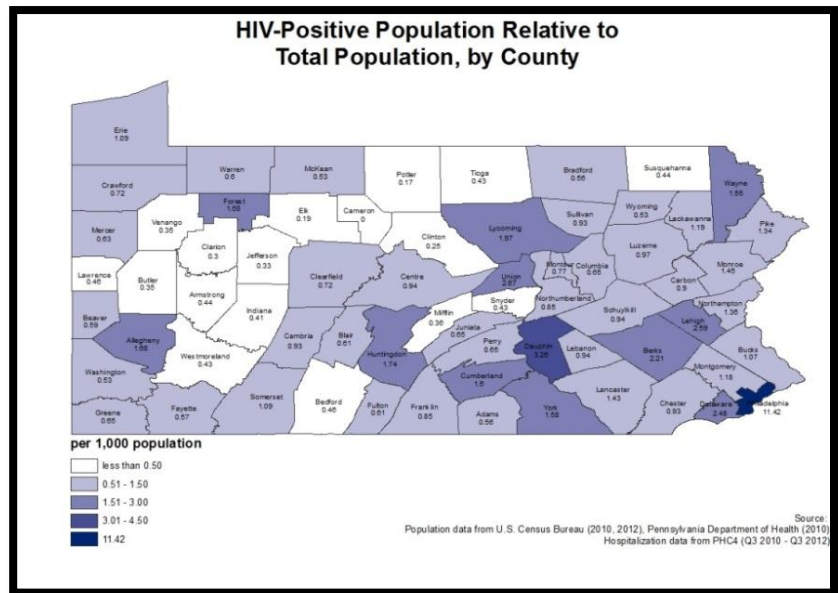
The map below shows the share of the HIV-positive population per 1,000 overall population. Not surprisingly given very high absolute rates, PLWHA represent much larger shares of the overall populations in Philadelphia County.

Number of HIV-Positive Individuals, by County

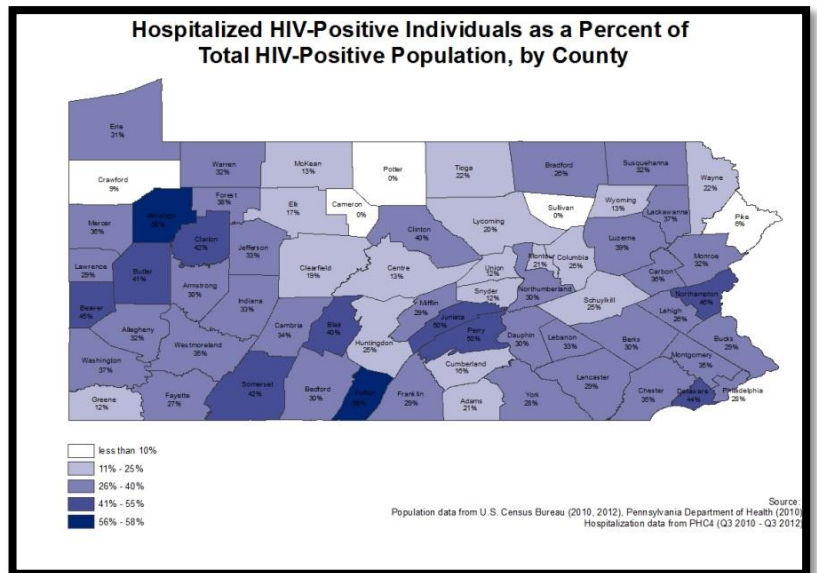


Healthcare providers in counties with few PLWHA may nevertheless be more likely to encounter HIV-positive patients than providers in counties with large HIV-positive populations.

However, some counties with small absolute numbers of PLWHA have high rates relative to their overall populations. For example, Union County in central PA, with a population of 44,947, has an HIV-positive rate of 2.67 per 1,000 – or 120 people. Likewise, Huntingdon County in south central PA, with a population of 45,913, has an HIV-positive rate of 1.74 per 1,000 – or 80 people. **While all healthcare providers need good information on reaching out to and caring for HIV-positive patients, these numbers make the point that healthcare providers in counties with a small HIV-positive population may actually be more likely to encounter HIV-positive patients.**



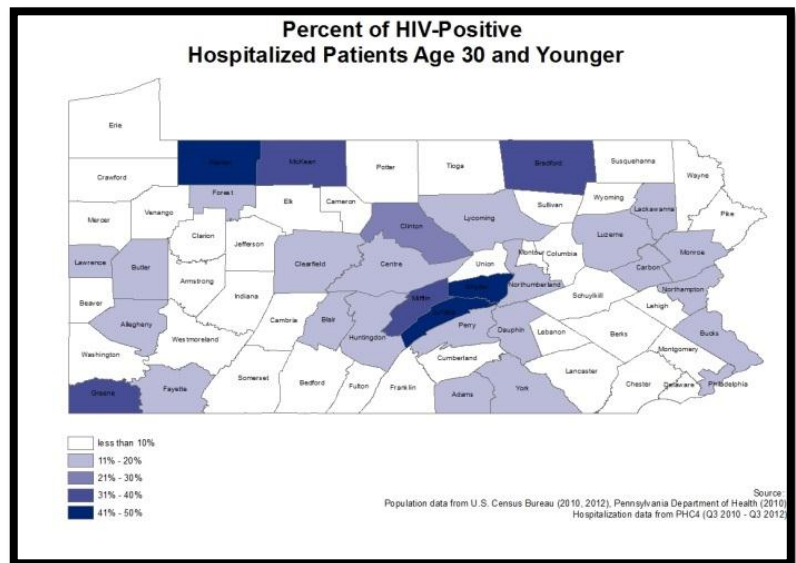
Similarly, the map to the right emphasizes the importance of an effective outpatient disease management and care continuum, even in counties with low absolute numbers of PLWHA. Merging PHC4 hospitalization data with PA Department of Health population data, the map shows the estimated percentage of the PLWHA in each county that was hospitalized between 2010 and 2012. If at least a portion of hospital admissions represents failures to prevent disease exacerbations at the primary care level, then **opportunities to improve outpatient HIV care may be especially pronounced in counties in which larger shares of the PLWHA population was hospitalized.**



While overall, 32% of the HIV-positive population was hospitalized between July of 2010 and October of 2012, in some counties (with darker shading) more than half of the HIV-positive population was hospitalized. For example, in Venango County (northwest PA) 58% of the HIV-positive population appears to have been hospitalized, 56% in Fulton County (south central PA), and 50% in Juniata and Perry Counties (central PA). All have relatively small HIV-positive populations.

By contrast the counties with the largest HIV-positive populations (e.g., Allegheny County) had hospitalization rates closer to the State average, raising the question about whether access to effective HIV primary care is more challenging outside the urban centers.

Finally, the map to the right shows variation in the percentage of HIV-positive hospitalizations that were for patients 30 years or younger. Overall, nine percent of the State's HIV-positive population under the age of 30 was hospitalized. For the most part, counties that exceeded this rate had lower absolute numbers of PLWHA. **Interestingly, the counties with highest rates of 30 and younger hospitalizations are not, for the most part, counties with the largest absolute numbers of PLWHA.** Nor are these counties with disproportionate shares of young people.



A possible explanation is that many of these counties border the regions with larger numbers of PLWHA (the greater Philadelphia, Erie and Allegheny County regions). These counties may represent the leading edge of transmission and/or the fact that providers in regions with small numbers of PLWHA may not yet be equipped to provide effective preventive care. **No matter the underlying cause, efforts to bring young people into regular HIV primary care may need to be heightened in regions proximate to those with high rates of infection.** This is particularly important given that the percentage of new HIV diagnoses among 15-24 year olds in Pennsylvania increased from approximately 9% in 2000 to 21% in 2012.¹⁹

Summary of Key Findings

Estimates provided by the Pennsylvania Department of Health indicate that an average of a third of people living with HIV/AIDS (PLWHA) do not receive recommended HIV primary care. With such care, PLWHA are more likely to be able to control their viral load; minimize the health impact of HIV and its treatment side effects; avoid costly, preventable hospital admissions and readmissions; and avoid transmitting HIV to others.

The purpose of this study was, therefore, to provide information that would help policy makers, healthcare providers and community-based AIDS service organizations target their outreach to and care of the PLWHA community in Pennsylvania. To do this, we used both hospital claims data and epidemiologic data to characterize hospital admissions and

readmissions for PLWHA in PA. Because some hospital admissions and readmissions represent failures to *prevent* acute health conditions, these findings help to identify characteristics of patients experiencing gaps in care. It is our hope that such information can form the basis of targeted outreach strategies.

Our key findings are summarized below:

Characterizing Patients Experiencing Hospital Admissions

- Between July 1, 2010 and September 30, 2012, a third of PLWHA in Pennsylvania was hospitalized at least once. The following groups are overrepresented among hospital patients relative to their share of the HIV-positive population:
 - Women: 29% of the population, but 36% of hospitalized population
 - Older patients: 10% of population, but 41% of hospitalized patients
 - Note that while African Americans are over represented in the HIV-positive population (11.4% of PA population, but 56% of the HIV-positive population), their share of hospitalizations (59%) is roughly similar to their share of the HIV-positive population.
- Just under half (44%) had two or more admissions.
 - The patient groups with the highest number of admissions include those who were dual eligible (with an average of 3.1 admissions) and who received Medicaid or Medicare (with an average of 2.4 admissions).
- Of the 10 most common diagnoses among hospitalized HIV-positive patients, half are related to chronic health conditions. One or more of the top 10 diagnoses was present on 87% of all HIV-positive admissions.
 - While many HIV-positive individuals are now developing chronic health conditions associated with aging, HIV infection and its treatment also increase the risk of cardiovascular disease, renal disease, liver disease and malignancies. It is important to note that while symptoms associated with HIV or its treatment are common, some conditions may be almost eliminated with suppressed viral load.

Characterizing Patients Experiencing Hospital Readmissions

- The average 30-day readmission rate for HIV-positive patients in PA was 28% compared to a PA-wide readmission rate for medical diagnoses of 15%. The rates were higher than for other chronic conditions, like heart failure. Moreover, the 30-day readmission rates were higher than the average for Medicare patients (28% vs. 19.6%).
- Groups more likely to be readmitted within 30 days include:
 - Patients dually eligible for Medicare and Medicaid (34%)
 - Patients transferred to another hospital or long-term care facility (65%)

- Patients with anemias (36%), chronic renal failure (41%) or hypertensive chronic kidney disease (41%)
 - African Americans somewhat more likely (29% vs. 27% for Caucasians)
 - Rates are fairly close for patients age 35 and older, but are highest among 45-64 year olds.
- Behavioral health comorbidities (depression and/or substance use disorders) are a prominent reality for HIV-positive patients. Overall, comorbid depression was documented on 21% of HIV-positive admissions, comorbid SUDs on 19% of HIV-positive admissions and either depression or SUD on 35% of admissions.
 - Comorbid depression and/or SUD were especially high on admissions with documented hypertensive chronic kidney disease (24%) and viral hepatitis (43%).
 - Comorbid depression and SUD are associated with higher likelihood of readmission, especially for patients with diagnosed anemias, chronic renal failure and hypertensive chronic kidney disease.

Variation Among Top Pennsylvania Admitting Hospitals

- While PLWHA were admitted to more than 200 PA hospitals in our study period, just 10 hospitals accounted for half of all HIV-positive admissions; nine of these were located in southeastern PA.
- There are variations in 30-day readmission rates, with eight of the 10 having rates greater than the average (28%). Further study would be required to identify underlying reasons for this variation as the basis for corrective strategies.

Geographic Patterns of Admissions and Readmissions

- Half of PLWHA in Pennsylvania live in the Philadelphia area. Of the 10 counties with 500 or more PLWHA, nine are in greater Philadelphia and one is in Allegheny County (Pittsburgh).
- While improvement efforts in these counties will affect a larger population of PLWHA, our analyses indicate that improvement opportunities abound in other parts of Pennsylvania as well. For example:
 - Some counties, while small, have more PLWHA relative to the size of their overall population (e.g., Union and Huntingdon Counties). This means that providers in those counties may actually be more likely to encounter HIV-positive patients than providers in counties with a large HIV-positive population, but one that is small relative to the total population.

- If at least a portion of hospital admissions represents failures to prevent disease exacerbations at the primary care level, then opportunities to improve outpatient HIV care may be especially pronounced in counties in which larger shares of the PLWHA population were hospitalized. Comparing the size of the HIV-positive population to that of the hospitalized HIV-positive population across PA counties, we see that overall 32% of the HIV-positive population was hospitalized between July of 2010 and October of 2012. In some counties, however more than half of the HIV-positive population was hospitalized (e.g., Venango, Fulton, Juniata and Perry Counties, all with relatively small HIV-positive populations). By contrast the counties with the largest HIV-positive populations (e.g., Allegheny County) had hospitalization rates closer to the State average. The findings suggest that access to effective HIV primary care may be more challenging outside the urban centers.
- Finally, we note that some counties stand for having high rates of hospitalization for PLWHA who are 30 years old or younger. Again, these counties are not, for the most part, counties with the largest absolute numbers of PLWHA (e.g., Greene, Juniata, Warren and Schuylkill Counties), but many border regions with larger numbers of PLWHA (the greater Philadelphia area, Erie and Allegheny Counties). These counties may represent the leading edge of transmission and/or the fact that providers in regions with small numbers of PLWHA may not yet be equipped to provide effective preventive care. No matter the underlying cause, efforts to bring young people who are HIV-positive into regular HIV primary care may need to be heightened in regions proximate to those with high rates of infection.
- Overall, these findings emphasize the fact that, while all healthcare providers need good information on reaching out to and caring for HIV-positive patients, healthcare providers in counties with relatively small numbers of PLWHA should not be overlooked in provider education and engagement efforts.

¹ Pennsylvania Department of Health, Bureau of Epidemiology. Integrated HIV AIDS Epidemiologic Profile, Updated August 2010, Table 43. HIV-primary care includes viral load testing or CD4 count or provision of ART during a 12-month time frame (p. 103).

² Op cit. PA DOH Integrated HIV AIDS Epidemiologic Profile, Updated August 2010, Table 42.

³ This study draws in part on the methods used in an earlier PRHI study analyzing the HIV+ population in western Pennsylvania: Kanel KT, Elster S, Vrbin C and Hazon S. PRHI Readmission Brief: Patterns of Hospitalization Among HIV-Positive Patients in Southwestern Pennsylvania, April 2012 Update.

<http://www.jhf.org/Resources/PaperPdfs/PRHI%20HIV%20Readmission%20Brief%20April%202012%20Update.pdf>

⁴ PHC4 is an independent state agency created and mandated in 1986 by the Pennsylvania (PA) legislature to collect, analyze and make available public data on the cost and quality of care in Pennsylvania. All PA hospitals must report discharge data to PHC4 within 90 days. For more information, see www.phc4.org.

⁵ Pennsylvania Department of Health, Bureau of Epidemiology. Integrated HIV AIDS Epidemiologic Profile, Update August 2010, Table 42.

⁶ Pennsylvania Health Care Cost Containment Council. Hospital readmissions in Pennsylvania 2010, Figure 7, page 19. April 2012. <http://www.phc4.org/reports/readmissions/10/docs/readmissions2010report.pdf>, accessed November 12, 2013.

⁷ The Centers for Disease Control and Prevention defines ICD-9 codes as follows: "The International Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) is based on the World Health Organization's Ninth Revision, International Classification of Diseases (ICD-9). ICD-9-CM is the official system of assigning codes to diagnoses and procedures associated with hospital utilization in the United States."

<http://www.cdc.gov/nchs/icd/icd9cm.htm>, accessed November 7, 2013.

⁸ Kanel, Elster, Vrbin and Hazon, 2012 update. op cit, page 4

⁹ Deeks SG and Phillips AN. HIV infection, antiretroviral treatment, ageing, and non-AIDS related morbidity. British Medical Journal. 2009(338).

¹⁰ Schambelan, M, Benson, CA, Carr, A, et al. Management of metabolic complications associated with antiretroviral therapy for HIV-1 infection: recommendations of an International AIDS Society-USA panel. Journal of Acquired Immune Deficiency Syndrome 2002; 31:257

¹¹ AIDS.gov, <http://aids.gov/hiv-aids-basics/staying-healthy-with-hiv-aids/potential-related-health-problems/kidney-disease/>, Accessed November 3, 2013. See also Choi, A. and Rodriquez, R.; "Renal Manifestations of HIV"; HIV Insite Knowledge Base Chapter; Nov. 2003; Updated Jan. 2008.

¹² Centers for Disease Control and Prevention. HIV and Viral Hepatitis. May 2013.

<http://www.cdc.gov/hiv/resources/factsheets/hepatitis.htm>.

¹³ Chubineh 2008, cited in Kanel et al, op cit 2012.

¹⁴ Pennsylvania Health Care Cost Containment Council. Hospital readmissions in Pennsylvania 2010. April 2012. <http://www.phc4.org/reports/readmissions/10/docs/readmissions2010report.pdf>, Accessed November 3, 2013.

¹⁵ Jencks SF, Williams MV and Coleman EA. Rehospitalizations among patients in the Medicare fee-for-service program. New England Journal of Medicine, 2009:1418-1428.

<http://www.nejm.org/doi/full/10.1056/NEJMs0803563>, accessed November 3, 2013.

¹⁶ Comorbid depression includes all the ICD-9 codes related to depression: 296.20, 296.21, 296.22, 296.23, 296.24, 296.25, 296.26, 296.30, 296.31, 296.32, 296.33, 296.34, 296.35, 296.36, 298.0, 300.4, 309.1, 311. Comorbid substance use disorder (SUD) includes all ICD-9 code groups related to alcohol or legal and illegal drug use include: 303 (alcohol dependence), 304 (drug dependence) and 305 (nondependent abuse of drugs).

¹⁷ Bureau of Epidemiology, Pennsylvania Department of Health. 2012/13 Integrated Epidemiologic Profile of HIV/AIDS in Pennsylvania (in support of prevention and care), Section D, Subsection D2, page D2-p2.

¹⁸ Smith RC and Condel J. Reducing 30-day hospital readmissions among HIV/AIDS population. Presented at Academy Health's Annual Research Meeting, Baltimore, MD, June 24, 2013.

<http://academyhealth.org/files/2013/monday/smithr.pdf>, accessed February 11, 2014.

¹⁹ Bureau of Epidemiology, PA Department of Health, 2012 Annual HIV Surveillance Summary, December 2012, p.