VA Colon Cancer Quality and Costs Study: Estimating Healthcare Costs for Colon Cancer

Denise M. Hynes, RN, MPH, PhD

Center for Management of Complex Chronic Care &
VA Information Resource Center, Edward Hines Jr. VA Hospital Hines, IL
College of Medicine and School of Public Health,
University of Illinois, Chicago, IL

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VA HEALTH CARE Defining EXCELLENCE in the 21st Century

Focus for Today

- VA Colon Cancer Quality of Care and Cost Study
- Approaches and Data Sources Used for Estimating Costs
- Alternative Methods for Dealing with Outliers and Impacts on Results

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Overview

VA COLON CANCER QUALITY AND COSTS STUDY

Objective

- Examine and compare healthcare use and costs for colon cancer patients treated in the Veterans Health Administration (VA) and Medicare

- Completed study funded by VA HSR&D Service begun in 2004

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- Coauthors/Investigators:
  - Elizabeth Tarlov, PhD, RN
  - Todd A. Lee, PharmD, PhD
  - Thomas Weichle, MS
  - Ramon Durazo-Arvizu, PhD
  - Ruth Perrin, MA
  - Qiuying Zhang, MS
  - Rosario Ferreira MD, MAPP
- Advisors:
  - Al Benson, MD, FACP
  - Nirmala Bhoopalam, MD
  - Vivien W. Chen, PhD
  - Marc T. Goodman, PhD
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How Much Does Colon Cancer Care Cost ?

- **Direct Medical Cost**
- Est. average cost of between $35,000 and $80,000 for each cancer episode
- Total cost for treatment of anticipated new cases ~ $8.3 billion

- **Medicare Treatment Cost**
- With first-year Medicare treatment spending after detection estimated at $35,800 per case,
- Medicare spending for new colorectal cancer cases ~ $2.4 billion

- **Treatment Cost: Early Detection vs. Late Stage**
- Early ~ $30,000/patient
- Late ~ $120,000/patient

2007 estimates

Cost of Care Varies Widely

- The total cost of chemotherapy to treat colorectal cancer may differ by as much as $36,999 per patient, depending on the regimen

  – Lyman ,et al., AmJ Managed Care, 2008 (See Variation in the cost of medications for the treatment of colorectal cancer. Ferro SA, Myer BS, Wolff DA, et al. Am J Manag Care. 2008 Nov;14(11):717-25.)

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VA and Cancer Care

- VA treats about 175,000 cancer patients per year
- VA cancer care is the focus of a congressionally mandated Government Performance and Results Act study
- Evaluation and measurement of cancer care and outcomes in the VA population is complicated by veterans' use of both VA and non-VA

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VA Cancer Care Facility Characteristics

	Overall (N = 138)	Complexity Level High (N = 67)	Medium (N = 32)	Low (N = 39)	p-value
Volume					
Mean	155.5	254.1	105.2	27.2	<.0001
Min	0.0	81.3	0.0	0.0	.
Max	568.0	568.0	246.3	146.0	.
Comprehensive Cancer Center (%)	31.9	61.2	9.4	0.0	<.0001
Institutional Structure					
Cancer Registries					
Onsite Registrar (%)	69.6	94.0	62.5	33.3	<.0001
ACoS Certified (%)	41.3	68.7	34.4	0.0	<.0001
Tumor Boards					
1 (%)	44.9	43.3	65.6	30.8	<.0001
> 1 (%)	29.7	53.7	12.5	2.6	.
None (%)	25.4	3.0	21.9	66.7	.

Source: Program Evaluation of Oncology Programs in the VHA – Survey of VA Facilities, GPRA Evaluation, 2006

What We Know About Dual VA and Medicare Users

- Over 80% of elderly veterans eligible to use VA, use Medicare alone or with VA services (Hynes, et al., 2007)

- Empirical evidence of quality of care problems for general medical illnesses in a multiple provider situation (Borowsky & Cowper, 1999 and Petersen, et al., 2001)

- Patients using more than one healthcare system may find coordination of care across systems to be lacking, resulting in delays in care and excessive healthcare use and costs

Colon Cancer Management Strategies 1999-2002

- **Stage 0**
  - Local excision or simple polypectomy with clear margins
- **Stage I & II**
  - Wide surgical resection & anastomosis
  - Adjuvant chemotherapy in *controlled clinical trials only*
- **Stage III**
  - Wide surgical resection & anastomosis
  - Adjuvant chemotherapy
- **Stage IV**
  - Surgical resection/ anastomosis or bypass of primary lesions
  - Radiation therapy to primary tumor
  - Surgical resection of isolated metastases (liver, lung, ovaries)
  - Adjuvant chemotherapy
  - Clinical trials evaluating new drugs & biologic therapy

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Methods

- Retrospective cohort
  - Dually eligible for VA and Medicare benefits
  - At least 66 yrs old in 1999–2001

- Matched & linked to incident cancer record in VA Central Cancer Registry or one of 8 NCI SEER registries
  - Participating SEER registries: Atlanta, California, Detroit, Hawaii, Iowa, Louisiana, New Jersey, & Western Washington

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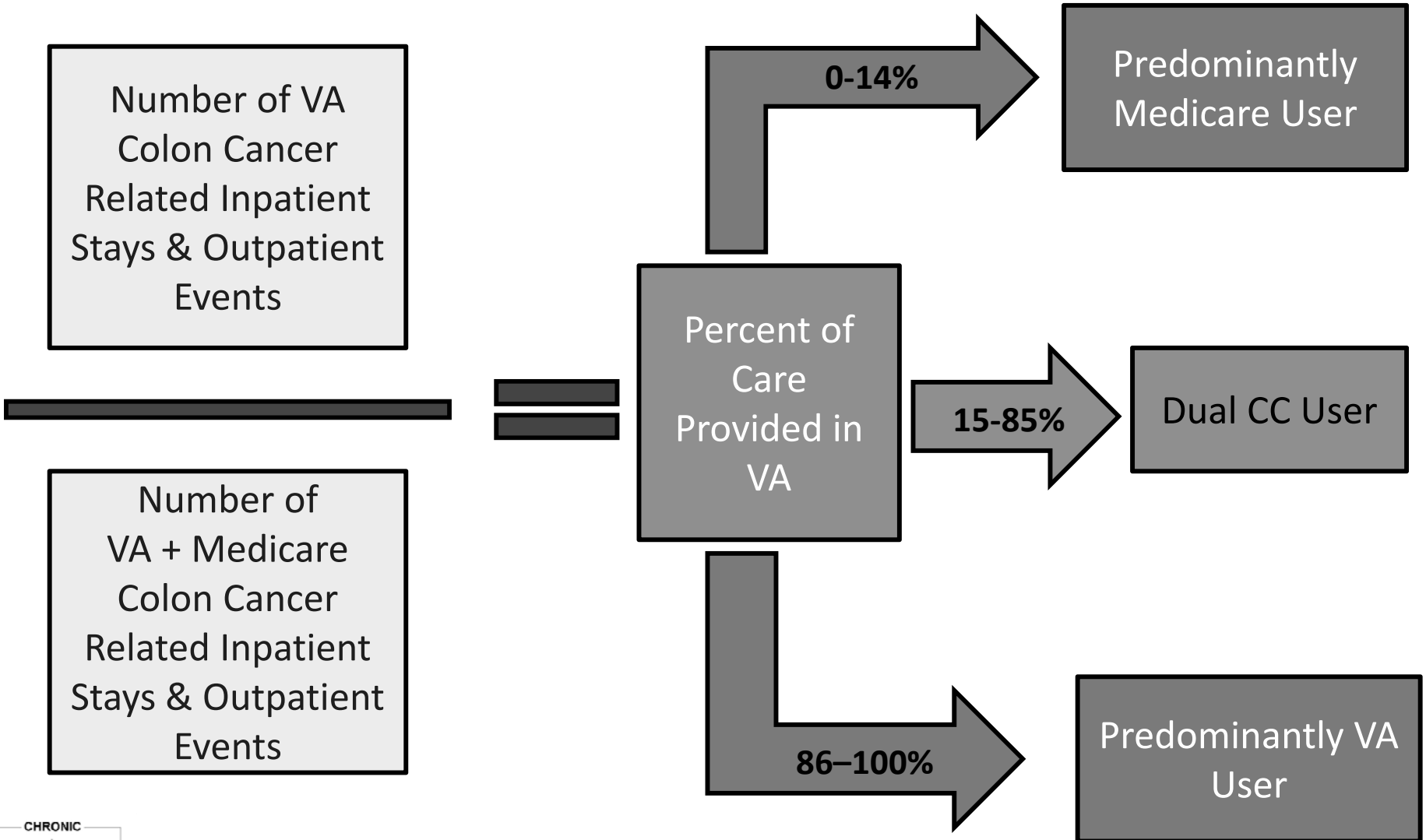
Methods

- Dual Use Measure
  - Specific to Colon Cancer Care
    - Colon cancer, colectomy, or chemotherapy events indicated by diagnosis, DRG, procedure, HCPCS, BETOS, revenue center, clinic stop, or pharmacy class codes
    - Calculated based on percentage of colon cancer specific inpatient and outpatient healthcare use in the VA
    - Three CC User Groups: Dual, Predominantly Medicare, and Predominantly VA


Number of VA Colon Cancer Related Inpatient Stays & Outpatient Events
Number of VA + Medicare Colon Cancer Related Inpatient Stays & Outpatient Events
Percent of Care Provided in VA
0-14%
Predominantly Medicare User
15-85%
Dual CC User
86–100%
Predominantly VA User

Methods

APPROACHES AND DATA SOURCES USED FOR ESTIMATING COSTS

VIReC Finder file
Veterans known to VA
at least 66 years old
dually eligible to use VHA and Medicare
between 1999-2001

3,482,654

8 SEER program registries
California Iowa Georgia
Louisiana New Jersey Hawaii
Western Washington
Metro Detroit

and VA Central Cancer Registry

Exclusions: 1,485
Incomplete or absent utilization information

At some point during the study period*:

- Not enrolled or not eligible for VA care (**259)**
- Medicare HMO enrollment (**1,056)**
- Non-Medicare primary payer (private insurance) **(86)**
- Medicare Part B coverage only (**19)**

No healthcare utilization records during study period, reason unknown (**60)**

No utilization records during 6-month period surrounding diagnosis date, reason unknown **(438)**

Autopsy-only diagnosis **(15)**

No colon cancer-related health care within 12 month after diagnosis **(101)**

Zero colon cancer-related costs **(92)**

Match yield
Veterans with
stage I–IV colon cancer
diagnosed between
7/1/99-12/31/01
who were 66 years or older
at the time of diagnosis
5,327

Analytical cohort:
3,842

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Summary of Data Sources Used

- Define Cohort
  - VIReC Finder File
  - NCI SEER (8)
  - VA Central Cancer Registry (VA CCR)
- Determine Exclusions based on Healthcare Use
  - VA Workload data--MEDSAS
  - Medicare Claims

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Methods: Measuring Costs

- 12 Months from diagnosis
- Valuation:
  - VA cost valued using Health Economic Resource Center (HERC) average cost approach
  - Medicare valued using Medicare payments
- Includes
  - VA and Medicare acute and intermediate inpatient and outpatient utilization, including pharmacy
- Excludes
  - VA long term care
  - Medicare home health care, hospice, & DME

Analysis

- Healthcare use & costs within 12 months after diagnosis

❖ Descriptive analyses (Stata™)
- ❖ Compared overall (inpatient and outpatient) costs
- ❖ Examined association of user group (Dual, Predominantly Medicare, Predominantly VA) with costs
- ❖ Adjusted for predisposing, enabling, and contextual factors

❖ Multivariable regression analysis (GLM) (Stata™)

❖ All costs adjusted to 2004 dollars

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Cohort Characteristics (N=3,842)

		%
Age at diagnosis (yrs)	66–75	49.2
	76–85	45.8
	86 and older	5.0
Gender	Male	96.5
Race	African American	15.5
Marital status	Not married	37.7
	Married	59.6
	Unknown	2.8

Cohort Characteristics (N=3,842)

		%
Stage at diagnosis	I	26.8
	II	30.7
	III	23.2
	IV	19.3
Comorbidity score[b]	0	51.4
	1	25.6
	2–3	18.5
	4 or higher	4.5
Chemotherapy[c]	Yes	33.6
Colectomy[d]	Yes	89.4
[b] Measured from months -6 to 0 in study period; [c] Measured from months 0 to 12 in study period.; [d] Measured from months -1 to 6 in study period.		

Colon Cancer Care 12 Month Costs* By User Group (N=3,842)

	Predominantly Medicare		Dual Use		Predominantly VA	
	N	Mean (SD)	N	Mean (SD)	N	Mean (SD)
Total CC Costs	1,417	39,136 (31,567)	510	44,264 (50,567)	1,915	36,146 (37,060)
Inpatient	1,370	32,907 (29,836)	492	42,174 (50,866)	1,808	34,587 (37,217)
VA	35	37,166 (42,554)	340	41,785 (51,806)	1,797	34,163 (37,132)
Medicare	1,357	32,264 (29,159)	337	19,181 (18,622)	83	11,199 (13,129)
Outpatient	1,308	7,930 (10,587)	498	3,665 (6,347)	1,706	3,919 (5,788)
VA	166	357 (462)	460	1,213 (1,976)	1,697	3,800 (5,633)
Medicare	1,306	7,897 (10,557)	453	2,750 (5,967)	186	429 (903)

* All significant at P<0.01

Colon Cancer Care 12 Month Use* By User Group (N=3,842)

	Predominantly Medicare	Dual use	Predominantly VA
	(N = 1,417)	(N = 510)	(N = 1,915)
		Mean (SD)	
Inpatient admissions per patient	1.5 (1.0)	1.9 (1.2)	1.5 (1.3)
Days per inpatient admission	13.7 (15.8)	15.5 (19.0)	13.2 (24.7)
Total inpatient days per patient	21.3 (23.4)	29.4 (33.7)	20.8 (32.4)
Outpatient visits per patient	35.7 (29.9)	19.2 (22.0)	13.5 (16.6)
Total outpatient visit days	24.8 (20.1)	14.4 (14.4)	12.1 (14.4)

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* All significant at P<0.0001

Estimated Expense Rate Ratios (N=3,842)

	Adjusted ERR (95% Confidence Intervals)
Age at Diagnosis	
66–75	Ref
76–85	1.17 (1.08–1.27)
86 and older	1.24 (1.04–1.47)
Race	
Non-African American	Ref
African American	1.14 (1.03–1.28)
Married	
No	Ref
Yes	0.88 (0.81–0.95)
Unknown	0.58 (0.40-0.86)
Stage at diagnosis	
I	Ref
II	1.37 (1.23–1.53)
III	1.84 (1.63–2.07)
IV	2.27 (2.01–2.56)

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Estimated Expense Rate Ratios (N=3,842)

	Adjusted ERR (95% Confidence Intervals)
Comorbidity score	
0	Ref
1	1.17 (1.08–1.28)
2 or 3	1.48 (1.33-1.66)
4 or higher	2.07 (1.74–2.42)
Chemotherapy	
No	Ref
Yes	0.92 (0.85–1.00)
Surgery	
No colectomy	Ref
Colectomy	1.51 (1.31–1.73)
User Group	
Predominantly Medicare	0.85 (0.76–0.95)
Dual user	Ref
Predominantly VA	0.88 (0.78–0.99)

Expense rate ratios from GLM model (gamma family with log link). Additional adjusters include hospitals w/oncology services and outpatient events.

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Results Summary

- Adjusted costs were lower among single system CC users compared to dual CC users

- Compared to dual users, adjusted costs were:

  - **15% lower** among predominantly Medicare CC users (ERR: 0.85, $CI_{95\%}$: 0.76–0.95)

  - **12% lower** among predominantly VA CC users (ERR: 0.88, $CI_{95\%}$: 0.78 – 0.99)

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Impact on Results

ALTERNATIVE METHODS FOR DEALING WITH OUTLIERS AND INFLUENTIAL CASES

GLM Models & Limitations

- Can accommodate skewness in large datasets by weighting variances without assumptions regarding distribution
- Mis-specifying variance function in GLMs can result in losses of precision
- Can lose efficiency if data have large log-scale error variance or error distribution on log scale is symmetrical but has a heavy tail

Colon Cancer Care 12 Month Costs* By User Group (N=3,842)

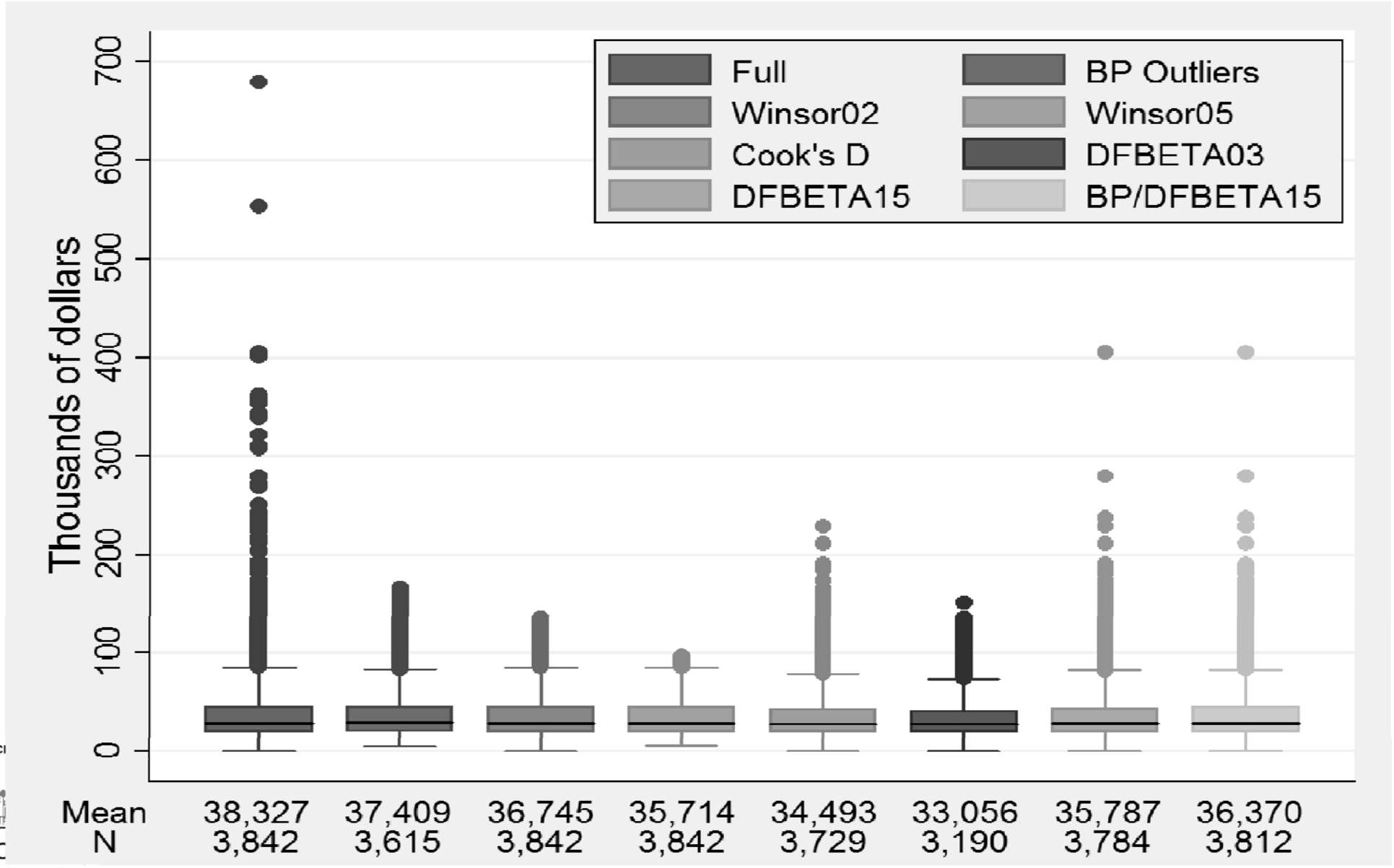
	Predominantly Medicare		Dual Use		Predominantly VA	
	N	Mean (SD) Range	N	Mean (SD) Range	N	Mean (SD) Range
Total Colon Cancer Cost	1,417	39,136 (31,567) (42 - 405,892)	510	44,264 (50,567) (138 - 679,471)	1,915	36,146 (37,060) (70 - 553,115)
Inpatient	1,370	32,907 (29,836)	492	42,174 (50,866)	1,808	34,587 (37,217)
Outpatient	1,308	7,930 (10,587)	498	3,665 (6,347)	1,706	3,919 (5,788)

* All significant at P<0.01

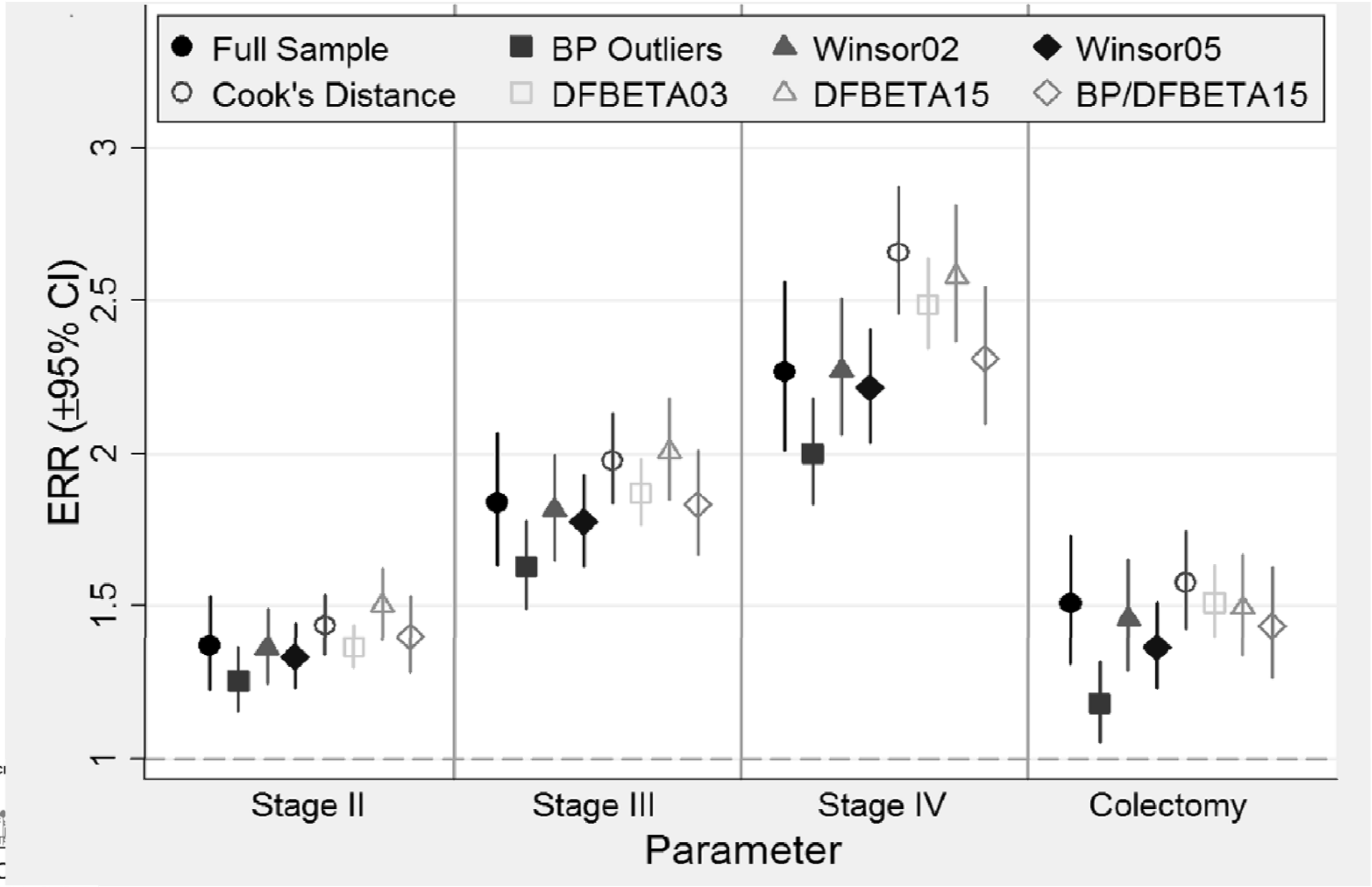
Approaches to Identify Outliers & Influential Observations

- Adjusting outliers
  - Box-plot analysis
    - Interquartile method
  - Winsorization
    - Involves replacing (or limiting) extreme values
- Influential observations
  - Cook's distance
    - Measures the aggregate change with omission
  - DFBETAs
    - Focuses on impact on each regressor

Characteristics of Each Approach



Key Cost Drivers



Limitations

- Selection bias: three level exposure variable (user group) not easily amenable to propensity score matching
- Cases reported from NCI SEER may not represent all the VA reported cases outside VA
- Coverage in VA and Medicare differs; attempted to focus on comparable care, i.e. inpatient and outpatient care

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Conclusions

- Costs were lower for single system users compared to dual users
- These differences were similar using different approaches for accounting for outliers and influential cases
- Costs were also higher among patients who were African American, had more comorbidities, were older, or had more advanced-stage disease
- Differences in the course of treatment, quality of care and costs attributable to colon cancer warrants further study

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Time for Questions

THANK YOU !

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