# Comparative Costs and Benefits of Permanent Supportive Housing in Knoxville, Tennessee


The Mayors' Office of the Ten Year Plan to End Chronic Homelessness
*Michael Dunthorn, BA*
*Kendall Cox, BA Intern*

The Knox County Health Department Epidemiology Program
*Kathy Brown, Ph.D.*
*Alicia Mastronardi, MPH*
*Roberta Sturm, MPH*

The University of Tennessee College of Social Work-KnoxHMIS
*David A. Patterson, Ph.D.*
*Stacia West, MSSW*
*Steven Stothard, MSSW Intern*


Knox County Health Department
Every Person, A Healthy Person

KnoxHMIS

City of Knoxville

## ACKNOWLEDGEMENTS

This study was made possible because of participating men and women living in permanent supportive housing in Knox County. We thank them for their assistance.

The staff of Volunteer Ministry Center and Helen Ross McNabb Center in Knoxville were crucial in consenting participants into the study. This study would not have been possible without their assistance.

Thirteen different agencies and organizations contributed data to this study. Collecting these data presented challenges for many and we thank each agency for the time devoted to this study and their willingness to contribute to an improved understanding of the cost of homelessness to the community.

Much appreciation also goes to the staff of Knoxville Homeless Management Information System (KnoxHMIS) for their technical assistance, guidance on data collection, and their database from which the sample was drawn.

## PROJECT TEAM

Kathleen Brown, PhD, MPH, RN, CHES
Director, Community Assessment and Health Promotion
Knox County Health Department

Alicia Mastronardi, MPH
Epidemiologist
Knox County Health Department

Steven Stothard, MSSW
KnoxHMIS Intern
College of Social Work
University of Tennessee, Knoxville

Stacia West, MSSW
Data Analyst, KnoxHMIS
College of Social Work
University of Tennessee, Knoxville

Michael Dunthorn
Project Manager, Homeless Plan Implementation Office
City of Knoxville

David Patterson, PhD
Professor and Director KnoxHMIS
College of Social Work
University of Tennessee, Knoxville

Roberta Sturm, MPH
Epidemiologist
Knox County Health Department

## EXECUTIVE SUMMARY

The presence of individuals experiencing chronic homelessness in Knox County, Tennessee remains an ongoing challenge to the community. The purpose of this study was to measure the effect of permanent supportive housing on the cost and frequency of services used by a sample of the chronically homeless population in Knox County. Permanent supportive housing provides people who are homeless with a stable residence and supportive services. Objectives of the study were:

To compare service utilization one year prior to entering PSH to the first year in PSH.

To compare costs associated with services between the year prior to entering PSH and the first year of PSH.

Rationale: Improved understanding of the costs and benefits of permanent supportive housing for individuals and families who are experiencing chronic homelessness can inform local efforts to effectively address chronic homelessness. Similar studies in cities across the United States have found notable reductions in services utilization and community costs[1].

### Methods

Forty-one individuals over the age of 18 consented to participate in the study. All participants experienced chronic homelessness for at least one year and had subsequently lived in permanent supportive housing for at least one year. Data for the study were drawn from Knoxville Homelessness Management Information System (KnoxHMIS) (including permanent housing date) and linked with frequency and cost data for services obtained separately from Covenant Health, Mercy Health Partners, University of Tennessee Medical Center, Helen Ross McNabb Center, Inc., Cherokee Health Systems, Lakeshore Mental Health Institute, Knox County Health Department, Knoxville Police Department, Knox County Sheriff's Office, and Rural/Metro Corporation. Participants in the study had the following demographic characteristics, 83% male, 59% white, 90% single/divorced/separated, and average age of 52.

### Findings

- Community Costs[2] -The cost of community services for the 41 participants decreased by $76,721 compared to one year before permanent supportive housing placement.
    - Of that amount, there was a$38,664 decrease in Knox County Sheriff's Office costs associated with incarceration. This represents a 99% decrease in costs ($45,072 vs. $640) and an 86% decrease of days in jail.
    - Knoxville Police Department showed a 67% decrease in field interviews, citations and arrests one year after permanent supportive housing for participants.

[1] http://documents.csh.org/documents/policy/UpdatedCostMatrixSept09.pdf - Retrieved from Community Supportive Housing website http://www.csh.org/about-csh

[2] Community services include case management, emergency shelter, supportive services, jail stays, and emergency medical services.

    - Overall, there was a 57% decrease in costs associated with community services as a result of placement in permanent supportive housing.
- Mental Health Services[3] – The cost of mental health services decreased by $20,669 from pre- to post-permanent supportive housing placement.
    - Over half of the participants (54%) accessed mental health outpatient services either before or after permanent supportive housing placement.
    - There was a $21,418 decrease (23%) in mental health inpatient services and a $750 increase in outpatient services ($16,172 vs. $16,921).
- Healthcare Services[4] - Costs increased $131,117 or $3,198 per capita after permanent supportive housing placement among the 41 participants in the study.
    - For inpatient hospitalizations, 7% of the study participants account for 59% of the pre-housing charges and 90% of the post-housing charges.
    - For outpatient hospital services, 7% of participants accounted for 88% of cost pre-housing and 72% of costs post-housing.
- Summary Findings – The cost of one year of housing for the 41 participants was $144,791 or $3,531 per capita. Table 1 summarizes total costs associated with community services, mental health services, healthcare services and housing, showing the pre- and post-housing per capita costs.

**Table 1. Costs Summary Per Capita**

| | Pre-Housing Costs | Post-Housing Costs (includes cost of housing) | Difference |
|---|---|---|---|
| All Participants (N=41) | $16,322 | $20,676 | $4,354 |
| Outliers[5] Removed (n=26) | $9,861 | $8,716 | -$1,145 |

**Table 2. Average Public Facility Costs per Day of Usage in Knox County**

| Type of Public Facility | Cost per Day of Usage |
|---|---|
| Supportive Housing* | $12 |
| Emergency Shelter | $12 |
| Jail | $72 |
| Mental Health Inpatient Hospital | $816 |
| Inpatient Hospital | $5,027 |

*This figure was calculated based on public burden only for the 41 participants in the study.
Source: Picture of the Present: Tennessee's Health (2007) Tennessee Department of Health

[3] Mental Health services include both inpatient and outpatient mental health care costs.
[4] Healthcare costs include inpatient hospitalization, outpatient hospitalization, primary care service and emergency room utilization.
[5] An outlier is an observation that is more than two standard deviations above or below the sample mean.

## FOR MORE INFORMATION

**For more information about this study, please contact:**

Michael Dunthorn
Project Manager, Homeless Plan Implementation Office
City of Knoxville
400 Main Street, Room 512
Knoxville, TN 37902
(865) 215-3103
mdunthorn@cityofknoxville.org

**For technical questions about methodology or data, please contact:**

David Patterson, PhD
Professor and Director Knox HMIS
College of Social Work
University of Tennessee, Knoxville
1618 Cumberland Avenue
Knoxville, TN 37996
(865) 974-7511
dpatter2@utk.edu

Kathleen C. Brown, PhD, MPH, RN, CHES
Director, Community Assessment and Health Promotion
Knox County Health Department
140 Dameron Avenue
Knoxville, TN 37917
(865) 215-5170
kathleen.brown@knoxcounty.org

## INTRODUCTION

The goal of this study was to determine the impact of permanent supportive housing (PSH) on the cost and frequency of services used by individuals experiencing chronic homelessness in Knox County, Tennessee. PSH provides individuals experiencing chronic homelessness with both a safe, stable residence and a case manager. The U.S. Department Housing and Urban Development's (HUD) definition of an individual experiencing chronic homelessness is: "either (1) an unaccompanied homeless individual with a disabling condition who has been continuously homeless for a year or more, OR (2) an unaccompanied individual with a disabling condition who has had at least four episodes of homelessness in the past three years." A disabling condition is defined as "a diagnosable substance abuse disorder, a serious mental illness, developmental disability, or chronic physical illness or disability, including the co-occurrence of two or more of these conditions." Additionally, "a disabling condition limits an individual's ability to work or perform one or more activities of daily living" (HUD, 2007). Typically, a case manager assesses the needs of the client and as necessary "arranges, coordinates, monitors, evaluates, and advocates for a package of multiple services to meet the specific client's complex needs."(NASW, 2012)

By definition, individuals experiencing chronic homelessness have disabling conditions and, as such, pose a service delivery challenge to community health, mental health, and substance abuse treatment providers. Homeless adults have high rates of chronic medical illness, severe and persistent mental illness, and substance abuse/dependence (Edens, Mares, & Rosenheck, 2011; Sadowski, Kee, VanderWeele, & Buchanan, 2009).

Objectives of the study were:

> To compare service utilization one year prior to entering PSH to the first year in PSH.
>
> To compare costs associated with services between the year prior to entering PSH and the first year of PSH.

Study Rationale: Studies across the U.S. have found that providing the individuals experiencing chronic homelessness PSH reduces utilization of services and associate costs to communities (CSH, 2012). PSH has been associated with reductions in incarcerations, hospitalizations, use of emergency shelters, and related social costs in multiple studies (Kresky-Wolff, Larson, O'Brien, & McGraw, 2010).

This study is modeled on studies conducted in Maine and New York City (Mondello, Gass, McLaughlin,& Shore, 2007; Mondello, Bradley, Chalmers, & Shore, 2009; Palermo, Dera, Cltne, Ternoway, & Lewis, 2006). This study replicates the methodology in the 2007 Maine study to determine a cost comparison.

## METHODS

All research participants were individuals 18 and older who *formerly* experienced chronic homelessness and subsequently lived in PSH for one year or more.

KnoxHMIS is an integrated network of Knoxville area homeless service providers using encrypted Internet communication linking them to a secure, central homeless information database. Operated by the University of Tennessee's (UT) College of Social Work, KnoxHMIS resides on firewall-protected servers at UT. This HUD and locally funded community outreach research endeavor, employs state of the art, web-based information management software and empowers homeless service providers to access and manage real-time client and resource data. All computers linking to the KnoxHMIS have password protected virtual private network (VPN) and all users of the KnoxHMIS have received training in the protection of client privacy. Using KnoxHMIS to generate a sample allowed researchers to confirm that participants met all inclusion criteria; including having the ability to give legal consent for themselves. No individual with a condition that precluded his or her ability to give legal consent was included in the study sample.

Case managers who were currently licensed KnoxHMIS users employed by either Volunteer Ministry Center or Helen Ross McNabb Center (and previously signed and agreed to the confidentiality and data security requirements of the KnoxHMIS User Policy, Responsibility Statement & Code of Ethics) recruited participants. To minimize any risk of coercion, case managers did not recruit from their own caseload. Case managers were chosen to recruit potential participants because they: 1) understood the target population; 2) had an established relationship and trust with the target population; 3) had already signed confidentiality and data security requirements of KnoxHMIS; 4) were willing to assist with the study with no incentive; and 5) had previously recruited participants into similar research studies.

Forty-four individuals were consented into the study over a 5-month period out of a possible 137 individuals who were identified to meet the study criteria at that time. In order to access a full year of data after PSH placement, only individuals with housing dates before March 1, 2010 were eligible to participate. Three individuals consented into the study were not included in analysis because records indicated that they may not have been in Knox County for the entire year prior to PSH placement. Participating individuals were consented into the study by a Volunteer Ministry Center or Helen Ross McNabb case manager who was not their own (to avoid any possible coercion issues).

### Data Collection

Once consent to participate in the study was obtained from a participant, they were included in a data request to service agencies in the area. KnoxHMIS data (including PSH date) was linked with frequency and cost data for services obtained separately from Covenant Health, Mercy Health Partners, University of Tennessee Medical Center, Helen Ross McNabb Center, Cherokee Health Systems, Lakeshore Mental Health Institute, Knox County Health Department, Knoxville Police Department, Knox County Sheriff Office, and Rural/Metro. Information released to the

researchers only included type of service (i.e. nights of jail stay, inpatient visit, outpatient visit, or emergency room visit and length of stay) and costs of services.

Agencies were given a large time span (January 1, 2005- March 1, 2011) and asked to provide service and cost data on consented participants for that time span. Data were queried for each individual participant to capture only one year before and one year after PSH was established. These data included information regarding hospital admissions, medical services, mental health services, police contacts, emergency medical service care, and jail stays. This allowed comparison of service care costs for one year pre- and post-PSH.

Secure file transfer protocol (FTP) sites were set up with most agencies to ensure secure transfer of all data. For those unable to set up FTP sites, password protected e-mail or hard copies were exchanged. A list of consented participants was sent to each service provider. This list included the following: subject's name, social security number, and the date of birth to ensure that data for the correct individual was being obtained. Service providers queried their management system for cost data on the participants including service charges, department code, amount paid for the service and the payment source (when available) for each individual for the specified timeframe requested.

## Analysis

Most of the data were received from agencies in Microsoft Excel spreadsheets, though some hard copies were received and entered into Excel by staff. Excel was also used to conduct analysis.

Data were cleaned for each individual based on PSH date. Total costs were compared for participating individuals for one year before and one year after PSH date. Further exploratory analysis included removing outliers[6] by service type and person from the final product. Appendix B includes discussion of this analysis and data are shown with outliers removed.

[6]An outlier is an observation that is more than two standard deviations above or below the sample mean.

## RESULTS

The results of this study are presented below under the topics Community Services, Mental Health Services, and Primary Care Services. Total costs and per capita costs are reported for one year before PSH placement (defined as "pre-housing" in the tables) and one year after PSH placement (defined as "post-housing" in the tables). Per capita cost and service use is calculated using the entire study sample (41 participants) as the denominator. As is noted in the tables, the number of individuals who used a specific service (defined as "n" in the tables) is not consistent across services.

**Table 3. Sample demographics**

| | Gender | | Primary Race | | Ethnicity | | Marital Status | | Average Age |
|---|---|---|---|---|---|---|---|---|---|
| | Male | Female | White | Non-White | Hispanic/ Latino | Non-Hispanic | Single/ Divorced/ Separated | Married | |
| Non-consented sample (N=96) | 77% | 23% | 66% | 34% | 6% | 94% | 97% | 3% | 48 |
| Consented Sample (N=41) | 83% | 17% | 59% | 41% | 0% | 100% | 90% | 10% | 52 |

Data provided by KnoxHMIS.

The 96 people that were eligible for the study (experiencing chronic homelessness at least one year prior to study and were all placed in PSH for at least one year) were not consented into the study because they were lost to follow-up. These individuals likely moved out of PSH and into rental housing and, therefore, case managers were unable to find them.

## COMMUNITY SERVICES

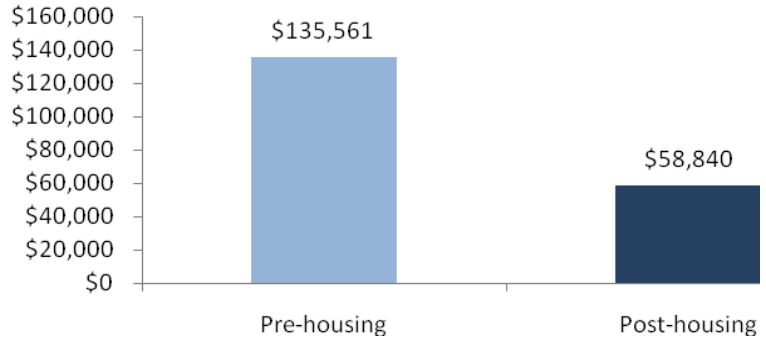
Cost analyzed under community services include case management, emergency shelter, supportive services, jail stays, and emergency medical services (EMS). Case management, emergency shelter, and supportive services data were collected via KnoxHMIS.

Community service costs decreased $76,721 for the 41 study participants compared to one year before PSH placement.

**Table 4. Community Services Costs** ***(includes emergency shelter, supportive services, case management costs, emergency medical services, and jail costs)***

| Pre-housing | Post-housing | Difference |
|---|---|---|
| $135,561 | $58,840 | -$76,721 |

**Figure 1. Community Services Costs *(includes emergency shelter, supportive services, case management costs, emergency medical services, and jail costs)***




## Emergency Shelter

Emergency shelter data comes from KnoxHMIS system and includes costs for nights of stay in Knoxville Area Rescue Ministry (KARM) and Salvation Army. KARM costs are for the night of stay only whereas Salvation Army costs include meals and other services that may be provided. An average cost per night of stay was given by these agencies to calculate the charges.

Notable findings include:

- Emergency shelter costs decreased by $29,363.
- Emergency shelter bed utilization data collection began in April 2008, so these savings may be an underestimate.

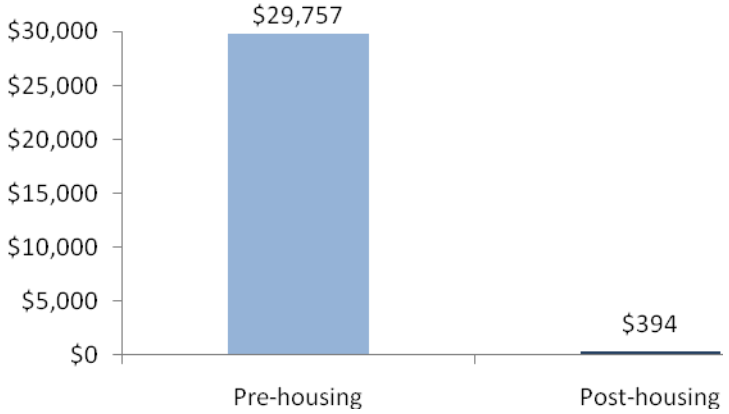
**Table 5. Emergency Shelter Costs**

| **Emergency Shelter Cost** | | |
|---|---|---|
| | Pre-housing | Post-housing[7] |
| **Individuals accessing service** | 21 | 6 |
| **Total Cost** | $29,757 | $394 |
| **Per Capita Cost*** | $726 | $10 |
| **Emergency Shelter Days of Stay** | | |
| **Total Nights of Stay** | 2,418 | 32 |
| **Average Nights of Stay (per capita)** | 59 | 1 |

*Per capita N=41

[7] Emergency shelter may be accessed after a PSH date is set because residence may be available but some time for set-up may still be necessary.

**Figure 2. Emergency Shelter Costs**




## Supportive Services

Supportive services data were collected from KnoxHMIS and includes data from assisting agencies Volunteer Ministry Centers (VMC), KARM, and Helen Ross McNabb Center. Examples of supportive services include:

- Bus passes
- Laundry facilities
- Drop-in centers
- Baggage check in facilities
- Phone charges

Notable findings include:

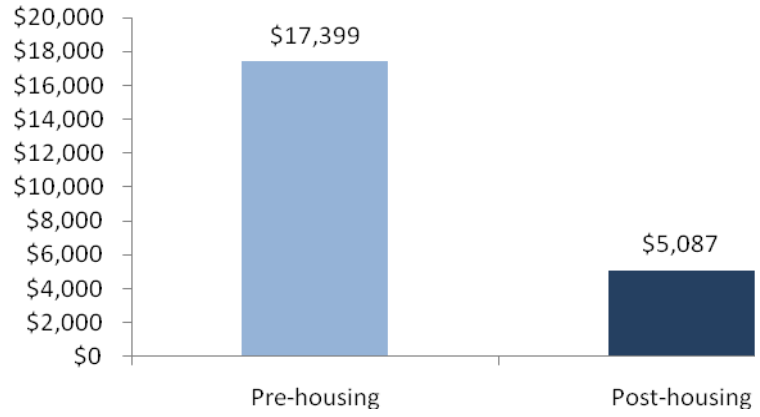
- 85% of participants used supportive services before PSH placement and 83% used supportive services afterward. However, there was a drop in the number of services used pre-housing (6,434 encounters) compared to post-housing (1,395 encounters) which represents a 78% drop in services utilization.
- For participants who received these services, there was a decrease of $12,312 pre-housing compared to post-housing which is a 70% drop in costs.

**Table 6. Supportive Services Costs**

| **Supportive Services Costs** | | |
|---|---|---|
| | Pre-housing | Post-housing |
| **Individuals accessing service** | 35 | 34 |
| **Total Cost** | $17,399 | $5,087 |
| **Per Capita Cost*** | $424 | $124 |
| **Supportive Services Encounters (n=38)** | | |
| **Total Number of Encounters** | 6,434 | 1,395 |
| **Average Number of Encounters (per capita)** | 157 | 34 |

*Per capita N=41

**Figure 3. Supportive Services Costs**




## Case Management Services

Case management services include: individual counseling, group therapy and alcohol/substance abuse prevention education. Agencies began documenting case management as a service in HMIS in April 2007. Therefore, though case management is part of the PSH experience for all individuals, this data was not available for all participants.

Notable findings include:

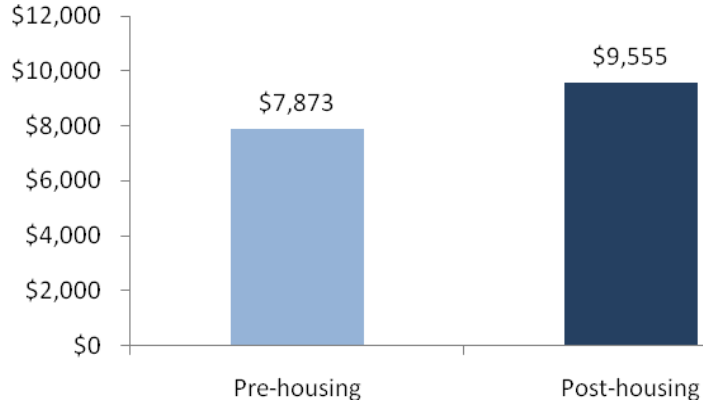
- 63% of the study participants used case management services before being placed in PSH and 66% accessed these services after being placed in housing.
- Case management costs increased after PSH placement (by $1,682).

**Table 7. Case Management Cost**

| Case Management Costs | | |
|---|---|---|
| | Pre-housing | Post-housing |
| **Individuals accessing service** | 26 | 27 |
| **Total Cost** | $7,873 | $9,555 |
| **Per Capita Cost*** | $303 | $354 |
| **Case Management Encounters** | | |
| **Total Number of Encounters** | 330 | 435 |
| **Average Number of Encounters (per capita)** | 13 | 18 |

*Per Capita n=26 pre-housing and n=27 post-housing

**Figure 4. Case Management Costs**




## Emergency Medical Services (EMS)

Emergency Medical Services cover medical service transportation provided by RuralMetro EMS. These services include costs for any ambulance trips taken one year before and one year after PSH for the 41 consented participants.

Notable findings include:

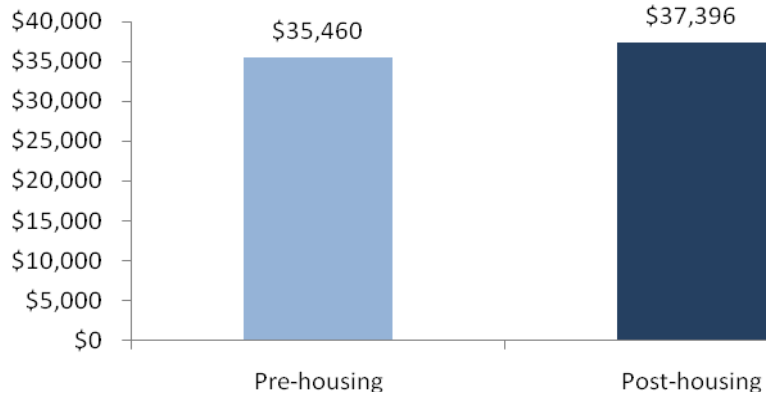
- 37% of study participants accessed EMS before being placed in PSH and 34% accessed these services after placement.
- Costs increased by $1,936 after PSH placement among the participants.
- Number of emergency medical service encounters increased by 5 encounters after housing placement.
- It should be noted that 5% of the participants accounted for over half of the post-housing EMS charges. With outliers removed, costs decreased by $6,960. For an analysis of EMS costs without these outliers, see Appendix B.

**Table 8. Emergency Medical Services**

| **Emergency Medical Services Costs** | | |
|---|---|---|
| | Pre-housing | Post-housing |
| **Individuals accessing service** | 15 | 14 |
| **Total Cost** | $35,460 | $37,396 |
| **Per Capita Cost*** | $865 | $912 |
| **Emergency Medical Services Encounters** | | |
| **Total Number of Encounters** | 57 | 62 |
| **Average Number of Encounters (per capita)** | 1 | 2 |

*Per Capita N=41

**Figure 5. Emergency Medical Services Costs**




## Law Enforcement Services

Law enforcement services data came from Knox County Sherriff's Office (KCSO) and Knoxville Police Department (KPD). KCSO accounts for all jail costs. KPD may arrest individuals, but if incarceration is required, the individual is transferred to KCSO facilities. Some individuals may be arrested under KCSO jurisdiction (which includes all Knox County areas outside of Knoxville) or KPD jurisdiction. In addition, data from University of Tennessee Police Department was not requested.

Notable findings include:

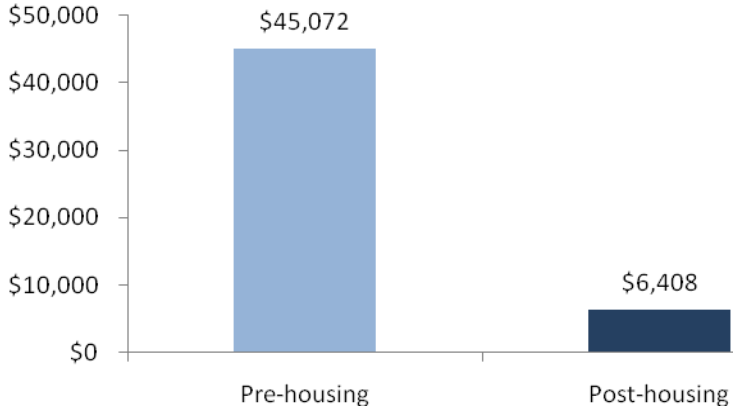
- Before PSH placement 37% of study participants were in KCSO detention center for at least one night. After housing placement, 17% of participants were in the KCSO detention center at least one night.
- There were notable savings in this community service category and decreased by $38,664 after PSH placement for the 41 participants in the study. This represents a 99% decrease in costs.
- 10% of the study participants accounted for 91% of pre-housing costs.

**Table 9. Jail Costs**

| **Jail Costs** | | |
|---|---|---|
| | Pre-housing | Post-housing |
| **Individuals accessing service** | 15 | 7 |
| **Total Cost** | $45,072 | $640 |
| **Per Capita Cost*** | $1,099 | $156 |
| **Jail Days of Stay** | | |
| **Total Days of Stay** | 626 | 89 |
| **Average Days of Stay (per capita)** | 15 | 2 |

*Per Capita N=41

**Figure 6. Jail Costs**




Knoxville Police Department provided the study with data on individuals for arrests and encounters. Though it was not feasible to estimate a monetary value on these types of services as they vary greatly depending on location and time spent on the individual encounter, below is a number count for the individuals participating in the study including one year before and one year after PSH was obtained. Nearly half (44%) of the participants in the study had a Knoxville Police Department encounter. Table 7 shows a decrease in field interviews, citations and arrests one year after permanent supportive placement.

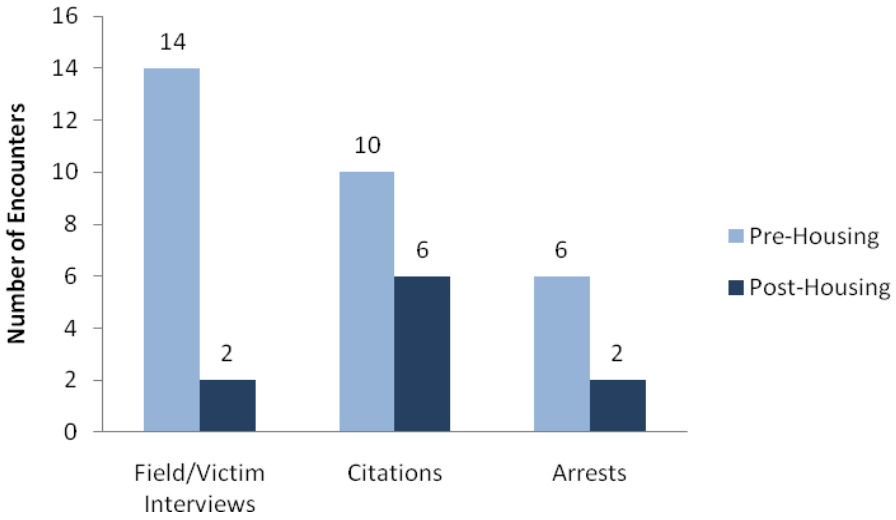
> Knoxville Police Department showed a 67% decrease in field interviews, citations and arrests one year after PSH for participants. There were 30 total encounters among the 41 participants pre-housing and only 10 post-housing.

**Table 10. Knoxville Police Department Encounters**

| **Police Encounters** | | |
|---|---|---|
| | Pre-housing | Post-housing |
| **Individuals with KPD encounters** | 13 | 8 |
| **Field/Victim Interviews** | 14 | 2 |
| **Citations** | 10 | 6 |
| **Arrests**[8] | 6 | 2 |

[8] Seven individuals were incarcerated (as noted in Table 6), however, KPD only reports 2 arrests. This difference is likely due to arrests made in KCSO or University of Tennessee jurisdictions. Arrest data was not collected from these agencies.

**Figure 7. Knoxville Police Encounters**




## MENTAL HEALTH SERVICES

Mental health services include data from Lakeshore Mental Health Institute, Covenant Health (Peninsula), Cherokee Health Services and Helen Ross McNabb. These services included both inpatient and outpatient mental health care costs.

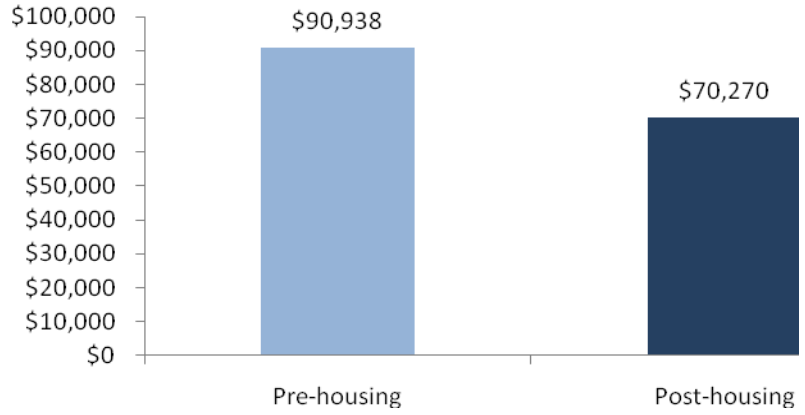
Notable findings include:

- Over half of the participants (54%) accessed mental health outpatient services either before or after PSH placement.
- The total cost of mental health inpatient services decreased by $21,418 (a 23% decrease).
- The total number of mental health inpatient days decreased by 11 days.
- The total cost of mental health outpatient services increased by $750.
- The total number of mental health visits increased by 20 after PSH.
- Total mental health costs (inpatient and outpatient) decreased by $20,669.
- With the removal of 5% of participants in cost outlier analysis of mental health outpatient services, a cost savings of $781 and a decrease in outpatient encounters (8 encounters) was noted. For an analysis of mental health costs without these outliers, see Appendix B.

**Table 11. Mental Health Services**

| Pre-housing | Post-housing | Difference |
|---|---|---|
| $90,938 | $70,270 | -$20,669 |

**Figure 8. Mental Health Services**




## Mental Health Inpatient Services

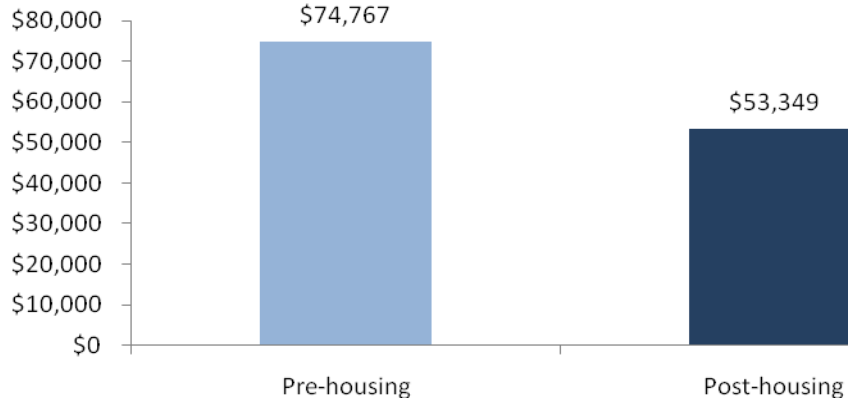
Mental health inpatient services only include costs for overnight stays in mental health care facilities, Lakeshore and Peninsula. These facilities offer inpatient services.

**Table 12. Mental Health Inpatient Costs**

| Mental Health Inpatient Costs | | |
|---|---|---|
| | Pre-housing | Post-housing |
| **Individuals accessing service** | 8 | 4 |
| **Total Cost** | $74,767 | $53,349 |
| **Per Capita Cost*** | $1,824 | $1,326 |
| **Mental Health Days of Stay** | | |
| **Total Days of Stay** | 84 | 73 |
| **Average Days of Stay (per capita)** | 2 | 2 |

*Per Capita N=41

**Figure 9. Mental Health Inpatient Costs**



## Mental Health Outpatient Services

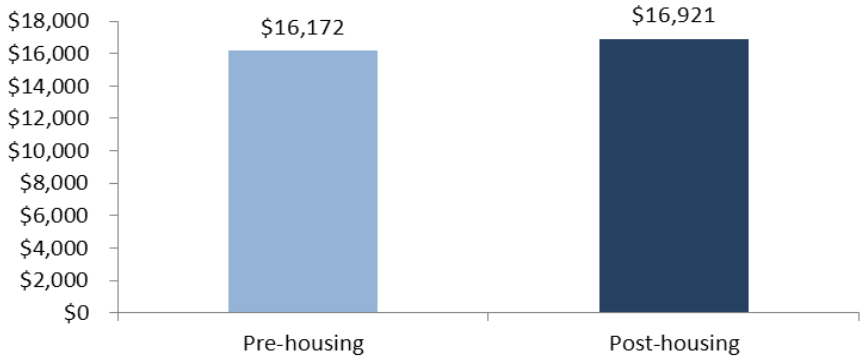
Mental health outpatient services include any outpatient visits and care from Helen Ross McNabb, Peninsula and Cherokee Health.

**Table 13. Mental Health Outpatient Costs**

| Mental Health Outpatient Costs | | |
|---|---|---|
| | Pre-housing | Post-housing |
| **Individuals accessing service** | 20 | 16 |
| **Total Cost** | $16,172 | $16,921 |
| **Per Capita Cost*** | $394 | $413 |
| **Mental Health Outpatient Visits** | | |
| **Total Visits** | 130 | 150 |
| **Average Number of Visits (per capita)** | 3 | 4 |

*Per Capita N=41

**Figure 10. Mental Health Outpatient Costs**



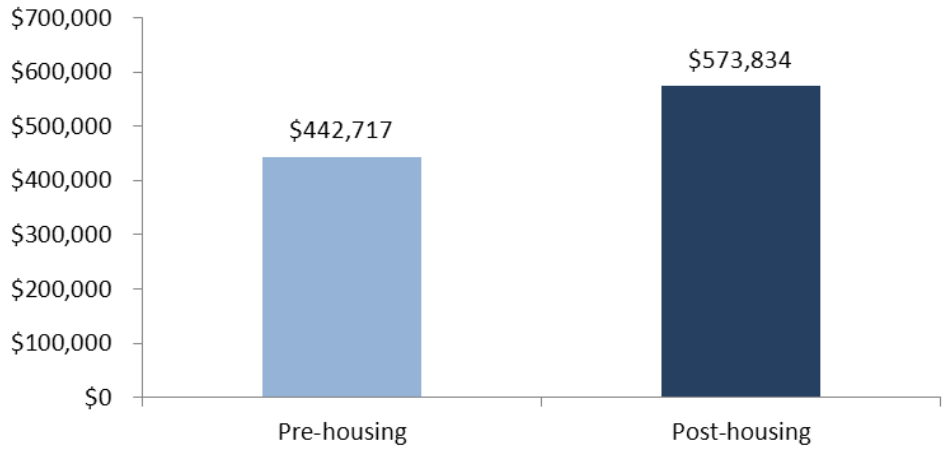

## HEALTHCARE SERVICES

Healthcare services include the following: inpatient hospitalization costs, outpatient hospitalization costs, primary care service costs and emergency room utilization costs. Data was collected from the following agencies: Covenant Health Systems, University of Tennessee Medical Center, Mercy Health Partners, Knox County Health Department, and Cherokee Health Systems. As with all service categories, only cost data was obtained and medical information connected to those costs was not requested to protect the privacy of the study's participants.

**Table 14. Healthcare Service Costs**

| Pre-housing | Post-housing | Difference |
|---|---|---|
| $442,717 | $573,834 | $131,117 |

**Figure 11. Healthcare Service Costs**




## Inpatient Hospital Services

Inpatient Hospital Services include costs for any hospitalizations requiring at least one overnight stay or more.

**Notable findings include:**

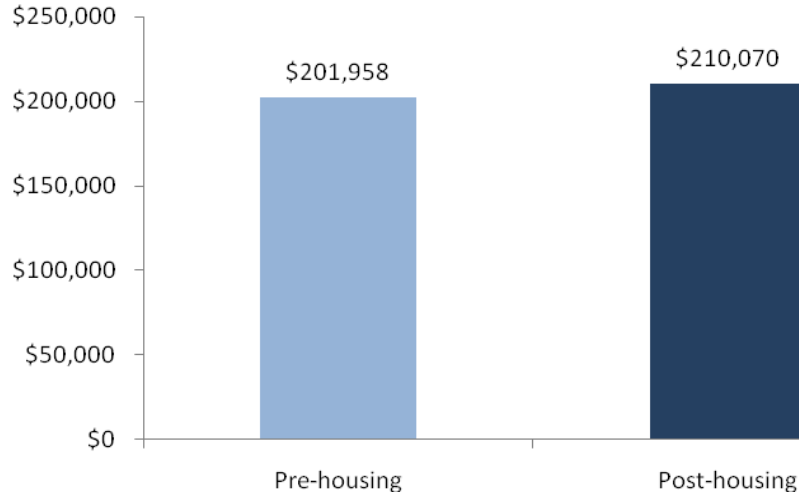
- Before permanent supportive housing, 22% of study participants accessed inpatient hospital services at the participating agencies. After housing placement, 12% accessed these services.
- 7% of the study participants account for 59% of the pre-housing charges and 90% of the post-housing charges. For additional information about outlier analysis, refer to Appendix B.
- Total days of stay decreased by 6 after PSH placement.
- For hospital inpatient services, an increase of $197 per capita was determined post-housing placement.

**Table 15. Inpatient Hospital Services Costs**

| Inpatient Hospital Services Costs | | |
|---|---|---|
| | Pre-housing | Post-housing |
| **Individuals accessing service** | 9 | 5 |
| **Total Cost** | $201,958 | $210,070 |
| **Per Capita Cost*** | $4,926 | $5,124 |
| **Inpatient Days of Stay** | | |
| **Total Days of Stay** | 46 | 40 |
| **Average Days of Stay (per capita)** | 1 | 1 |

*Per Capita N=41

**Figure 12. Inpatient Services Costs**




## Outpatient Hospital Services

Outpatient Hospital Services costs includes data for hospital procedures that did not require an overnight stay in a hospital.

**Notable findings include:**

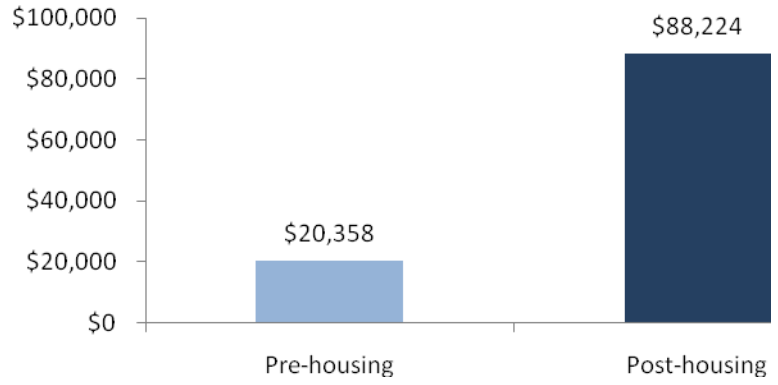
- Before PSH, 15% of study participants accessed outpatient hospital services at the participating agencies. After housing placement, 29% accessed these services.
- 7% of participants accounted for 88% of cost pre-housing and 72% of costs post-housing. For analysis without the outlying observations, see Appendix B.
- For hospital outpatient services, an increase of $1,655 was determined per capita post-housing placement.

**Table 16. Outpatient Hospital Services Costs**

| Outpatient Hospital Services Costs | | |
|---|---|---|
| | Pre-housing | Post-housing |
| **Individuals accessing service** | 6 | 12 |
| **Total Cost** | $20,358 | $88,224 |
| **Per Capita Cost*** | $497 | $2,152 |
| **Outpatient Visits** | | |
| **Total Visits** | 25 | 58 |
| **Average Number of Visits (per capita)** | 1 | 1 |

*Per Capita N=41

**Figure 13. Outpatient Services Costs**




## Primary Care Services

Primary care includes only Cherokee and Knox County Health Department. As discussed in the limitations, there may be other agencies where primary care services were accessed for these 41 participants.

- 71% of participants accessed primary care services pre-housing and 61% post-housing.
- Primary care services cost increased by $43,068 after PSH.
- 10% of participants account for 78% of the charges pre-housing and 70% of the charges post-housing. (See Appendix B for information about removing outliers.)
- Number of visits remained consistent before and after PSH.

**Table 17. Primary Care Costs**

| **Primary Care Costs** | | |
|---|---|---|
| | Pre-housing | Post-housing |
| **Individuals accessing service** | 29 | 25 |
| **Total Cost** | $122,432 | $165,501 |
| **Per Capita Cost*** | $2,986 | $4,037 |
| **Primary Care Visits** | | |
| **Total Visits** | 326 | 326 |
| **Average Number of Visits (per capita)** | 8 | 8 |

*Per Capita N=41

**Figure 14. Primary Care Services Costs**

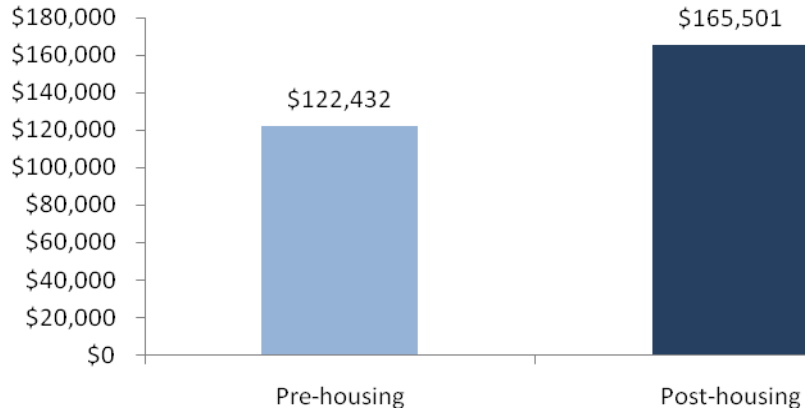



**Table 18. Primary Care Services**

| Pre-housing | Post-housing | Difference |
|---|---|---|
| $122,432 | $165,501 | $43,068 |

## Emergency Room Services

Emergency Room Services include costs from emergency room visit care. A few participants may have entered the hospital via emergency room services and be transferred to inpatient hospitalization for care and treatment. Those costs were included in inpatient hospital services.

**Specific findings include:**

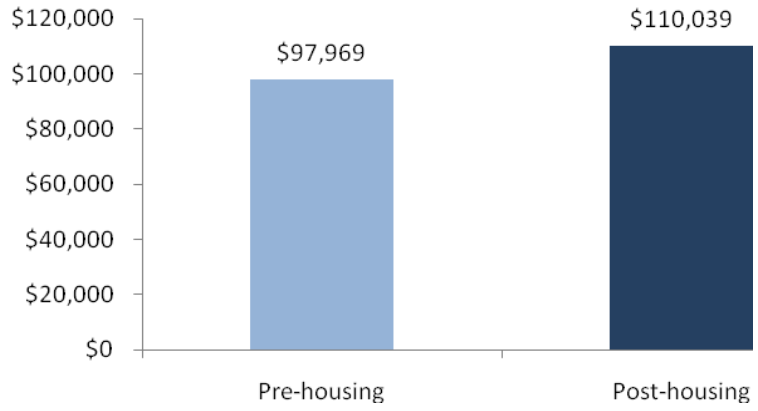
- Before PSH, 54% of study participants accessed hospital emergency room services at the participating agencies. After housing placement, 44% accessed these services.
- 7% of participants accounted for almost half (48%) of pre-housing charges and 58% of post-housing charges. (For more information about this type of outlier analysis, see Appendix B.)
- Post-housing, there was an increase of $12,070 emergency room services costs despite a 23% decrease in visits.

**Table 19. Emergency Room Services Costs**

| Emergency Room Services Costs | | |
|---|---|---|
| | Pre-housing | Post-housing |
| **Individuals accessing service** | 22 | 17 |
| **Total Cost** | $97,969 | $110,039 |
| **Per Capita Cost*** | $2,389 | $2,684 |
| **Emergency Room Visits** | | |
| **Total Visits** | 104 | 102 |
| **Average Number of Visits (per capita)** | 3 | 2 |

*Per Capita N=41

**Figure 15. Emergency Room Services Costs**




## SUMMARY RESULTS

Table 18 below reports the net difference for pre- and post-housing costs across all categories for all participants with and without outliers removed.

**Table 20. Cost Summary Per Capita**

| | Pre-Housing Costs | Post-Housing Costs (includes cost of housing) | Difference |
|---|---|---|---|
| All Participants (N=41) | $16,322 | $20,676 | $4,354 |
| Outliers Removed (n=26) | $9,861 | $8,716 | -$1,145 |

Table 19 breaks down the data to show what percentage of the 41 participants had increases in cost post-housing or decreased/no change in costs post-housing. The only areas in which post-housing costs increased for the majority of participants were supportive services and case management.

**Table 21. Percentage of Participants with Costs Post-Housing (Increased or Decreased/No Change)**

| | Increased Costs Post-Housing | | Decreased/No Change Costs Post-Housing | |
|---|---|---|---|---|
| N=41 | n | % | n | % |
| **Healthcare Costs** | | | | |
| **Physical Health Costs** | 19 | 46% | 22 | 54% |
| **Mental Health Costs** | 11 | 27% | 30 | 73% |
| **Community Services** | | | | |
| **Emergency Shelter** | 1 | 2% | 40 | 98% |
| **Supportive Services** | 21 | 51% | 20 | 49% |
| **Case Management** | 13 | 32% | 28 | 68% |
| **EMS** | 11 | 27% | 30 | 73% |
| **Jail** | 5 | 12% | 36 | 88% |

Average public health facility costs per day of usage in Knox County were calculated based on discussion with local service providers and resources cited in the table below. Except for the supportive housing costs, all public facility data costs were calculated based on the average user and does not use participant data.

**Table 22. Average Public Facility Costs per Day of Usage in Knox County**

| Type of Public Facility | Cost per Day of Usage |
|---|---|
| Supportive Housing* | $12 |
| Emergency Shelter | $12 |
| Jail | $72 |
| Mental Health Inpatient Hospital | $816 |
| Inpatient Hospital | $5,027 |

*This figure was calculated based on public burden only for the 41 participants in this study.
Source: Picture of the Present: Tennessee's Health (2007) Tennessee Department of Health

## DISCUSSION

There are four key findings that emerge from the data reported here:

- 1) the cost of community services for the 41 participants decreased by $76,721 compared to one year before PSH,
- 2) the cost of mental health services decreased by $20,669 post PSH placement, 3) healthcare services costs rose $131,117 after PSH placement, and
- 4) the healthcare costs of a limited number of medically ill study participants account for a substantial portion of the pre- and post-PSH healthcare costs.

The results of this study are on one hand consistent with the large body of prior research findings demonstrating reductions in costs and services utilization resulting from providing PSH to individuals experiencing chronic homelessness. On the other hand the rise in healthcare related costs post-PSH is inconsistent with the findings of prior studies. The two sides of the findings of this study are detailed here and placed in the context of prior research.

There was a 57% reduction in costs associated with community services after one year of PSH. The community cost category included case management, emergency shelter, supportive services, jail stays, and emergency medical services (EMS). The study found a notable drop in utilization of supportive services post-housing and as would be expected an increase in the use of case management services post housing. However, while there was a 21% increase in the cost of case management ($1,682), there was a $12,312 decrease in the cost of supportive services. There was a 5% increase in the cost of emergency medical services, as indicated above; charges associated with the transportation of a very limited number of participants resulted in over half of the post housing EMS charges. The costs associated with incarceration of participants in this study decreased dramatically (99%) pre-to post-housing. Police encounters with study participants dropped 67% post-housing. The decreases in jail stays, police encounters, and supportive services are consistent with the findings of studies conducted in Seattle, Rhode Island, Maine, and Denver (CSH, 2012).

The total cost of mental health services (inpatient and outpatient) declined 23% post-PSH. The costs associated with inpatient mental health hospitalizations post housing decreased $21,418. Conversely and as expected, there was a slight increase in mental health outpatient services and an increase in outpatient mental health visits. It is possible that increased outpatient mental health services and associated case management reduced the need for inpatient mental health hospitalizations. The finding that 54% of the participants accessed outpatient mental health services is both consistent with the high prevalence rate of mental health problems found among individuals experiencing chronic homelessness and a positive indicator that mental health issues are being addressed, perhaps due to the support and encouragement of case managers (Edens, Mares, & Rosenheck, 2011; Nooe & Patterson, 2010). The finding of reduced mental health costs post-PSH and increased services are consistent with findings from studies in Maine, Chicago, and Portland, Oregon (CSH, 2012; Basu, Kee, Buchanan, & Sadowski, 2012)

Studies of post-PSH healthcare for individuals experience chronic homelessness in Chicago, San Francisco, Denver, Massachusetts, Maine, Seattle, Rhode Island, and Portland, OR found notable decreases in services and cost associated with PSH (CSH, 2012). The findings of this present study represent a notable exception to the prevalent pattern in earlier studies. The healthcare services addressed here include inpatient hospitalization costs, outpatient hospitalization costs, primary care service costs and emergency room utilization costs. Overall, there was a 30% increase in healthcare services costs. It appears that the vast proportion of these charges were incurred as a result of the poor health status of a limited number (10%) of participants in the study, who accounted for 78% of pre-housing cost and 70% of post-housing charges. For inpatient hospitalizations, 7% of the study participants account for 59% of the pre-housing charges and 90% of the post-housing charges. For outpatient hospital services, 7% of participants accounted for 88% of cost pre-housing and 72% of costs post-housing. It is evident from these data is that the primary care costs are distorted by the unfortunate poor health of a limited number of participants.

The disparity between the findings of decreased healthcare costs in prior studies and this Knox County study can be understood from at least two perspectives. First, most of the prior studies have included a larger pool of participants, or stated otherwise larger samples. In costs studies, the statistical advantage of larger sample sizes is that the effects of extreme costs (outliers)

incurred by a limited number of individuals on the calculation of average costs and total costs measured in the study is mitigated by having a larger sample size. In the case of the present study, the inverse is true. The relatively small sample of 41 is insufficiently large to smooth out or attenuate the disproportionally high medical costs of a limited number of individuals. The data presented in Appendix B removes cost outliers from the analysis, resulting in a 27% decrease in inpatient hospital services costs and a 41% decrease in inpatient hospitalizations post-PSH. A second perspective is that it is perhaps unrealistic to expect that placement of individuals experiencing chronic homelessness in PSH will alter the negative health effects of years of homelessness...

## LIMITATIONS

This study focuses on 41 of these individuals as a sample of the population who had formerly experienced chronic homelessness. Participant sampling in this study may have been biased towards individuals who are in greater need of supportive services and have more frequent contact with a case manager. In other words, some individuals that were eligible to participate may have already moved out of PSH into traditional rental housing and individuals with greater supportive needs may have been more easily accessible. In retrospect, eligible participants should have been recruited atone year of supportive housing placement to avoid selecting individuals whose conditions/living situation has prevented them from moving out of supportive housing.

The KnoxHMIS database was queried to ensure recruited participants were in Knoxville for supportive services one year before and one year after housing placement. If the participants had at least one documented service every two months, they were included in the analysis. It is possible that individuals accessed services in surrounding counties. Only Knox County services were requested and data from the surrounding areas were not collected.

In addition, primary care service data were collected from two healthcare agencies that are often utilized by individuals experiencing homelessness. Primary care services received from private physicians, low-income clinics, or surrounding counties were not collected or analyzed for this study.

Only one year surrounding PSH placement (both before and after) was considered. Other studies have considered a longer length of time pre- and post-housing to analyze. Results from those studies indicate that the longer a person stays in housing after a period of chronic homelessness, the less community cost they accrue in subsequent years. Since the sampling timeframe of this study was limited to one year prior to and one year after housing, the accrual of community costs over a longer time frame cannot be determined.

Finally, case management services were not captured in HMIS until April 2007; thus, service provision data from some participants who accessed services prior to that date are not included in the analysis.

## CONCLUSIONS

Overall, the findings indicate that placing a person in PSH who has formerly experienced chronic homelessness cost the community $4,354 more over a one year period than that person remaining without a home. After removing individuals with extreme costs (outliers), the total community savings per year is $1,145. These finding are placed in some context by the fact that since 2006, 397 individuals in Knox County with a history of chronic homelessness have been placed in PSH (KnoxHMIS, 2012).

It is noteworthy that as indicated in Table 20, a majority of participants had no change or increase in costs post-PSH placement. Research from the Heartland Alliance (2009) has indicated that after one year of housing, costs associated with PSH decline considerably. In addition, the cost of housing one person in PSH for one night costs the same as housing a person in an emergency shelter, and significantly less than housing a person in a jail, hospital, or inpatient mental health facility. These findings are consistent with research from other locales (Dodds & Colman, 1999; Pomeroy, 2005; Palermo, 2006).

Every well-designed study answers the questions for which it was created and raises additional questions and avenues of research. Future research regarding the efficacy and utility of PSH as a tool to address the complex needs of individuals and families experiencing chronic homelessness should be expanded to include:

1) a larger number of homeless service providers to measure outcomes across providers,
2) an expanded pool of participants to better control for the effects of high costs among a limited number of participants, and
3) longer study timeframes to allow the biopsychosocial effects of PSH to be more precisely measured over time.

This study and future studies can inform both public policy intended to address homelessness and the operations of homeless service providers who daily strive to find housing options and meet the challenging, multi-systemic problems of individuals and families experiencing homelessness.

## APPENDIX A. Tables with all costs (no outliers removed)

| Case Management | | | | |
|---|---|---|---|---|
| | COSTS | | ENCOUNTERS | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 26 | 27 | 26 | 27 |
| **Total** | $7,783 | $9,555 | 330 | 435 |
| **Per Capita** | $192 | $233 | 8 | 11 |
| **Average** | $232 | $281 | 11 | 13 |
| **Standard Deviation** | $389 | $357 | 16.3 | 16.2 |
| **Median** | $77 | $121 | 4 | 6 |

| Emergency Shelter | | | | |
|---|---|---|---|---|
| | COSTS | | DAYS OF STAY | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 21 | 6 | 21 | 6 |
| **Total** | $29,757 | $394 | 2,418 | 32 |
| **Per Capita** | $726 | $10 | 59 | 1 |
| **Average** | $1,294 | $17 | 105 | 1 |
| **Standard Deviation** | $1,102 | $47 | 90 | 4 |
| **Median** | $1,145 | $0 | 93 | 0 |

| Supportive Services | | | | |
|---|---|---|---|---|
| | COSTS | | ENCOUNTERS | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 35 | 34 | 35 | 34 |
| **Total** | $17,399 | $5,087 | 6,434 | 1,395 |
| **Per Capita** | $424 | $124 | 157 | 34 |
| **Average** | $458 | $134 | 169 | 37 |
| **Standard Deviation** | $502 | $237 | 181 | 71 |
| **Median** | $252 | $70 | 123 | 13 |

## APPENDIX A. Tables with all costs (no outliers removed)

| Emergency Medical Services (EMS) | | | | |
|---|---|---|---|---|
| | COSTS | | ENCOUNTERS | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 15 | 14 | 15 | 14 |
| **Total** | $35,460 | $37,396 | 57 | 62 |
| **Per Capita** | $865 | $912 | 1 | 2 |
| **Average** | $1,773 | $1,870 | 3 | 3 |
| **Standard Deviation** | $2,131 | $3,195 | 3 | 6 |
| **Median** | $825 | $705 | 2 | 1 |

| Hospital Inpatient Services | | | | |
|---|---|---|---|---|
| | COSTS | | DAYS OF STAY | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 9 | 5 | 9 | 5 |
| **Total** | $201,958 | $210,070 | 46 | 40 |
| **Per Capita** | $4,926 | $5,124 | 1 | 1 |
| **Average** | $18,360 | $19,097 | 4 | 4 |
| **Standard Deviation** | $16,958 | $34,882 | 5 | 7 |
| **Median** | $12,071 | $0 | 3 | 0 |

| Hospital Outpatient Services | | | | |
|---|---|---|---|---|
| | COSTS | | ENCOUNTERS | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 6 | 12 | 6 | 12 |
| **Total** | $20,359 | $88,224 | 25 | 58 |
| **Per Capita** | $497 | $2,152 | 1 | 1 |
| **Average** | $1,357 | $5,882 | 2 | 4 |
| **Standard Deviation** | $2,511 | $8,592 | 4 | 7 |
| **Median** | $0 | $1,212 | 0 | 2 |

## APPENDIX A. Tables with all costs (no outliers removed)

| Primary Care Services | | | | |
|---|---|---|---|---|
| | COSTS | | ENCOUNTERS | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 29 | 25 | 29 | 25 |
| **Total** | $122,432 | $165,501 | 326 | 326 |
| **Per Capita** | $2,986 | $4,037 | 8 | 8 |
| **Average** | $3,710 | $5,015 | 10 | 10 |
| **Standard Deviation** | $10,766 | $10,529 | 15 | 14 |
| **Median** | $357 | $369 | 4 | 3 |

| Mental Health Inpatient Services | | | | |
|---|---|---|---|---|
| | COSTS | | DAYS OF STAY | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 8 | 4 | 8 | 4 |
| **Total** | $74,767 | $53,349 | 84 | 73 |
| **Per Capita** | $1,824 | $1,326 | 2 | 2 |
| **Average** | $6,797 | $4,850 | 8 | 7 |
| **Standard Deviation** | $7,414 | $10,200 | 9 | 11 |
| **Median** | $4,085 | $0 | 4 | 0 |

| Mental Health Outpatient Services | | | | |
|---|---|---|---|---|
| | COSTS | | ENCOUNTERS | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 20 | 16 | 20 | 16 |
| **Total** | $16,172 | $16,921 | 130 | 150 |
| **Per Capita** | $394 | $413 | 3 | 4 |
| **Average** | $735 | $769 | 6 | 7 |
| **Standard Deviation** | $686 | $913 | 5 | 8 |
| **Median** | $625 | $580 | 5 | 6 |

## APPENDIX A. Tables with all costs (no outliers removed)

| Emergency Room Services | | | | |
|---|---|---|---|---|
| | COSTS | | ENCOUNTERS | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 22 | 17 | 22 | 17 |
| **Total** | $97,969 | $110,039 | 104 | 102 |
| **Per Capita** | $2,389 | $2,684 | 3 | 2 |
| **Average** | $3,768 | $4,232 | 4 | 4 |
| **Standard Deviation** | $5,160 | $7,366 | 7 | 8 |
| **Median** | $2,318 | $428 | 3 | 1 |

| Law Enforcement, Jail Stays | | | | |
|---|---|---|---|---|
| | COSTS | | DAYS OF STAY | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 15 | 7 | 15 | 7 |
| **Total** | $45,072 | $6,408 | 626 | 89 |
| **Per Capita** | $1,099 | $156 | 15 | 2 |
| **Average** | $2,651 | $377 | 37 | 5 |
| **Standard Deviation** | $5,805 | $745 | 81 | 10 |
| **Median** | $288 | $0 | 4 | 0 |

## APPENDIX B. Tables with costs (outliers removed)

| Case Management (removed 12% of participants) | | | | |
|---|---|---|---|---|
| | COSTS | | ENCOUNTERS | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 21 | 23 | 21 | 23 |
| **Total** | $3,387 | $6,184 | 146 | 282 |
| **Per Capita** | $83 | $151 | 4 | 7 |
| **Average** | $117 | $213 | 6 | 10 |
| **Standard Deviation** | $186 | $254 | 8 | 12 |
| **Median** | $66 | $110 | 3 | 5 |

| Emergency Shelter(removed 7% of participants) | | | | |
|---|---|---|---|---|
| | COSTS | | DAYS OF STAY | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 18 | 4 | 18 | 4 |
| **Total** | $24,784 | $62 | 2,014 | 5 |
| **Per Capita** | $604 | $2 | 49 | 0 |
| **Average** | $1,239 | $3 | 101 | 0 |
| **Standard Deviation** | $969 | $7 | 79 | 1 |
| **Median** | $1,243 | $0 | 101 | 0 |

| Supportive Services (removed 12% of participants) | | | | |
|---|---|---|---|---|
| | COSTS | | ENCOUNTERS | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 30 | 29 | 30 | 29 |
| **Total** | $12,275 | $3,561 | 4,556 | 922 |
| **Per Capita** | $299 | $87 | 111 | 22 |
| **Average** | $372 | $108 | 138 | 28 |
| **Standard Deviation** | $384 | $144 | 131 | 40 |
| **Median** | $218 | $71 | 120 | 13 |

## APPENDIX B. Tables with costs (outliers removed)

| Emergency Medical Services (removed 5% of participants) | | | | |
|---|---|---|---|---|
| | COSTS | | ENCOUNTERS | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 13 | 12 | 13 | 12 |
| **Total** | $22,926 | $15,966 | 38 | 25 |
| **Per Capita** | $559 | $389 | 1 | 1 |
| **Average** | $1,274 | $887 | 2 | 1 |
| **Standard Deviation** | $1,559 | $849 | 3 | 1 |
| **Median** | $667 | $697 | 1 | 1 |

| Hospital Inpatient Services (removed 5% of participants) | | | | |
|---|---|---|---|---|
| | COSTS | | DAYS OF STAY | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 7 | 4 | 7 | 4 |
| **Total** | $131,300 | $95,623 | 27 | 16 |
| **Per Capita** | $3,202 | $2,332 | 1 | 0 |
| **Average** | $14,589 | $10,625 | 3 | 2 |
| **Standard Deviation** | $11,661 | $16,068 | 3 | 3 |
| **Median** | $11,621 | $0 | 3 | 0 |

| Hospital Outpatient Services (removed 5% of participants) | | | | |
|---|---|---|---|---|
| | COSTS | | ENCOUNTERS | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 5 | 10 | 5 | 10 |
| **Total** | $12,319 | $61,354 | 22 | 26 |
| **Per Capita** | $300 | $1,496 | 1 | 1 |
| **Average** | $948 | $4,720 | 2 | 2 |
| **Standard Deviation** | $1,817 | $7,936 | 4 | 2 |
| **Median** | $0 | $1,200 | 0 | 2 |

## APPENDIX B. Tables with costs (outliers removed)

| Primary Care Services (removed 10% of participants) | | | | |
|---|---|---|---|---|
| | COSTS | | ENCOUNTERS | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 26 | 21 | 26 | 21 |
| **Total** | $60,946 | $55,029 | 246 | 193 |
| **Per Capita** | $1,486 | $1,342 | 6 | 5 |
| **Average** | $2,102 | $1,898 | 8 | 7 |
| **Standard Deviation** | $3,895 | $3,132 | 11 | 9 |
| **Median** | $357 | $306 | 4 | 2 |

| Emergency Room Services (removed 7% of participants) | | | | |
|---|---|---|---|---|
| | COSTS | | ENCOUNTERS | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 19 | 14 | 19 | 14 |
| **Total** | $64,663 | $45,901 | 65 | 38 |
| **Per Capita** | $1,577 | $1,120 | 2 | 1 |
| **Average** | $2,811 | $1,996 | 3 | 2 |
| **Standard Deviation** | $3,303 | $3,892 | 4 | 2 |
| **Median** | $1,938 | $301 | 2 | 1 |

| Mental Health Inpatient Services (removed 2% of participants) | | | | |
|---|---|---|---|---|
| | COSTS | | DAYS OF STAY | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 7 | 3 | 7 | 3 |
| **Total** | $59,593 | $21,011 | 66 | 43 |
| **Per Capita** | $1,453 | $512 | 2 | 1 |
| **Average** | $5,959 | $2,101 | 7 | 4 |
| **Standard Deviation** | $7,246 | $4,821 | 8 | 8 |
| **Median** | $3,470 | $0 | 4 | 0 |

## APPENDIX B. Tables with costs (outliers removed)

| Mental Health Outpatient Services (removed 5% of participants) | | | | |
|---|---|---|---|---|
| | COSTS | | ENCOUNTERS | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 18 | 14 | 18 | 14 |
| **Total** | $12,321 | $11,540 | 113 | 105 |
| **Per Capita** | $301 | $281 | 3 | 3 |
| **Average** | $616 | $577 | 6 | 5 |
| **Standard Deviation** | $461 | $560 | 5 | 5 |
| **Median** | $553 | $537 | 4 | 6 |

| Law Enforcement, Jail Stays (removed 7% of participants) | | | | |
|---|---|---|---|---|
| | COSTS | | DAYS OF STAY | |
| | Pre-housing | Post-housing | Pre-housing | Post-housing |
| **n** | 12 | 6 | 12 | 6 |
| **Total** | $9,144 | $3,888 | 127 | 54 |
| **Per Capita** | $223 | $95 | 3 | 1 |
| **Average** | $653 | $278 | 9 | 4 |
| **Standard Deviation** | $1019 | $546 | 14 | 8 |
| **Median** | $144 | $0 | 2 | 0 |

## REFERENCES


Basu, A., Kee, R., Buchanan, D. & Sadowski, L. S. (2012). Comparative cost analysis of housing and case management programs for chronically ill homeless adults compared to usual care. *Health Services Research,* 47,1, 523-543.

Corporation for Supportive Housing (2012). Summary of studies: Medicaid/health services utilization and costs, Retrieve on 3/8/2012 from CSH website http://documents.csh.org/documents/policy/UpdatedCostMatrixSept09.pdf .

Edens, E. L., Mares, A. S. & Rosenheck, R. A. (2011). Chronically homeless women report high rates of substance use problems equivalent to chronically homeless men. *Women's Health Issues,* 21, 5, 383-389.

Kresky-Wolff, M., Larson, M. J., O'Brien, R. W., & McGraw, S. A. (2010). Supportive housing approaches in the Collaborative Initiative to Help End Chronic Homelessness (CICH). *Journal of Behavioral Health Services & Research, 37:2, 213-225.*

Mondello M, Gass A, McLaughlin T, Shore N. Cost analysis of permanent supportive housing, September, 2007;

Mondello M, Bradley J, Chalmers T, Shore N. Cost of rural homelessness: Rural PSH cost analysis, May 2009)

National Association of Social Workers (2012). *NASW Standards for Social Work Case Management*, Retrieved from http://www.socialworkers.org/practice/standards/sw_case_mgmt.asp on March 8, 2012.

Nooe, R. M. & Patterson. D.A. (2010). The Ecology of Homelessness. *Journal of Human Behavior in the Social Environment*, 20, 2, 105-152.

Palermo F, Dera B, Cltne D, Ternoway H, Lewis B. The cost of homelessness and the value of investment in housing support services in Halifax Regional Municipality, New York, 2006).

Patterson, D. A., West, S., & Lantz, J. (2011). *KnoxHMIS Annual Report.* The University of Tennessee College of Social Work-Knoxville Homeless Management Information System (KnoxHMIS). Retrieved from https://knoxhmis.sworps.tennessee.edu/lib/exe/fetch.php/documents/2010annualreportfinal.pdfJanuary 16, 2012.

Sadowski, L. S., Kee, R. A.,VanderWeele, T. J. & Buchanan, D. (2009). Effect of a housing and case management program on emergency department visits and hospitalizations among chronically ill homeless adults: A randomized trial. *Journal of the American Medical Association*, 301, 17, 1771-1778.

The Department of Housing and Urban Development (HUD). (2007).Defining chronic homelessness: A technical guide for HUD programs. HUD's Homeless Assistance Programs. Office of Community Planning and Development, Office of Special Needs Assistance Programs. Retrieved from http://www.hudhre.info/documents/DefiningChronicHomeless.pdf