

A Cost Comparison of Adult Foster Care to Nursing Home Care in the VA Medical Foster Home Program



Roe Gutman, PhD
Brown University
and

Cari Levy, MD, PhD
Professor of Medicine

University of Colorado Denver and the Eastern Colorado Health Care System

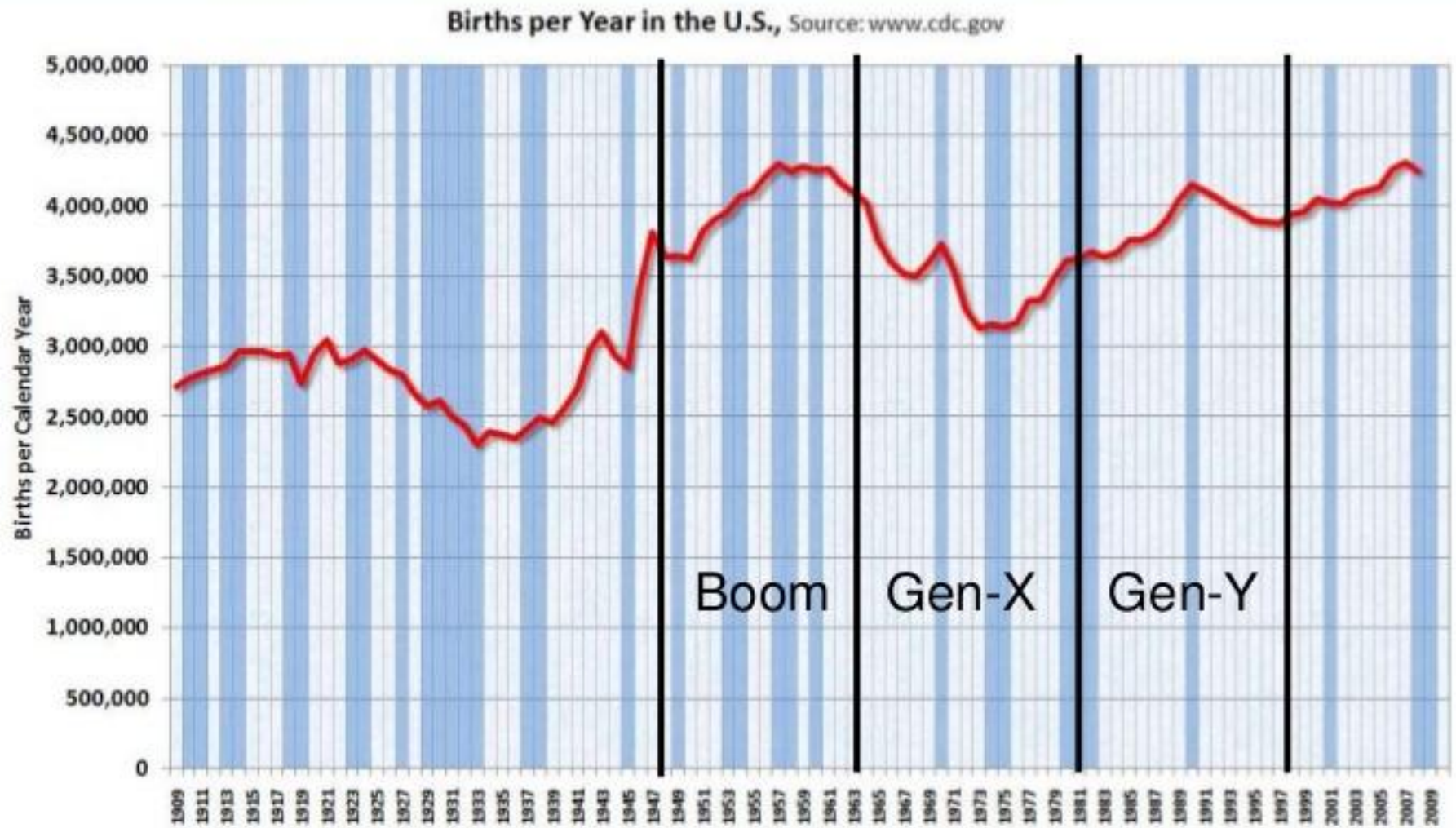
An Overview

- Converging Public Health Challenges
- What is Medical Foster Home?
- Is it safe and cost-effective?

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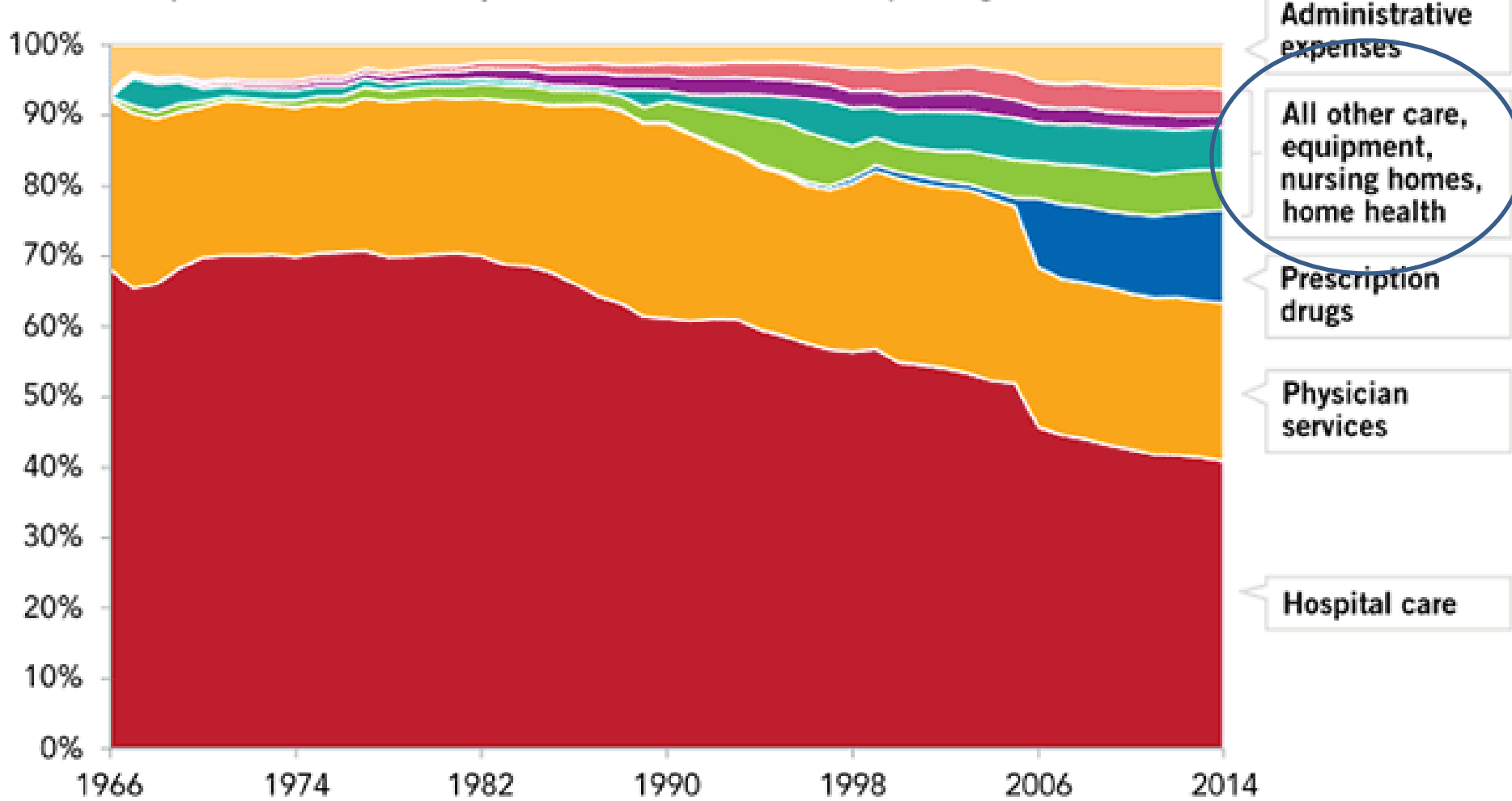
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Live Births by Year



Hospital expenses are the largest category of Medicare spending, but their share has fallen over time

Composition of Medicare Payments (% of Total Medicare Spending)



SOURCE: Centers for Medicare and Medicaid Services, *National Health Expenditures*, December 2014. Compiled by PGPF.
 NOTE: All data for 2014 are projected.

Family Caregivers: Institute of Medicine Study Group Between 2010 and 2040

Age 65+ will double (40 to 81 million)

2010



2040



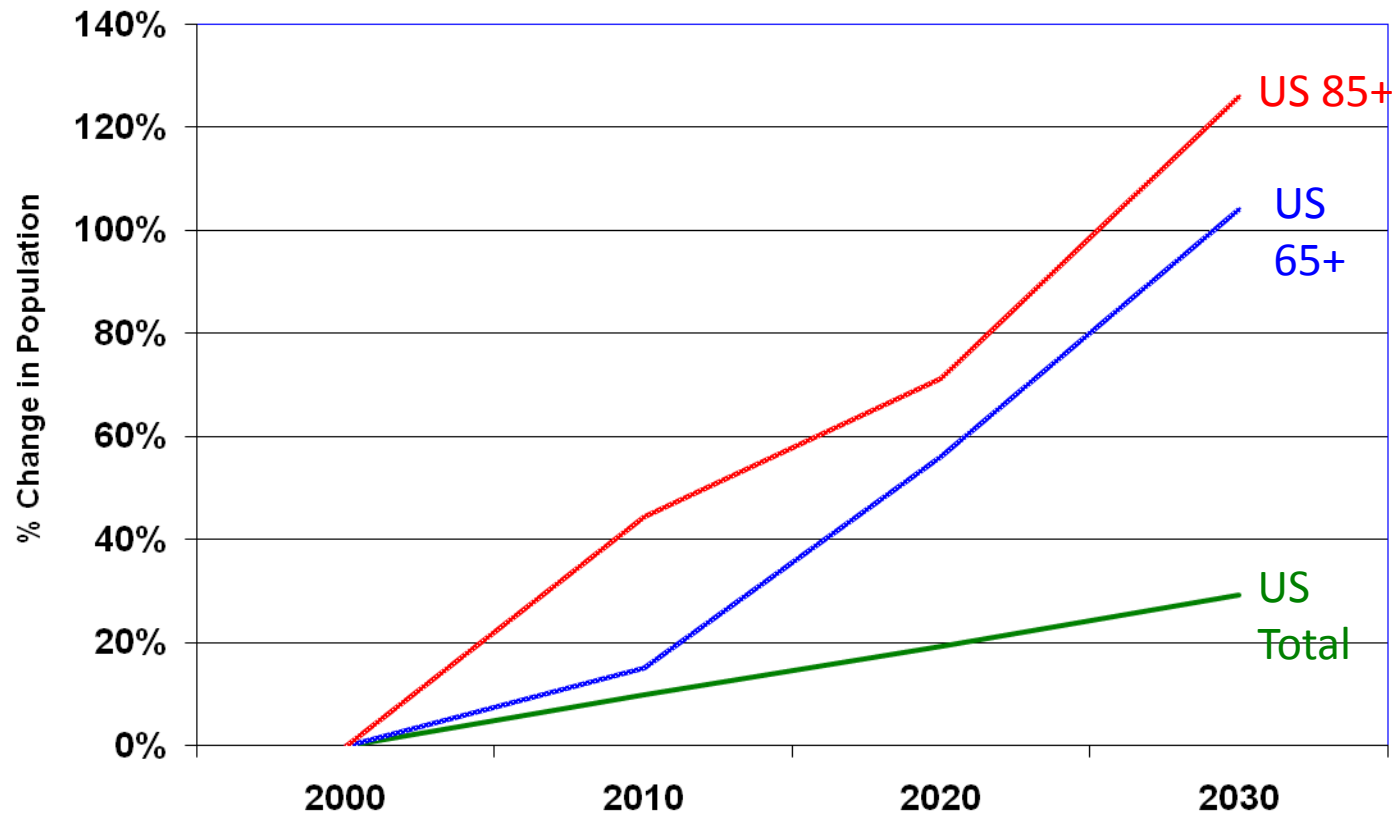
Family Caregivers: Institute of Medicine Study Group Between 2010 and 2040

Family caregivers will grow at a slower pace
AND the proportion of potential family caregivers
employed full time grows at a faster pace

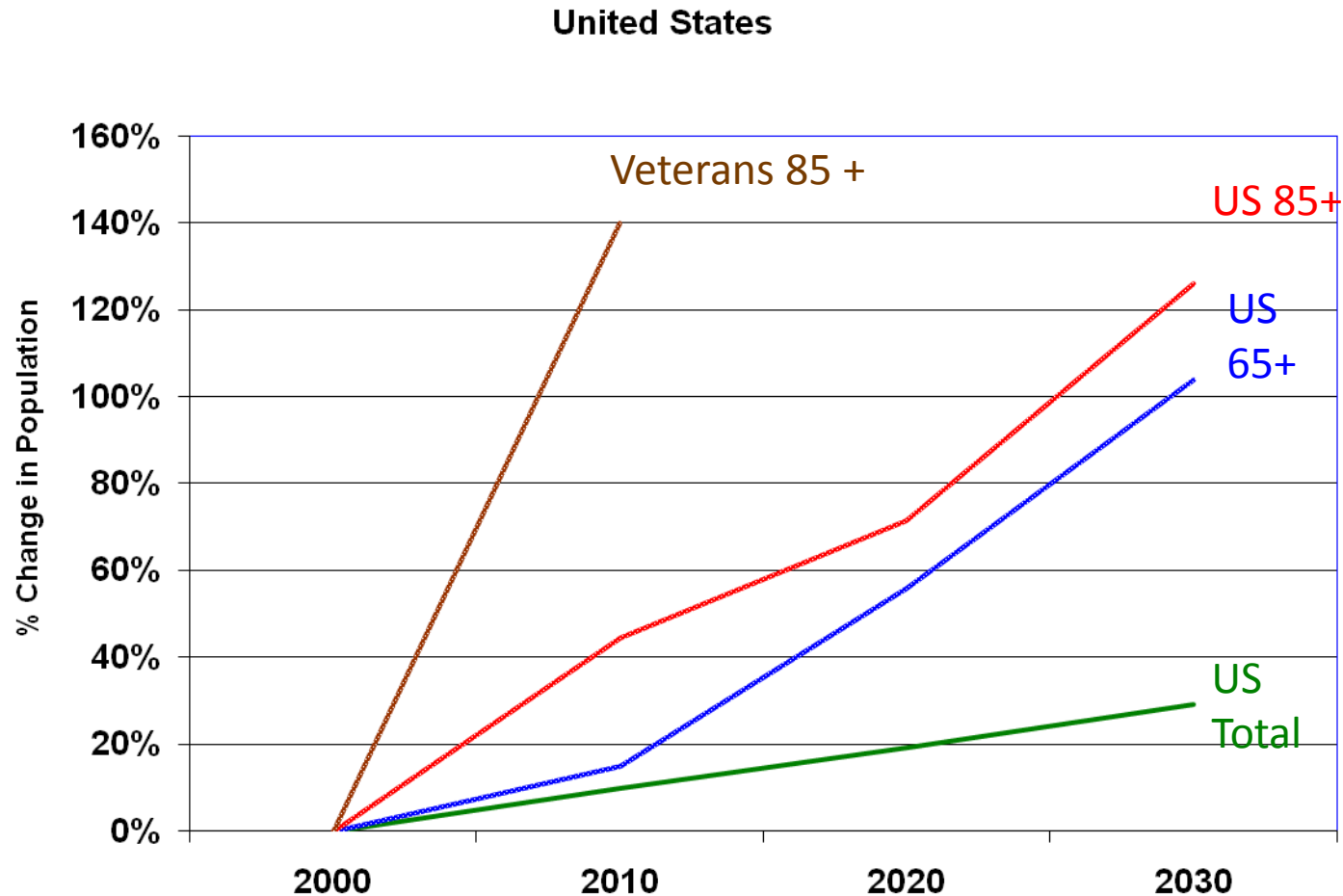


% Change in U.S. Population

United States



% Increase in Veterans over Age 85



Converging or *COLLIDING* Public Health Challenges

- Unsustainable rise in healthcare costs
- Increasing Veteran population over age 85
- Escalating prevalence of chronic disabling disease
- Relative decrease in family caregivers
- More in need of nursing home level of care
- Many refuse to move into nursing home

Reducing Health Care Costs: Four Options

- 1. Reduce or Restrict services:** ration who gets care, or what care they get
- 2. Share costs:** higher copayment; shift costs
- 3. Reduce cost of services:** lower salaries
- 4. Meet care needs in more efficient, lower cost manner:** avoid unnecessary costs
 - Prevent avoidable hospital days
 - Delay or avoid nursing home long stays
 - Minimize costly duplication and errors



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What is VA Medical Foster Home (MFH)?

An alternative to nursing home, in a personal home

- For Veterans who are unable to live independently, meet nursing home level of care need, prefer a family setting, and lack a strong family caregiver
- Merges adult foster home with VA Home Based Primary Care
- Person takes dependent Veteran into their home to provide daily supervision and personal assistance

What is different about VA Medical Foster Home?

- **ALL meet nursing home level of care need**
- **ALL have medical complexity**
- **ALL are enrolled in VA home care (HBPC)**
- **This home is the MFH Caregiver's home**
- **No more than 3 residents** receiving care

Safety, Oversight and Payment

- **VA MFH Coordinator** identifies MFH Caregivers, manages fire and safety inspections, provides oversight
- **VA HBPC** provides caregiver education, oversight, comprehensive medical care in home, 3 visits/mo
- **Veteran** pays MFH Caregiver – avg \$2500 per month

What is VA Home-Based Primary Care (HBPC) ?

- Comprehensive, longitudinal primary care
- Delivered in the home
- By an Interdisciplinary team: **Nurse, Physician, Social Worker, Rehabilitation Therapist, Dietitian, Pharmacist, Psychologist**
- For patients with complex, chronic disabling disease
- When routine clinic-based care is not effective

For those “too sick to go to clinic”

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First, what is known about outcomes
in HBPC?



HBPC Cost Outcomes Published Data

Non-VA: 722 HBPC & 2,161 propensity matched controls over 2 years:

- HBPC 17% lower total MC cost $p=0.003$
- 20% lower hospital and skilled nursing facility costs

(2014 JAGS De Jonge)

Independence at Home 7.7% savings for all participating programs

- 17% savings for 9 of 17 surpassing 5% mandatory savings threshold
- \$12-53 billion projected depending on dissemination approach

(2016 JAGS Kinosian)

VA HBPC 6,951 also enrolled in Medicare Hierarchical Condition Category (HCC) scores to project cost

- 12% reduction in combined VA+MC costs, includes cost of HBPC

(2014 JAGS Edes)

Methods



Rubin's Framework for Causal Inference

	Y(0)	Y(1)	W	X
1			0	
2			0	
...		?	...	
...			...	
...			...	
n_0			0	
			1	
	?			
...			1	
N			1	

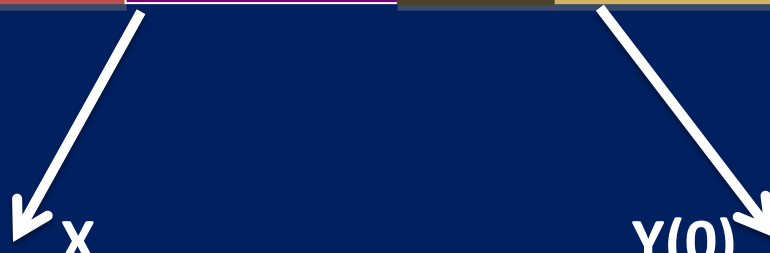
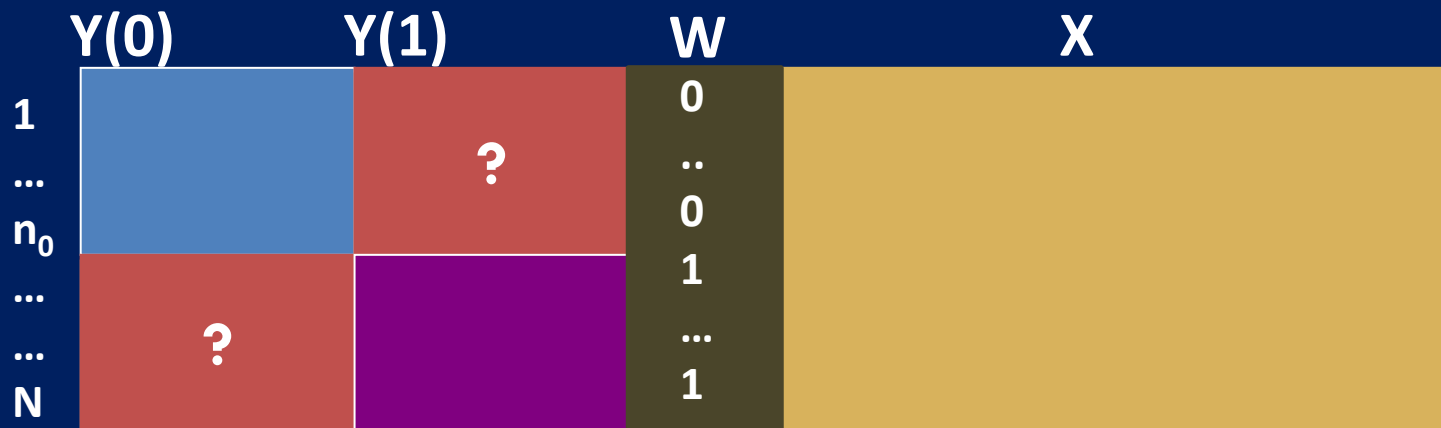
Y(0) – Expenditures on hospitalizations, outpatient, hospice, etc. If that person was at CNH

Y(1) – Expenditures on hospitalizations, outpatient, hospice, etc. If that person was at MFH

X – Covariates, demographics, care facility, medical priority, etc

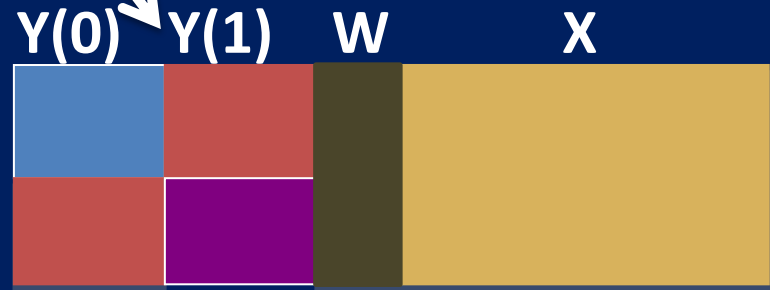
$$E(Y(1)-Y(0))=E(E(Y(1)-Y(0) | X))$$

Imputation of potential outcomes



...

m



How do we do it...

➤ Select only observations that overlap between the two groups in terms of the covariates

- Create subclasses (knots) on the propensity score in places where there is at least one observation from each group.
- Estimate $Y(0)=f_c(X)$ and $Y(1)=f_t(X)$, using **cubic splines** on the **propensity score** and **additive linear** on the directions **orthogonal to the propensity score**.
- Multiply impute the missing potential outcomes L times (from the posterior distribution of β).
- Calculate the mean and the standard deviation for average treatment effect for each of the L complete data sets.
- Combine using Rubin's Rule for MI.

Estimating the propensity score

- Made sure that there would be at least one person from each facility that stayed at MFH and at least one that stayed in a Nursing Home (facilities that didn't have both were discarded)
- Use logistic regression with variables that are thought to influence the decision whether to enroll or not.
- Iterate until balance is reached:
 - Examine balance of variables that may influence the outcome
 - If balance is not reached add variables/interaction
- **Not outcome data in this calculation**

Balance metrics

- Global balance across strata

$$\hat{\tau}_k(j) = \bar{X}_{1,k}(j) - \bar{X}_{0,k}(j)$$

$$\hat{V}_k(j) = s_k^2(j) \left(\frac{1}{n_1(j)} + \frac{1}{n_0(j)} \right)$$

$$z_k = \frac{\hat{\tau}_k}{\sqrt{\hat{V}_k}}$$

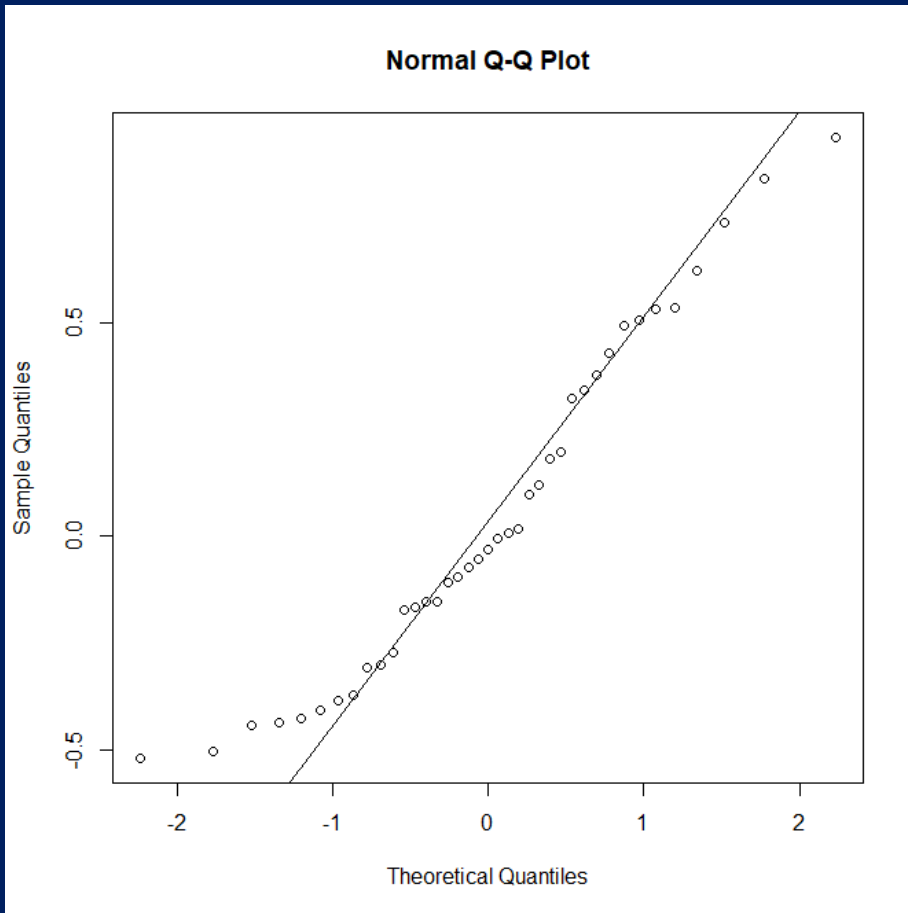
- Assessing balance within all blocks

$$E(X_{ik} | W_i, B_i(1), \dots, B_i(J)) = \sum_{j=1}^J \alpha_{kj} B_i(j) + \sum_{j=1}^j \tau_k(j) B_i(j) W_i$$

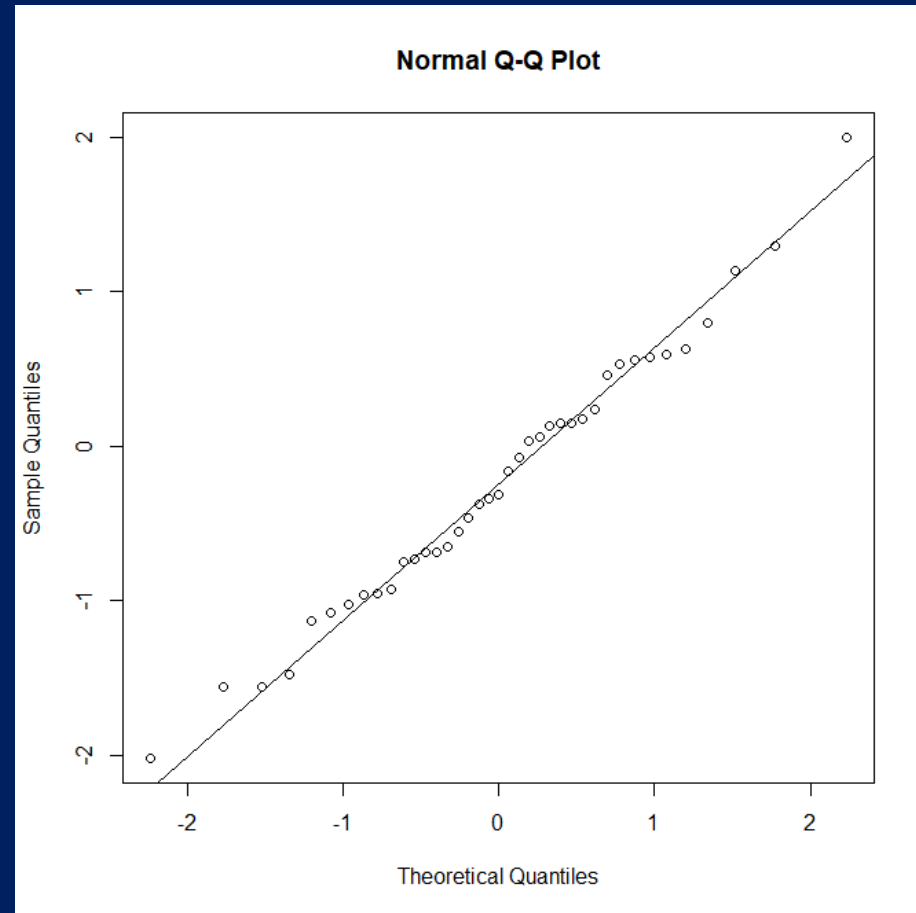
$$F_k = \frac{(SSR_k^r - SSR_k^{ur}) / J}{SSR_k^{ur} / (N - 2J)}$$

Balance Comparison

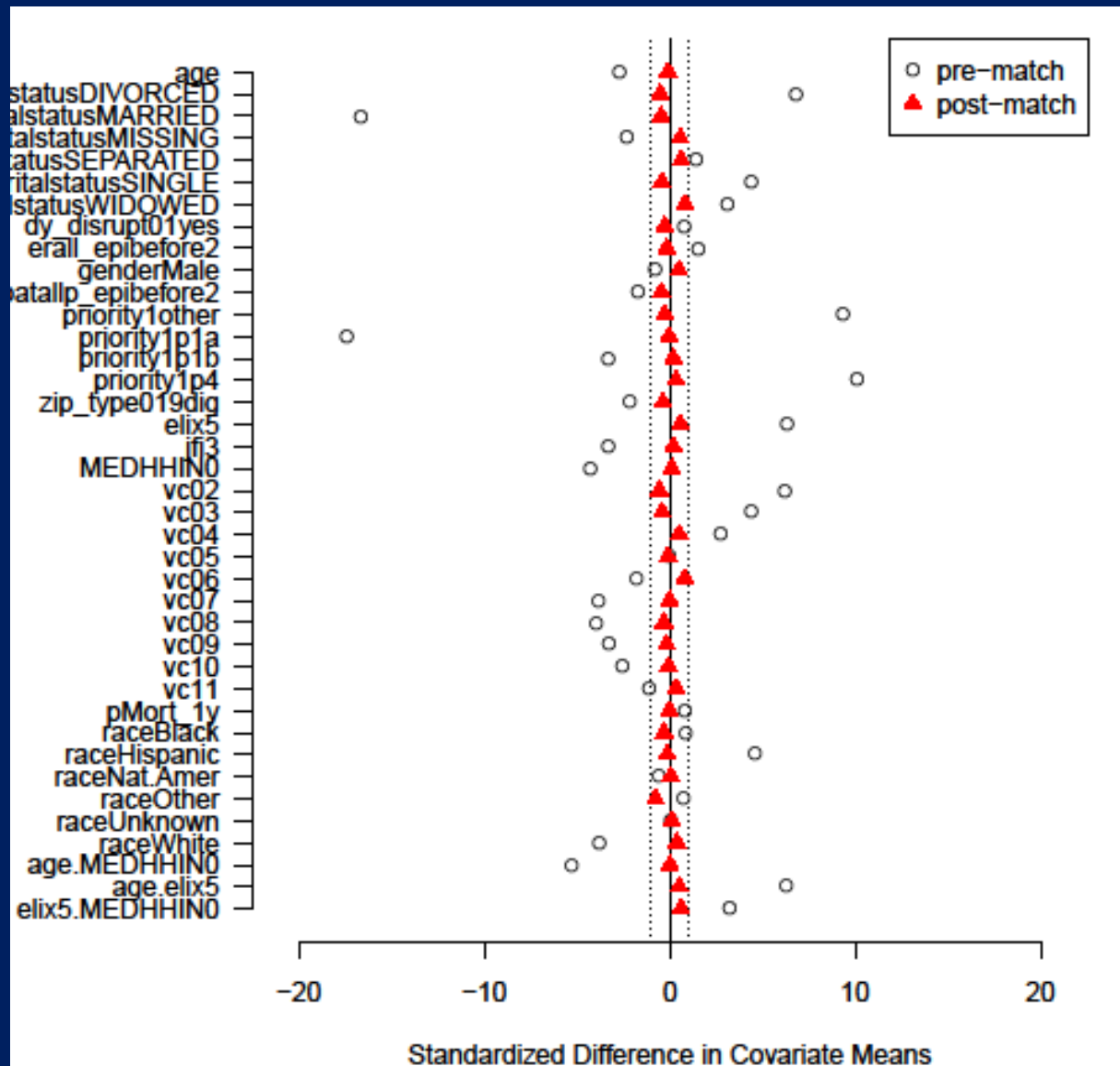
Balance across strata



Balance within all blocks

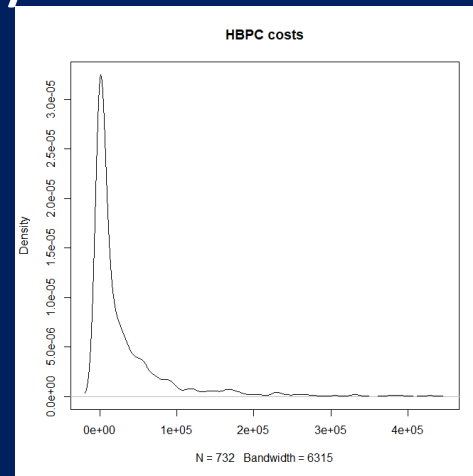


Love Plot



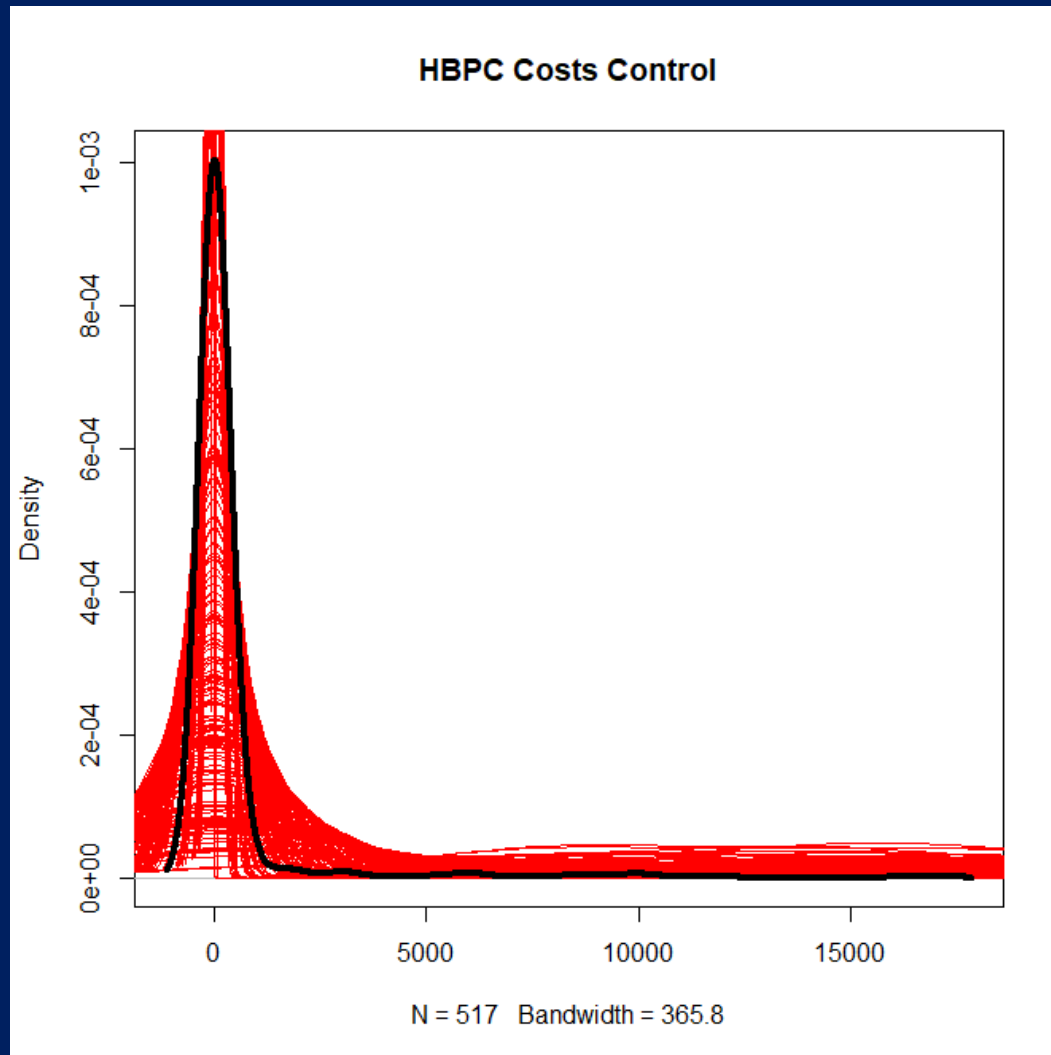
Imputation phase

- $Y(0)=f_c(X)$ and $Y(1)=f_t(X)$
- Cost distributions are highly skewed with point mass at zero.



- Two-part model:
 - Logistic for having any cost (spline along the propensity + orthogonal covariates)
 - Predictive mean matching (Little, 1988) with PSPP (Little & An, 2004) for cost if exists.

HBPC costs imputation – on controls



Effect Estimates

- Using Rubin's Multiple Imputation Rules

– In each complete dataset we collect (Q_i, U_i)

Point estimate

Sampling Variance

– The overall point estimate is

$$\bar{Q} = \frac{1}{M} \sum_1^M \hat{Q}_i$$

– The Sampling variance is

$$T = \bar{U} + \left(1 + \frac{1}{m}\right)B$$

$$\bar{U} = \frac{1}{M} \sum_1^M U_i$$

$$B = \frac{1}{M-1} \sum_{i=1}^M (\hat{Q}_i - \bar{Q})^2$$

Effect Estimates

- In this analysis $Q = \text{median}(Y_i(1) - Y_i(0))$ among the treated ($W_i=1$).
- Sampling variance was calculated using Bootstrap
- We also examined the difference in proportions of having any costs $E(\delta(Y_i(1) - Y_i(0) > 0))$

Results



Before Propensity Matching			After Propensity Matching			
Characteristic	MFH N=354	CNH N=1693	P-Value	MFH N=212	CNH N=511	P-Value
Age (%)						
Mean (SD)	71.9 (13.10)	74.0 (12.4)	0.0051	67.7 (12.4)	69.3 (12.3)	0.1120
Gender (%)						
Male	96.3	97.2	0.3996	95.8	94.9	0.6308
Ethnicity (%)						
White	57.6	68.5	<0.0001	60.4	58.1	0.5748
Black	16.4	14.6	0.3885	17.0	16.2	0.8072
Hispanic	10.7	3.0	<0.0001	3.3	4.3	0.5313
Asian	2.0	1.0	0.0938	2.4	2.4	1.0000
Other	0.9	0.5	0.6231	0.5	0.6	1.0000
Native American	0.3	0.5	0.6231	0.5	0.2	0.5008
Missing	12.2	12.1	0.9592	16.0	18.2	0.4868
Marital Status (%)						
Married	13.0	49.0	<0.0001	12.7	23.5	<0.0001
Divorced	40.1	21.2	<0.0001	41.4	37.0	0.2548
Widowed	22.3	14.9	0.0006	16.5	16.1	0.8778
Separated	3.7	2.2	0.0993	4.3	3.9	0.8362
Single	19.8	9.9	<0.0001	23.1	17.6	0.0875
Missing	1.1	2.7	0.0785	1.9	2.0	1.0000
Median Income	45,439 (24,031)	51,429 (23,499)	<0.0001	47,571 (23,206)	50,357 (22,998)	0.1397
ER Visits Prior Year	2.5 (3.3)	2.3 (2.7)	0.1213	2.5 (3.5)	2.5 (3.0)	0.8538
Hospitalizations Prior Year	1.7 (1.8)	1.9 (1.9)	0.0885	1.9 (2.1)	1.8 (1.8)	0.8461
Length of Stay days (SD)	281.5 (121.1)	224.7 (122.0)	<0.0001	281.6 (122.0)	206.8 (122.9)	<0.0001
Priority Status (%)						
1a	27.4	72.8	<0.0001	40.6	63.4	<0.0001
Elixhauser Comorbidity(SD)	3.8 (2.7)	2.8 (2.6)	<0.0001	3.9 (2.7)	3.6 (2.7)	0.2069
JEN Frailty Index Mean (SD)	6.2 (2.3)	6.6 (2.3)	0.0008	6.1 (2.3)	6.3 (2.3)	0.4800
CAN Score 1-year Mortality Probability (SD)	16.2 (17.1)	15.4 (16.4)	0.4131	13.8 (16.1)	13.6 (15.6)	0.9031

	Costs Before and After Propensity Matching					
	Before Propensity Matching			After Propensity Matching		
	MFH N=354	CNH N=1,693	p-value	MFH N=212	CNH N=511	p-value
Hospitalizations	23,680.3 (43,720.5)	26,770.3 (58,035.1)	0.2561	24,425.2 (47,490.9)	31,002.8 (58,814.9)	0.1156
Mental Health	1,776.1 (4,770.6)	662.6 (2,085.3)	<0.0001	2,435.4 (5,897.1)	1,118.6 (3,164.4)	0.0023
Therapy	1,004.1 (4,496.0)	430.9 (1,733.9)	0.0187	1,265.4 (5,418.3)	521.2 (1,957.1)	0.0527
HBPC	16,434.1 (10,500.8)	301.7 (1,492.3)	<0.0001	15,848.8 (10,511.2)	280.4 (1,426.1)	<0.0001
Home Health	2,888.2 (7,729.4)	1,797.4 (4,972.4)	0.0112	3,480.4 (9,186.9)	1,762.8 (4,907.1)	0.0106
Recreation	1,092.0 (2,614.0)	3.0 (44.3)	<0.0001	1,199.4 (2,1015.7)	2.7 (24.6)	<0.0001
Emergency Room	1,243.1 (2,348.5)	973.6 (1,722.4)	0.0412	1,297.7 (2,904.8)	1,011.3 (1,613.9)	0.1776
Outpatient	2,589.4 (11,620.8)	2116.8 (5,794.6)	0.4562	3,583.4 (14,887.4)	1,795.5 (2,984.4)	0.0843
Skilled Nursing Facility	951.0 (4,849.0)	1,577.5 (6,127.6)	0.0357	722.6 (3,340.7)	1,208.3 (5,142.5)	0.1333
Hospice	1,457.5 (6,708.0)	1,968.8 (11,015.4)	0.2518	780.3 (4,976.3)	1,317.4 (6,636.4)	0.2338
Short Stay Rehabilitation	878.3 (5,595.5)	849.7 (5,868.5)	0.9332	924.9 (6,440.0)	981.5 (6,582.4)	0.9157
CLC Costs	1,525.4 (10,349.9)	2,554.6 (17,177.4)	0.1365	1,088.8 (9,606.3)	2,423.8 (14,605.9)	0.1488
CNH Costs	1,024.0 (7,041.2)	48,716.9 (30,640.2)	<0.0001	1,280.5 (8,460.9)	45,081.4 (30,249.4)	<0.0001
Total Costs	67,068.0 (58,284.3)	96,430.4 (71,807.2)	0.0001	70,315.1 (64,693.1)	97,538.1 (6,900.9)	<0.0001

Mortality

	MFH-CNH	Lower 95% CI	Upper 95% CI
6-month mortality (%)	-0.07	-0.15	0.014
1-year mortality (%)	-0.13	-0.2711	0.00

Propensity-Adjusted Costs

Cost Variable	MFH-CNH	Lower 95% CI	Upper 95% CI
Hospitalization	-\$649	-3,643	2,343
HBPC Visits	\$14,075	12,904	15,247
Mental Health	\$81	197	358
Recreational Therapy	\$32	15	48
Inpatient	-\$455	-2,767	-1,855
CNH	-\$33,710	-41,329	-26,089
Total costs after enrollment	-\$27,982	-38,303	-17,660
TOTAL* (Per day alive)	-\$98	-126	-70

***Total includes nursing home, home health, therapy, pharmacy, lab, mental health, dialysis, procedures, radiology, hospice, outpatient, specialty care**

Demographic and Cost Summary

- Veterans in MFHs are younger than those in HBPC, more often unmarried, 26% are P1A and their co-morbidity exceeds that of Veterans in other long-term care settings
- Costs of the high intensity in home HBPC care and MFH support are offset by a reduction in residential care costs



Independence at Home Demo Continues Success



For the second performance year, Independence at Home participants saved Medicare more than \$10 million – an average of \$1,010 per beneficiary – while delivering higher quality patient care in the home, according to a new analysis released last week by the Centers for Medicare & Medicaid Services (CMS).

Under the terms of the demonstration, CMS will award incentive payments of \$5.7 million to seven participating practices that succeeded in reducing spending while improving quality.

“The Demonstration is authorized by Section 3024 of the Affordable Care Act, giving the Department of Health and Human Services authority: “to test a payment incentive and service delivery model that utilizes physician and nurse practitioner directed home-based primary care teams designed to reduce expenditures and improve health outcomes in the provision of items and services

Summary

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Next Steps

Legislation to pay room and board for highly service connected Veterans



Acknowledgements

This is
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thank you
dance!



Questions



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