

# WHI Medicare Data

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# Outline

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- Linkage between WHI and Medicare
- What is available on the Virtual Data Enclave (VDE)
- WHI Medicare Publications
- Agreement between Medicare and WHI Outcomes
- Suggested uses
- Analytic Issues

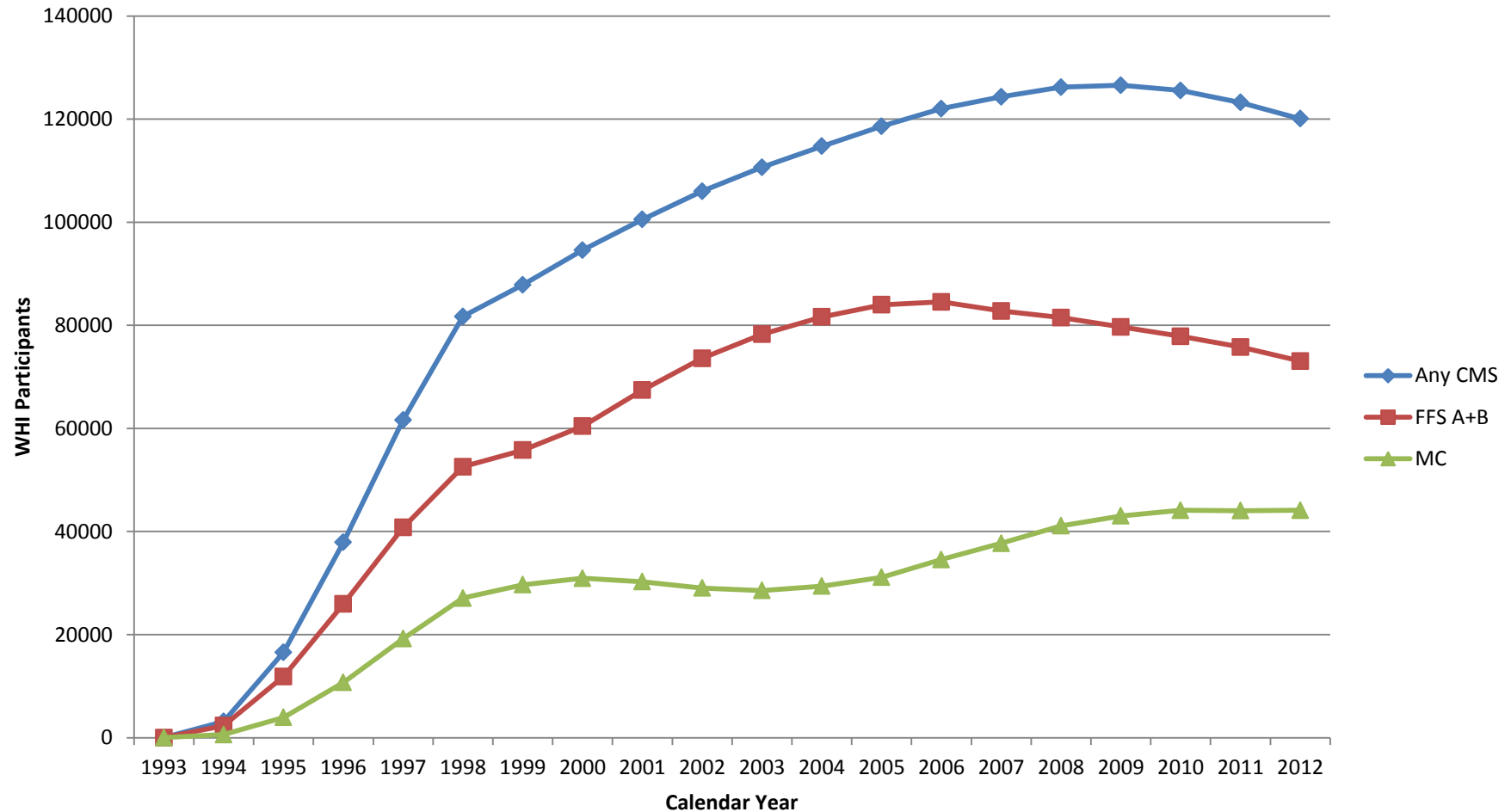
WHI CCC at Fred Hutch, through an Interagency Agreement with CMS, has obtained Medicare data linked to WHI participants. The DUA governs the use and sharing of the data.



# Linkage between WHI and Medicare

- WHI has 161,808 participants
  - 151,169 with a valid SSN were sent to CMS in a finder file
  - 147,998 returned in linkage file from CMS
  - 145,691 participants were then successfully linked by birth date, death date, and zip code
    - 143,058 were matched exactly on birth and/or death date
    - 2,633 were 'fuzzy matched' using close birth/death dates and zip codes
  - 54 participants were excluded for invalid Medicare enrollment type
  - 145,637 participants had valid Medicare data post WHI enrollment

# WHI Participants in Medicare Over Time



# What is available on the VDE

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- Enrollment
- MedPAR
- Outpatient
- CarrierB
- Durable Medical Equipment (DME)
- Home health
- Hospice

# What is available on the VDE, cont.

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- Files are presented 'as is' from CMS, including denied claims, bad characters, and claims prior to WHI enrollment.
- Each enclave investigator should be responsible for their own cleaning of the data to ensure correct data use.

# Enrollment File

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- Current file: Data through 2012
- Tracks participants Medicare status over WHI follow-up broken up into intervals defined by Medicare enrollment type.
  - Fee For Service (FFS) A, B, or A+B
  - Managed Care (HMO Enrolled)
- Participants have between 1 and 21 intervals



# Enrollment File

- Participant total intervals

Intervals	N	%
1	90081	61.9
2	35491	24.4
3	13076	9.0
4	4672	3.2
≥5	2317	1.6

# Enrollment File

id	mdcrenrltd1	mdcrenddt1	mdcrstat1	mdcrelig1	mdcrenrltd2	mdcrenddt2	mdcrelig2	mdcrstat2
1	09/25/97	12/31/12	Medicare A+B	Aged without ESRD	.	.	.	.
2	12/01/02	11/30/03	Medicare A Only	Aged without ESRD	12/01/03	05/31/06	Aged without ESRD	Medicare A+B
3	07/01/06	07/31/06	Medicare A+B	Aged without ESRD	08/01/06	12/31/12	Aged without ESRD	HMO Enrolled
4	03/19/98	02/28/02	HMO Enrolled	Disabled without ESRD	03/01/02	12/31/12	Aged without ESRD	Medicare A+B

# Enrollment File

- Intervals change when Medicare type changes

id	mdcrenrlt1	mdcrenddt1	mdcrstat1	mdcrelig1	mdcrenrlt2	mdcrenddt2	mdcrelig2	mdcrstat2
1	09/25/97	12/31/12	Medicare A+B	Aged without ESRD	.	.	.	.
2	12/01/02	11/30/03	<b>Medicare A Only</b>	Aged without ESRD	12/01/03	05/31/06	Aged without ESRD	<b>Medicare A+B</b>
3	07/01/06	07/31/06	<b>Medicare A+B</b>	Aged without ESRD	08/01/06	12/31/12	Aged without ESRD	<b>HMO Enrolled</b>
4	03/19/98	02/28/02	<b>HMO Enrolled</b>	Disabled without ESRD	03/01/02	12/31/12	Aged without ESRD	<b>Medicare A+B</b>

# Enrollment File

- Intervals **do not** change when the eligibility reason changes; Eligibility status is the status at the **start** of the given interval

id	mdcrenrlt1	mdcrenddt1	mdcrstat1	mdcrelig1	mdcrenrlt2	mdcrenddt2	mdcrelig2	mdcrstat2
1	09/25/97	12/31/12	Medicare A+B	Aged without ESRD	.	.	.	.
2	12/01/02	11/30/03	Medicare A Only	Aged without ESRD	12/01/03	05/31/06	Aged without ESRD	Medicare A+B
3	07/01/06	07/31/06	Medicare A+B	Aged without ESRD	08/01/06	12/31/12	Aged without ESRD	HMO Enrolled
4	03/19/98	02/28/02	HMO Enrolled	<b>Disabled without ESRD</b>	03/01/02	12/31/12	<b>Aged without ESRD</b>	Medicare A+B

# MedPAR

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- Includes both inpatient and skilled nursing facility (SNF) records
- Includes all facility charges, but not doctor or surgeon billing for visits in hospital
- Admission and discharge dates for each hospitalization
- Outcomes coded in 10 ICD-9 diagnosis code and 6 ICD-9 procedure code fields
  - Next iteration of Medicare data will also include ICD-10

# Outpatient

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- Includes claims from hospital outpatient centers, ambulatory care surgical centers, rehabilitation facilities, rural health clinics, and community mental health centers
- Dates of service for each outpatient claim FROM\_DT to THRU\_DT
- 10 ICD-9 diagnosis codes (i.e. ICD\_DGNS\_CD1)
- 6 ICD-9 procedure codes (i.e. PRCDRCD1)

# CarrierB

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- Contains claims from individual physicians or specialists
- Also can include claims from clinical social workers, chiropractors, ambulances, nurse practitioners, and physician assistants.
- Dates of service for each claim FROM\_DT to THRU\_DT
- 10 ICD-9 diagnosis codes (i.e. ICD\_DGNS\_CD1)

# Header Files vs. Line Items

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- Most files are broken into header and line item files
  - Header file contain ICD-9 codes
  - Line item files contain additional information
    - Healthcare Procedure Coding System Codes (HCPCS\_CD)
    - Provider specialty (HCFASPCL, Carrier only)
    - Cost information (charge, payment, etc.)
  - Merge records together by CLM\_ID



# Uses of the Medicare Billing Data in WHI

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- WHI Medicare Publications
- Agreement between Medicare and WHI Outcomes
- Suggested uses

# WHI Publications Using Medicare Data- Atrial Fibrillation

- Effects of postmenopausal hormone therapy on incident atrial fibrillation: the Women's Health Initiative randomized controlled trials. Perez MV, Wang PJ, Larson JC, *et al.* *Circ Arrhythm Electrophysiol.* 2012 Dec;5(6):1108-16.
- Risk factors for atrial fibrillation and their population burden in postmenopausal women: the Women's Health Initiative Observational Study. Perez MV, Wang PJ, Larson JC, *et al.* *Heart.* 2013 Aug;99(16):1173-8.
- Obesity, physical activity, and their interaction in incident atrial fibrillation in postmenopausal women. Azarbal F, Stefanick ML, Salmoirago-Blotcher E, *et al.* *J Am Heart Assoc.* 2014 Aug 20;3(4).

# WHI Publications Using Medicare Data- Atrial Fibrillation, cont.

- Lean body mass and risk of incident atrial fibrillation in post-menopausal women. Azarbal F, Stefanick ML, Assimes TL, *et al.* Eur Heart J. 2016 May 21;37(20):1606-13.
- Racial and ethnic differences in atrial fibrillation risk factors and predictors in women: Findings from the Women's Health Initiative. Rodriguez F, Stefanick ML, Greenland P, *et al.* Am Heart J. 2016 Jun;176:70-7.

# WHI Publications Using Medicare data

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- Validity of diabetes self-reports in the Women's Health Initiative. Jackson JM, DeFor TA, Crain AL, Kerby TJ, et al. *Menopause*. 2014 Aug;21(8):861-8.
- Pre-existing diabetes and breast cancer prognosis among elderly women. Luo J, Hendryx M, Virnig B, *et al*. *Br J Cancer*. 2015 Sep 1;113(5):827-32.
- Use of administrative data to increase the practicality of clinical trials: Insights from the Women's Health Initiative. Anderson GL, Burns CJ, Larson J, Shaw PA. *Clin Trials*. 2016 Jun 30.

# WHI Publications Using Medicare Data- Agreement between WHI and Medicare

- Cardiovascular Outcomes
  - Use of Medicare data to identify coronary heart disease outcomes in the Women's Health Initiative. Hlatky MA, Ray RM, Burwen DR, et al. Circ Cardiovasc Qual Outcomes. 2014 Jan;7(1):157-62.
  - Comparison of Medicare claims versus physician adjudication for identifying stroke outcomes in the Women's Health Initiative. Lakshminarayanan K, Larson JC, Virnig B, et al. Stroke. 2014 Mar;45(3):815-21.

# WHI Publications Using Medicare Data- Agreement between WHI and Medicare

- Cardiovascular Outcomes, cont.
  - Evaluation of Medicare claims data to ascertain peripheral vascular events in the Women's Health Initiative. Mell MW, Pettinger M, Proulx-Burns L, et al. J Vasc Surg. 2014 Jul;60(1):98-105.
  - Venous Thromboembolism Incidence, Recurrence, and Mortality Based on Data from the Women's Health Initiative and Medicare Claims. Burwen DR, Wu C, Cirillo D, et al. Submitted.

# Agreement between WHI and Medicare Cardiovascular Outcomes

	Training set results			Test set results		
	Sensitivity	PPV	Kappa	Sensitivity	PPV	Kappa
Stroke	87	68	0.75	87	65	0.74
MI	79	71	0.74	79	78	0.77
CABG	94	89	0.91	95	93	0.94
PCI	90	86	0.88	86	85	0.85
VTE	81	65	0.71	83	69	0.75
Carotid	92	81	0.86	92	81	0.86
AAA	90	63	0.74	71	62	0.66
LE PAD	73	58	0.65	76	56	0.64

**Adapted from** 'How Well Do Medicare Claims Identify Cardiovascular Outcomes in the Women's Health Initiative?' by Dale Burwen, presented by Garnet Anderson at the MESA Steering Committee Meeting, April 24-26, 2013

# Agreement between WHI and Medicare Invasive Cancer Outcomes

Invasive Cancer Site	WHI Yes, Medicare Yes	WHI No, Medicare Yes	WHI Yes, Medicare No	WHI No, Medicare No	Sens.	PPV	Kappa
Breast	3451	1562	56	98,302	98	69	0.80
Colorectal	1145	613	39	104,947	97	65	0.78
Endometrial	621	146	17	61,642	97	81	0.88
Lung	1236	634	63	105,468	95	66	0.78
Melanoma	357	785	24	105,353	94	31	0.47
Ovarian	353	372	19	86,168	95	49	0.64

Medicare-derived cancers based on presence of relevant ICD-9 codes in MedPar (inpatient data), any position, or the first occurring combination of 2 outpatient or carrier claims containing these codes that are 1-365 days apart. Median follow-up in WHI and Medicare was 7.5 years (Interquartile range 3.2 to 11.8 years). Diagnosis dates between the two sources were within  $\pm 30$  days for the majority.



# Why Were Outcomes Found in Claims But Not in WHI?

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## ■ CVD outcomes

- Key reason for a Medicare event without a WHI match was lack of a WHI report of hospitalization (participant did not recall, or participant was disabled/deceased and there was no proxy report).
- In such cases, there was no adjudicated medical record that would correspond to the Medicare event.

# Why Were Outcomes Found in Claims But Not in WHI?

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- Cancer outcomes
  - We found WHI adjudicated cancer outcomes at adjacent or related sites (including adjudicated in situ outcomes of the cancer of interest) for about half.
  - Only 5% had no self-report of any cancer or hospitalization and as such, no information available that would have initiated an adjudication process.

# Suggested Uses for Medicare Data

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- Validation of other WHI-adjudicated outcomes
  - CHF
  - Hip fracture
- Outcomes not collected by WHI
  - Incident events defined by presence of diagnosis and procedure codes
  - Glaucoma, Cataract surgery, Carpal tunnel syndrome
- Screening
  - Mammograms, Colonoscopy, Lipid testing

# Suggested Uses for Medicare Data, cont.

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- Health care cost, expenditures
- Post-outcome care
  - Continuity of care after MI
- Cancer treatment
  - LILAC study is assembling cancer treatment information for women with selected cancers

# Breast cancer treatment codes

	ICD-9 diagnosis	ICD-9 Procedure	Healthcare Common Procedure Coding system
<b>Surgery</b>	Breast conserving surgery	85.20-85.23, 85.25	19110, 19120, 19125, 19126, 19160, 19162, 19301, 19302
	Mastectomy	85.33-85.48	19180-19255, 19303-19307
<b>Radiation</b>	V58.0, V66.1 V67.1	92.21-92.29	77401-77425, 77520-77525, 77750-77799, G0173, G0251, G0256, G0261, G0339, G0340 77427-77499, 77300-77399, G0243 19296, 19297, 19298, C9714, C9715, 0073T, G0174, 0082T, Revenue Center Codes: 0330, 0333
<b>Chemotherapy</b>	V58.1, V66.2, V67.2	99.25	964XX, 965XX, Q0083-Q0085, J9000-J9999, J8510, J8520, J8521, J8530-J8999, G0355-G0362 Revenue center (0331, 0332, 0335)

J Luo. Pre-existing diabetes and breast cancer prognosis among elderly women. Br J Cancer 2015. Supplement table 1.

# Suggested Uses for Medicare Data, cont.

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- Disease recurrence
  - Challenging to assess if specific diagnosis codes for recurrence do not exist (e.g., cancer)
  - Involves algorithm development in order to infer recurrence
  - LILAC study is working on algorithms for breast, colorectal, and endometrial cancers

# Analytic Issues

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- Defining the study sample
- Exclusions
- Medicare coverage period
- Generalizability

# Benefit Program - Original reason for entitlement:

<b>Among total linked to Medicare (N=145,637)</b>	<b>%</b>
Old Age and Survivors Insurance (OASIS)	96.1
Disability Insurance Benefit (DIB)	3.9
End Stage Renal Disease (ESRD)	0.04
Both DIB and ESRD	0.01



# Age at enrollment into Medicare:

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Based on first interval of coverage in WHI

$\leq 63$ years	n=4,147 (2.9%)
64 years*	n=70,815 (48.6%)
$\geq 65$ years	n=70,675 (48.5%)

\* Coverage starts the first day of the month when the participant turns 65, or if born on the first of the month, starts at the beginning of the prior month.

# Type of Coverage

At WHI enrollment or when aged in:

<b>Among total linked to Medicare (N=145,637)</b>	<b>N (%)</b>
Not enrolled	41 (0.03%)
Medicare Advantage (aka: Managed Care, HMO, Part C)	30,981 (21.3%)
Fee-for-service (FFS)	
Medicare Part A only (inpatient)	19,420 (13.3%)
Medicare Part B only (outpatient and clinic/office visits)	757 (0.5%)
Medicare Parts A and B	94,438 (64.8%)

# Other possible exclusions:

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- Denied claims
- Skilled Nursing Facility (SNF) claims in MedPAR
- Claims prior to WHI enrollment (not all WHI participants will have them)
- Length of coverage
- Require “look-back” period for defining prevalent disease

# Medicare Enrollment Period

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- Should analysis start at enrollment or allow participants to age into Medicare?
  - N=68,556 (47.1%) linked participants were in Medicare at WHI enrollment
- Allow gaps in coverage ?, i.e. change from FFS to MC and then back to FFS

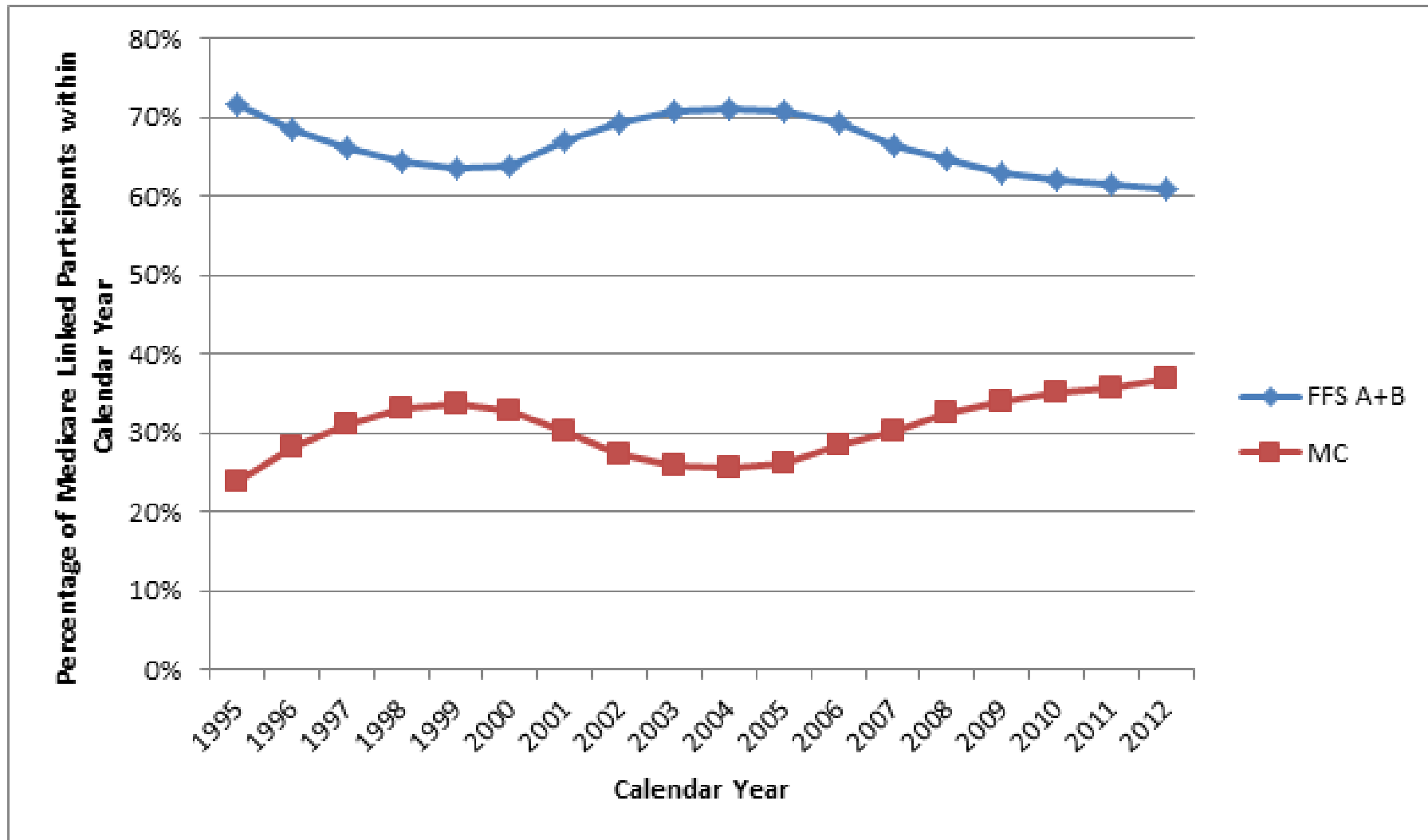
# Generalizability

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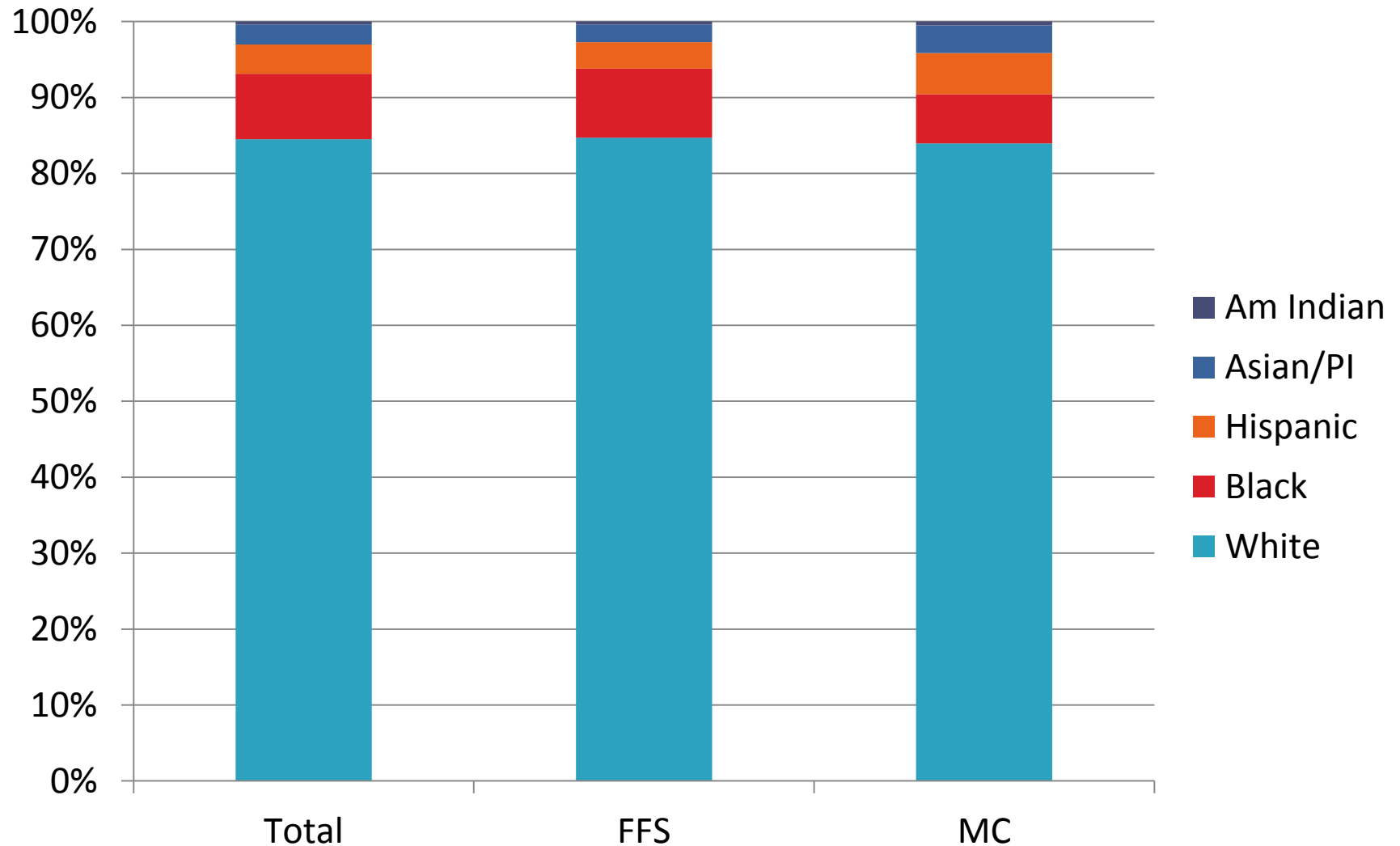
Are FFS beneficiaries in WHI representative of the overall WHI-Medicare linked sample?

Recall ~25-35% are enrolled in Managed Care

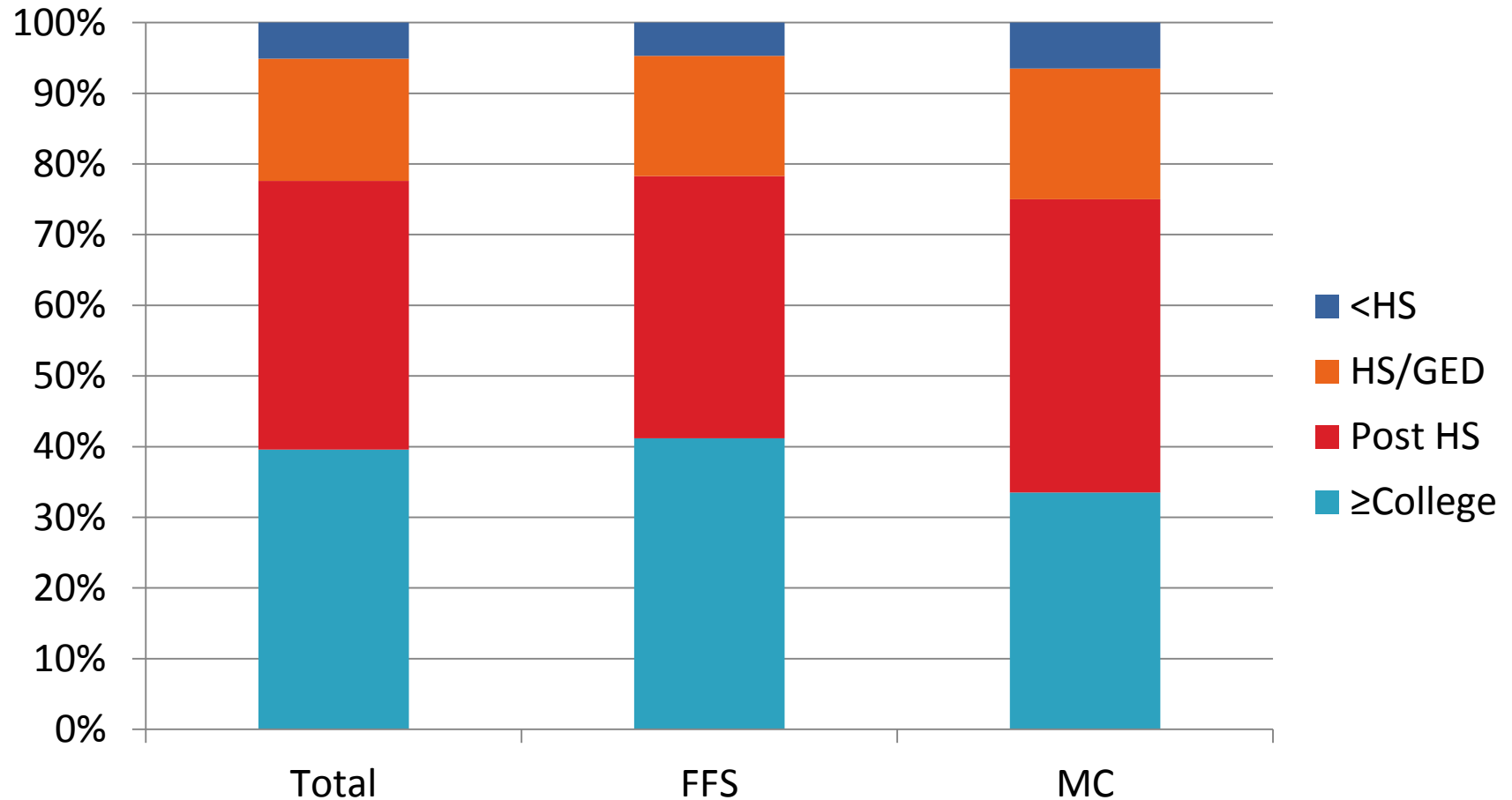
# Type of Coverage Over Time



# Characteristics of Participants in FFS vs HMO, by Race/Ethnicity

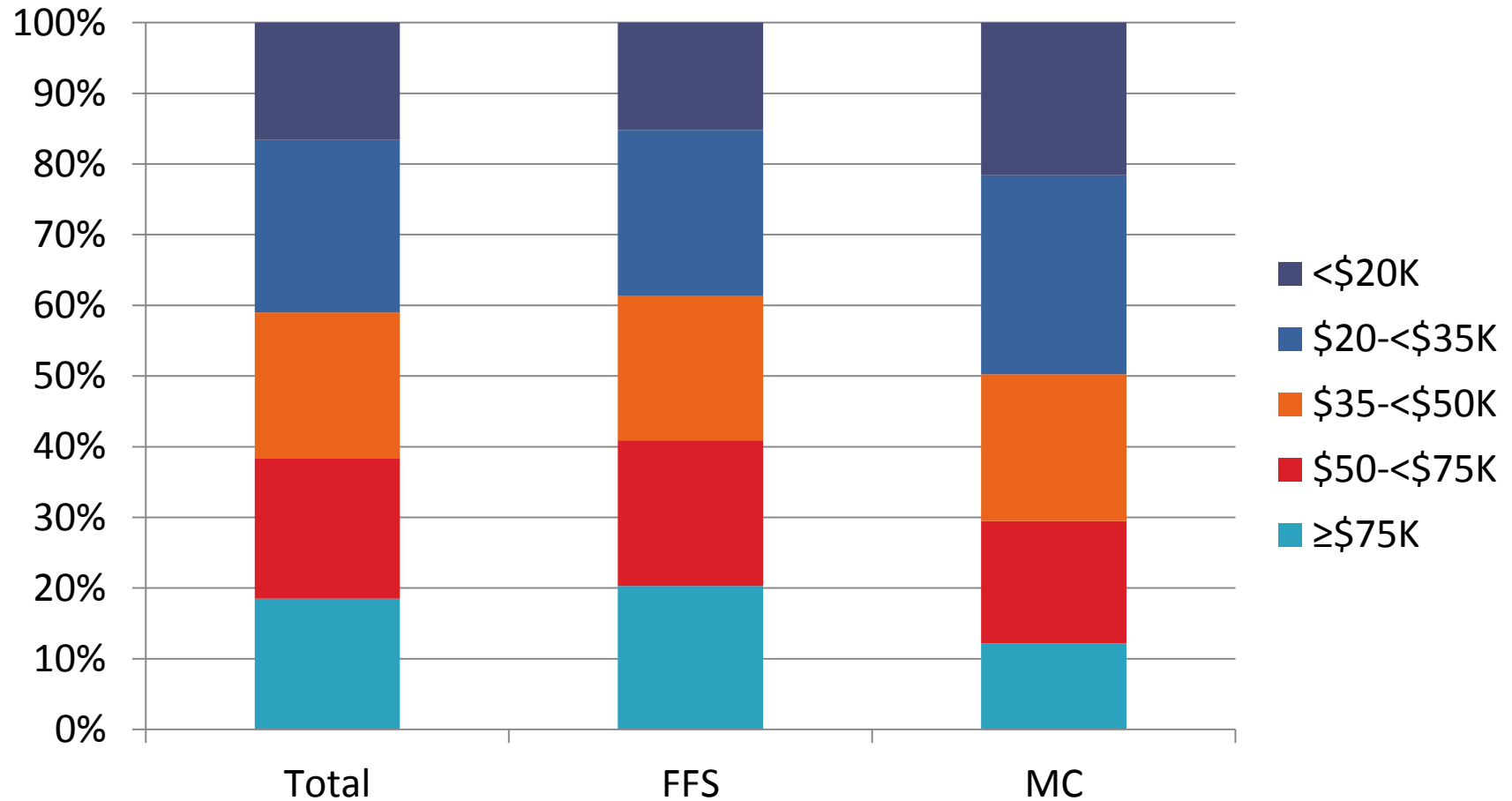


# Characteristics of Participants in FFS vs HMO, by Education

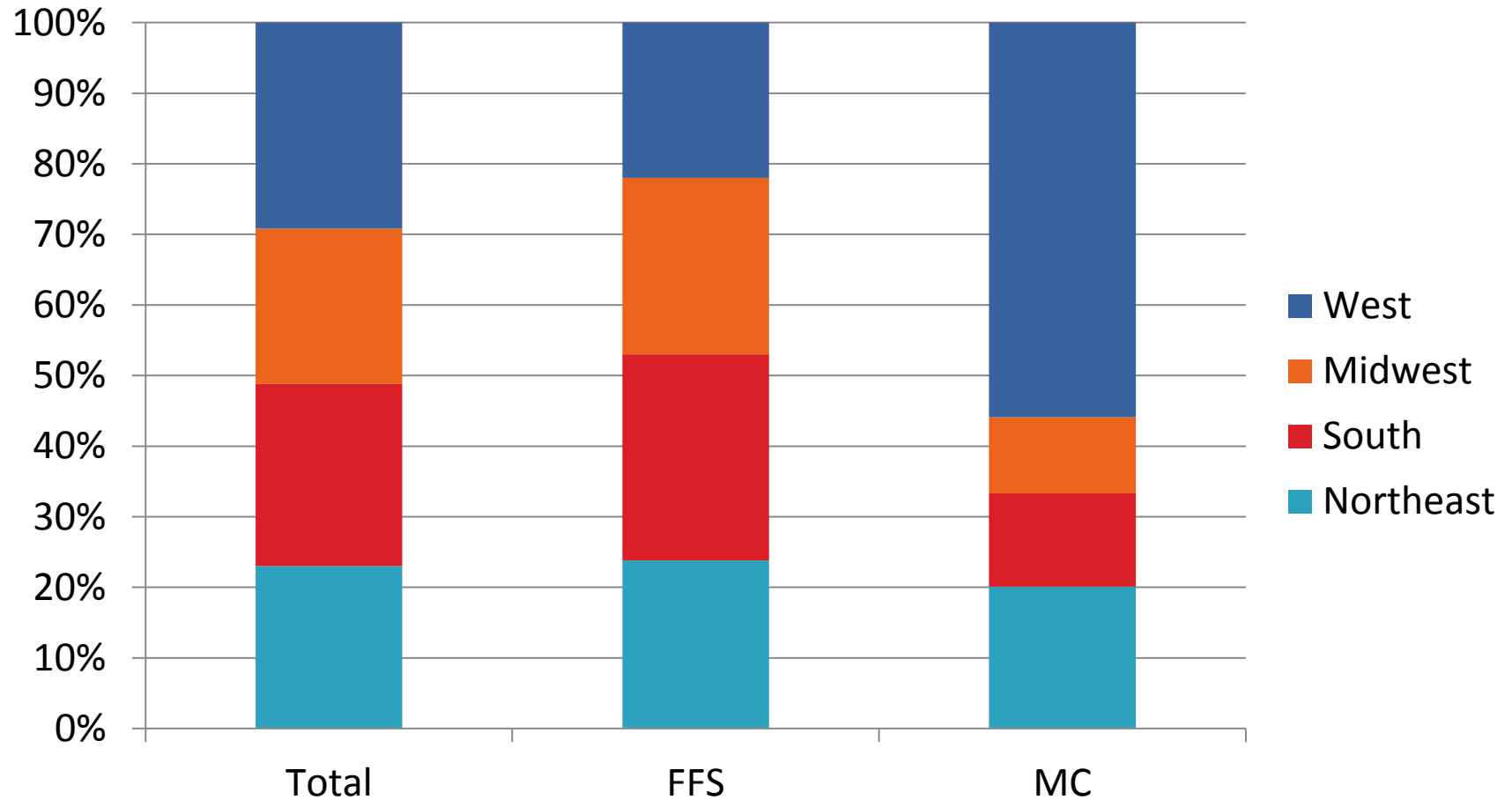




# Characteristics of Participants in FFS vs HMO, by Income



# Characteristics of Participants in FFS vs HMO, by Geographic Region



# Conclusion:

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FFS beneficiaries in WHI are fairly representative of the overall WHI-Medicare sample, although

- lower SES/minority women are under-represented
- differences in coverage by geographic region exist

Abstract: Habermann et al, **Medicare studies limited to fee-for-service beneficiaries: How generalizable are the results?** iHEA 9<sup>th</sup> World Congress on Health Economics, July 2013

# Important!! Restrictions when using CMS data:

1. Must adhere to CMS' current cell size suppression policy. **This policy stipulates that no cell size of 10 or less may be displayed.** Also, no use of percentages or other mathematical formulas may be used if they result in the display of a cell 10 or less.
2. Written manuscripts must be approved by the WHI Publications & Presentation Committee, **and** will also be sent to CMS prior to submission for publication.

# Helpful Resources

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- Research Data Assistance Center (ResDAC) is a CMS contractor providing free assistance to users of CMS data for research: [www.resdac.org](http://www.resdac.org)\*

\*Website has valuable training videos on use of Medicare data; also offers classes

# Helpful Resources

- CMS Chronic Conditions Data Warehouse (CCW) – source of data, and also provides useful algorithms for defining chronic conditions from claims
  - 27 chronic conditions, for ex: alzheimer's, diabetes, lung cancer, hip fracture, stroke
  - 33 other chronic or potentially disabling conditions, for ex: anxiety disorders, fibromyalgia, viral hepatitis

Website:

<https://www.ccwdata.org/web/guest/condition-categories>

# Helpful Resources

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- Join or reach out to WHI SIG on Health Services & Comparative Effectiveness, led by Karen Margolis (Karen.L.Margolis@HealthPartners.com)