

# Building Bridges between the VR-12 and SF-36<sup>®</sup> Patient Reported Outcomes in the SEER-MHOS Data Resource

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# Project team

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# Project Support

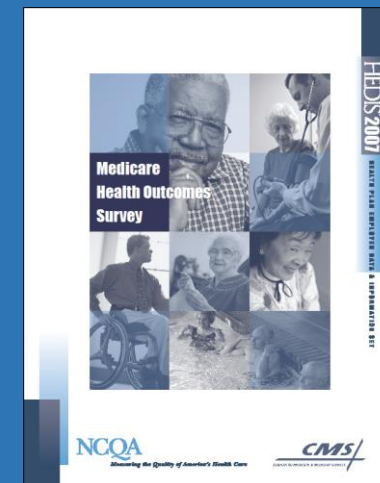
**Outcomes Research Branch/ Healthcare Delivery Research Program  
Division of Cancer Control and Population Sciences  
National Cancer Institute  
Contract # HHSN261201400530P**

# Topics to be covered in this presentation

- Medicare Health Outcomes Survey (MHOS)
- SF-36<sup>®</sup> and VR-12 health surveys
- Matching scales of the VR-12 to the SF-36<sup>®</sup>
- Extensibility Values - Definition and Applications
- Clinical Applications
- Conclusions

# SEER-MHOS Description

- Linkage of cancer registry data (SEER) to patient-reported measures from the Centers for Medicare Medicare & Medicaid Services Health Outcome Survey (MHOS)
- MHOS is an annual quality improvement survey of Medicare Advantage participants, with beneficiaries sampled/surveyed/resurveyed 2 years later on health-related quality of life and other PROs
- Linked data are the records of individuals in both the SEER (1973-2011) and MHOS data sets, plus all additional MHOS data for the years 1998-2013



# Description of the MHOS

- Sponsored by Centers for Medicare and Medicaid Services (CMS)
- Tracks functional health and well-being (HRQoL)
- Members of Medicare Advantage Plans
- Baseline random sample each year, 1998-present
- Follow-ups after 2 years must be alive and in plan
- Three eras in the type of instruments used to assess HRQoL

Era	Cohort	Baseline survey year	Baseline survey instrument	Follow-up survey year	Follow-up survey instrument
SF-36 era	1-6	1998-2003	SF-36	2000-2005	SF-36
Transition era	7-8	2004-2005	SF-36	2006-2007	VR-12
VR-12 era	9 to present	2006 to present	VR-12	2008 to present	VR-12

# Timeline of MHOS Cohorts 1-12

	SF-36 <sup>®</sup> Era						Transition Era		VR-12 Era					
Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
Baseline	1	2	3	4	5	6	7	8	9	10	11	12		
Follow-up			1	2	3	4	5	6	7	8	9	10	11	12

SF-36 <sup>®</sup>	
VR-12	

# SEER-MHOS linked dataset

- The Surveillance, Epidemiology, and End Results (SEER) program is a national registry of cancer patients that contains clinical and demographic information as well as causes of death. Data from a subset of individuals in the SEER program have been linked to the MHOS data resource, creating a combined SEER-MHOS data resource.



# Use of the MHOS

- Assesses changes in physical and mental health status
  - Outcomes are PCS same or better, and MCS better
  - Baseline to follow-up (including death)
- The SEER-MHOS data resource tracks respondents across multiple cohorts where possible
- The SEER-MHOS data resource allows longer-term follow-up
- CMS uses the MHOS as a quality improvement tool, however, researchers can use the MHOS and by extension the SEER-MHOS data resource for research purposes considering the rich robust clinical and PRO measures available

# Objective of the Bridging Study

Create an algorithm to match the scale scores between the SF-36<sup>®</sup> and the VR-12 and that can be applied across a broad range of potential subsamples in both SEER-MHOS and the MHOS.

## SF-36<sup>®</sup> version 1.0 and VR-12

- Both are derived from Medical Outcomes Study Rand-36 questionnaire
- SF-36<sup>®</sup>
  - 8 scales: physical functioning (PF), vitality (VT), bodily pain (BP), general health perceptions (GH), role limitations due to physical functioning (RP), role limitations due to emotional functioning (RE), social functioning (SF) and mental health (MH)
  - 2-10 items per scale
  - Physical and Mental Component Summary scores (PCS and MCS)
- VR-12
  - 12 representative items from the above 8 scales taken from the VR-36 (longer form counterpart originally derived from the SF-36)
  - Modifications to 4 “role functioning” items: 5 response choices in place of yes/no choices
  - 8 scales can be calculated but only 1-2 items per scale
  - PCS and MCS

# Development of a bridging algorithm

Goal: Compare scores across samples of respondents that may differ

- Across survey versions
- Across time
- In demographics or health status
- By an external characteristic in the SEER framework

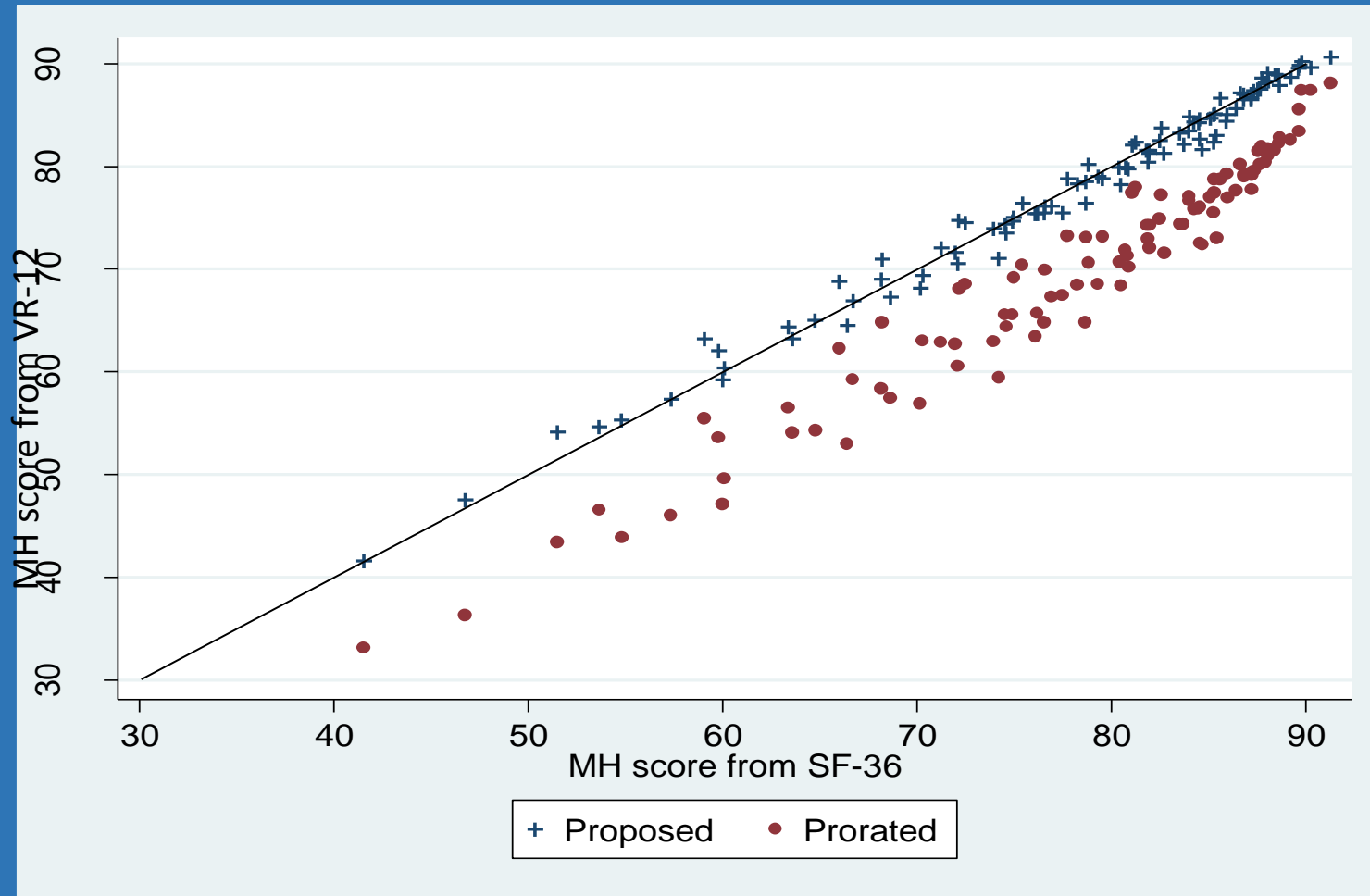
# Extensibility

- Derived from generalizability theory
- Concept: Modified item matches original scale across clusters
- Mathematical definition:
  - Mean square error of modified item vs. original scale
- Implication:
  - Match is never perfect
  - But much better than it might have been

# The bridging algorithm in more detail

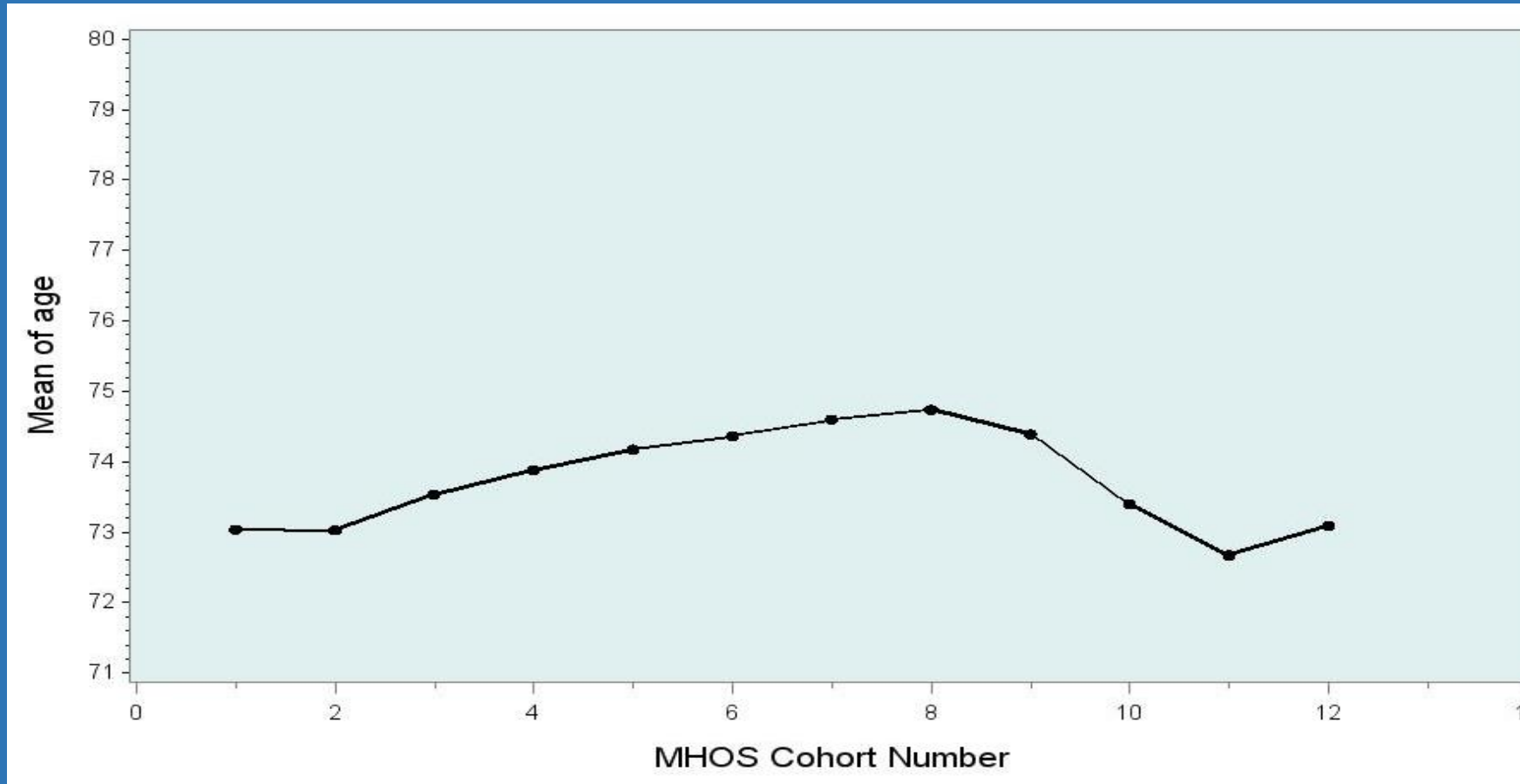
- Create MHOS subsamples (clusters) that
  - Differ in health status
  - Are fairly homogeneous within each cluster
- For each cluster, compute:
  - 1) Average of complete scale using standard SF-36 methods
  - 2) Average for specific items using modified scoring
- Modify the scoring to make complete scale and modified scoring match

## Results: Comparison of original to rescored scales\*



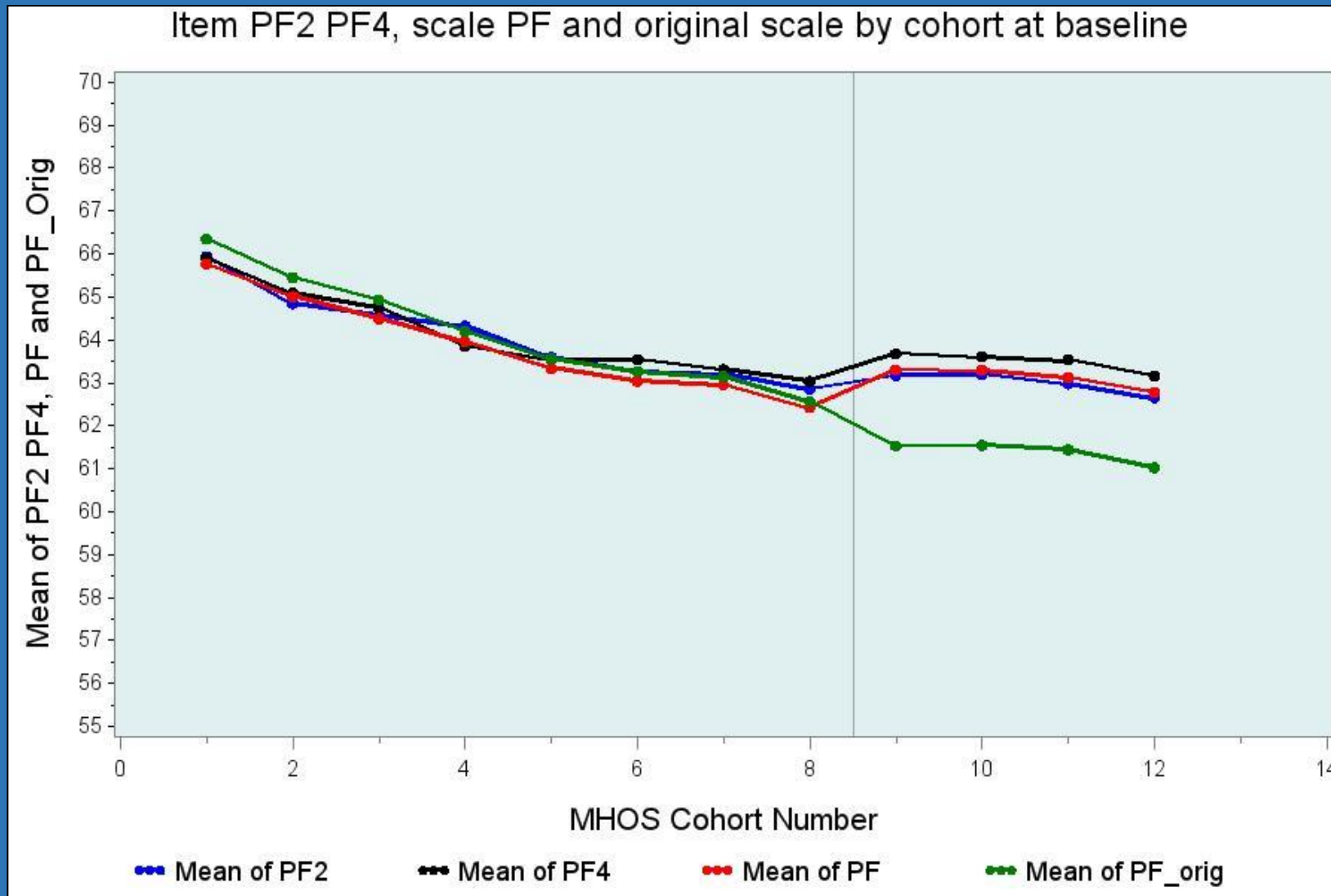
\*For the 100 clusters, association between the SF-36<sup>®</sup> Mental Health (MH) scale score calculated in the original way (with all 5 MH items present) and the VR-12 MH scale score calculated by two different methods, original (prorated) and rescored (proposed).

# Mean of baseline age by cohort in MHOS database (N=1,880,765)

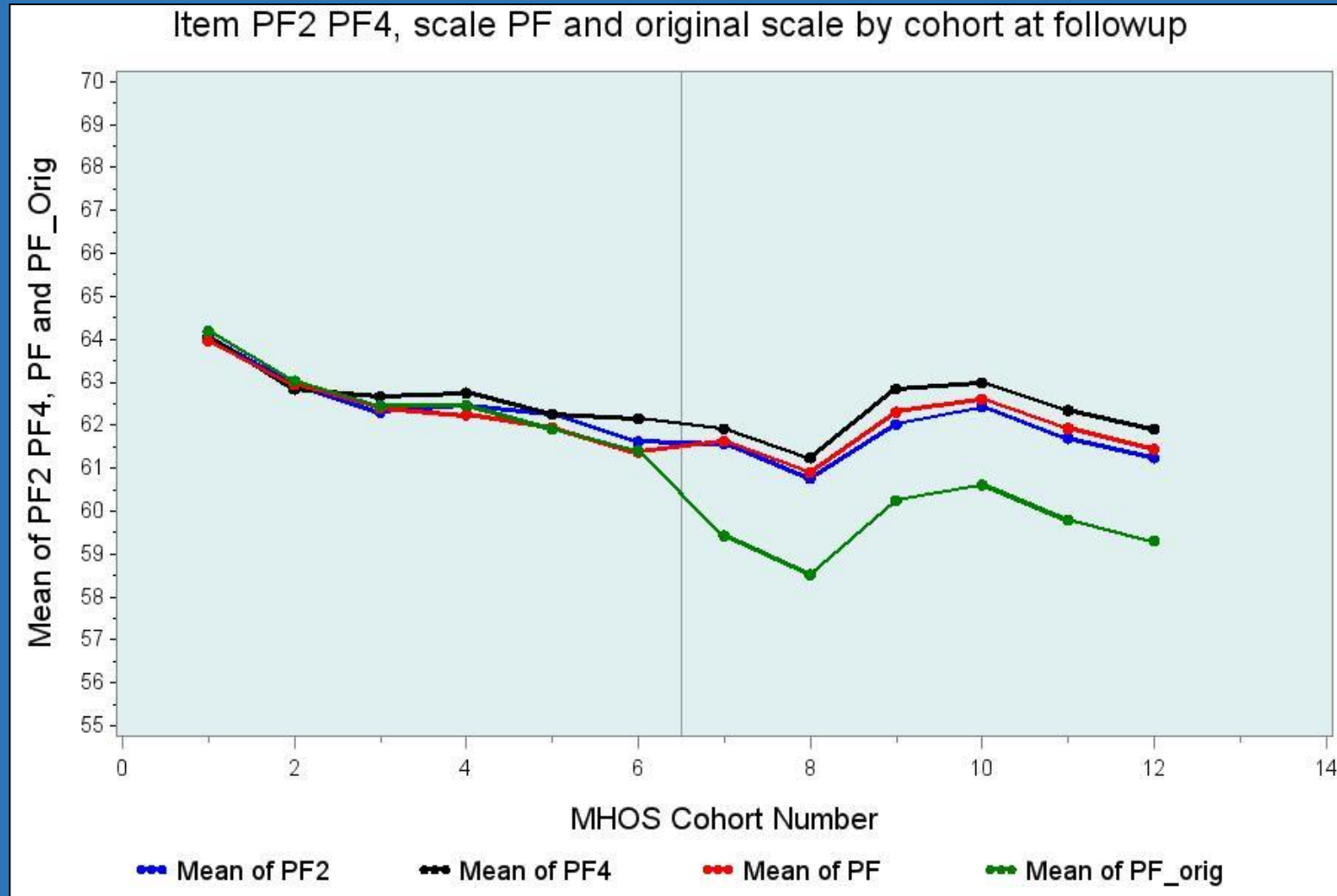




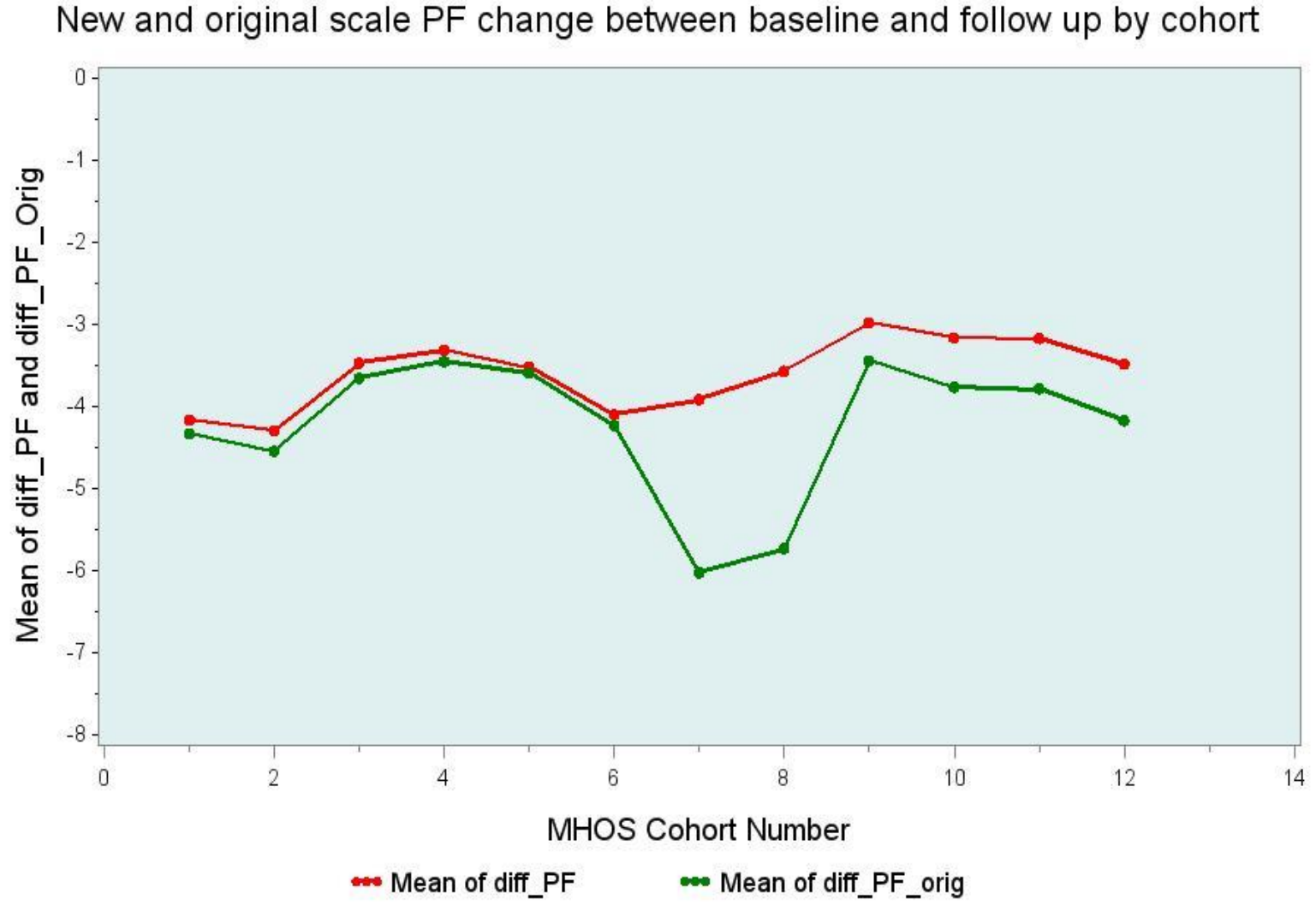
# Results: Baseline PF scores across MHOS cohorts 1-12



# Results: 2-year follow-up PF scores across MHOS cohorts 1-12



# Results: 2-year change in PF scores across MHOS cohorts 1-12



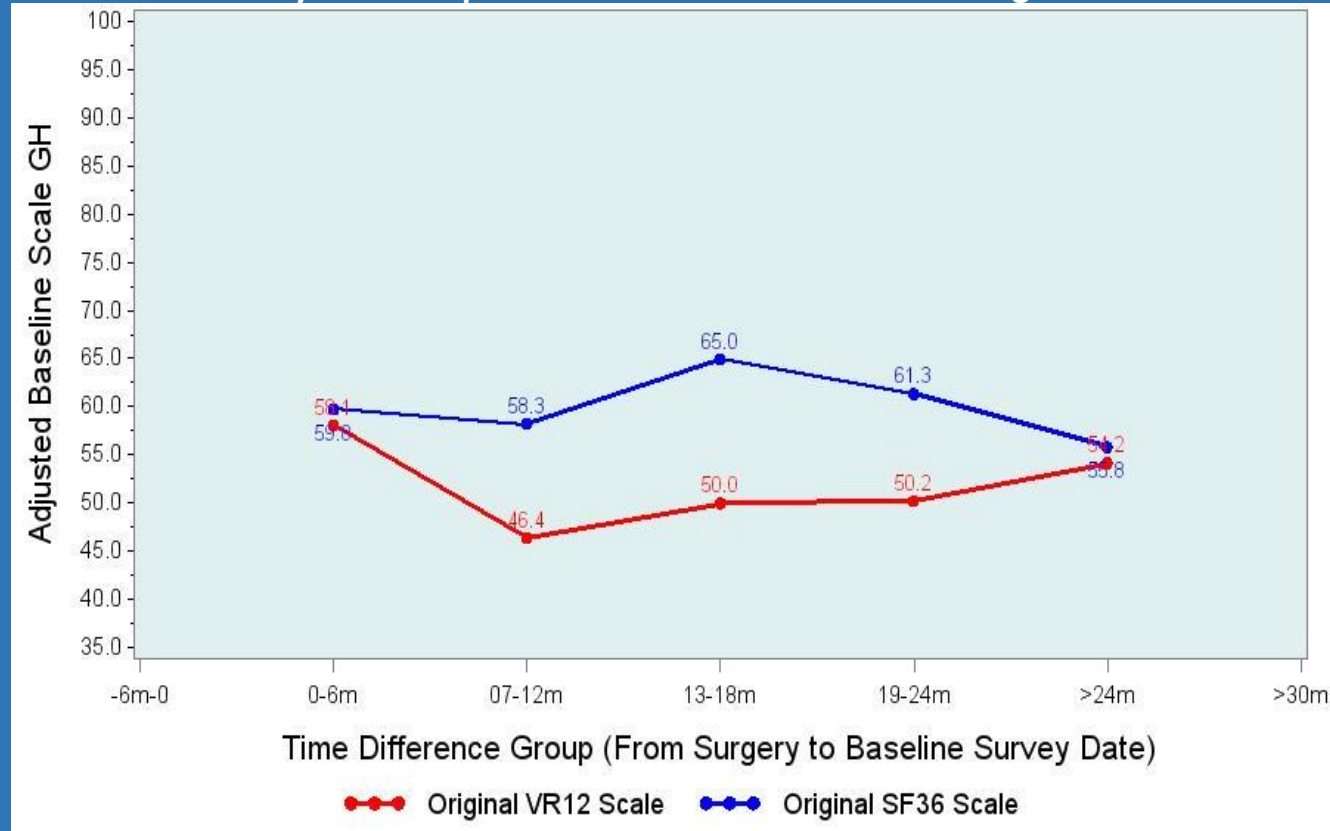
# Application of SEER Data Set with MHOS: Patients with localized prostate cancer who underwent surgical treatment N=907

Time intervals between the date of treatment to the date of the baseline survey	Patients with only localized prostate cancer who underwent surgical treatment (N=907)	
	SF-36 era (cohorts 3-8)	VR-12 era (cohorts 9-12)
0-6m	42	59
7-12m	24	44
13-18m	32	42
19-24m	24	37
>24m	63	540

# Prostate Cancer, General Health scale

Original VR12 scale vs. Original SF36 scale

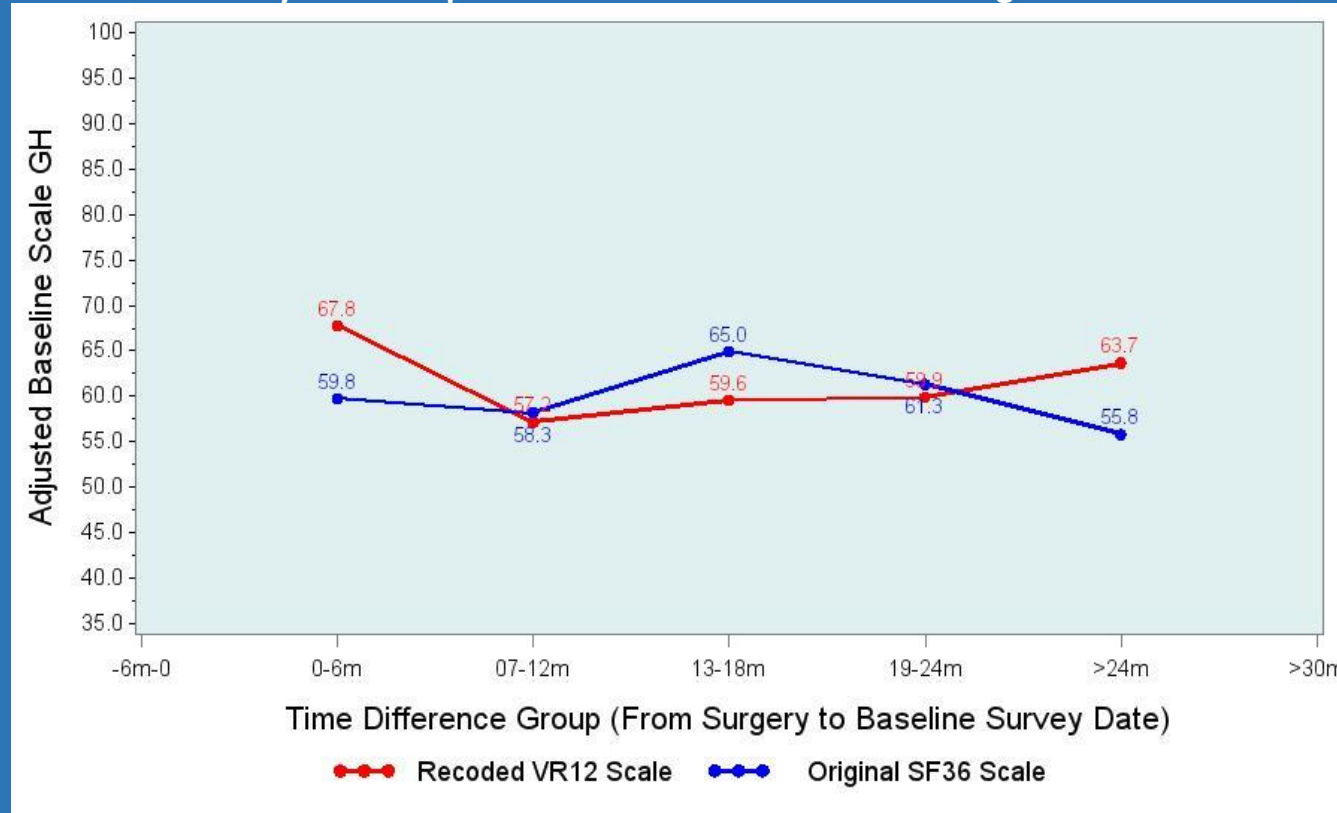
Adjusted baseline scores of General Health by time difference group in patients with only localized prostate cancer who underwent surgical treatment



# Prostate Cancer, General Health scale

Recoded VR12 scale vs. Original SF36 scale

Adjusted baseline scores of General Health by time difference group in patients with only localized prostate cancer who underwent surgical treatment



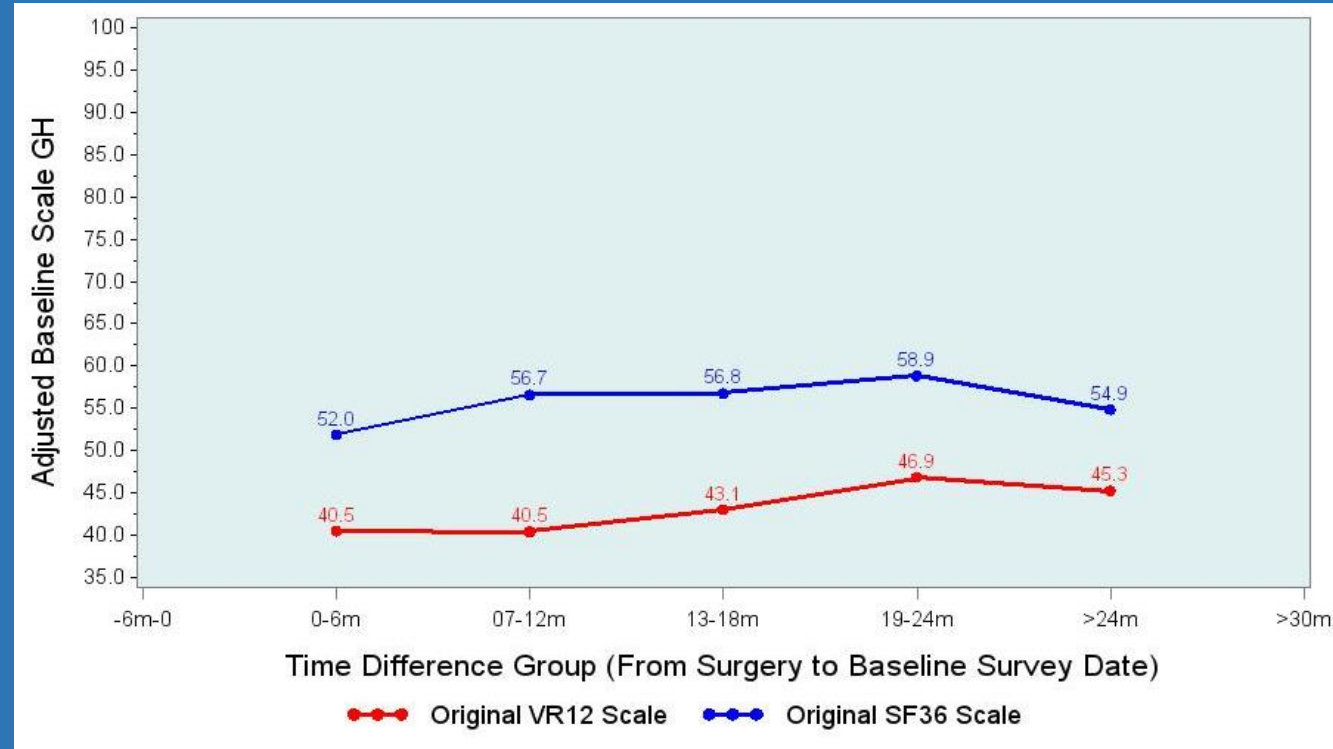
# Application of SEER Data Set with MHOS: Patients with localized colon cancer who underwent surgical treatment N=1938

Time intervals between the date of treatment to the date of the baseline survey	Patients with only localized colon cancer who underwent surgical treatment (N=1938)	
	SF-36 era (cohorts 3-8)	VR-12 era (cohorts 9-12)
0-6m	123	102
7-12m	93	117
13-18m	82	96
19-24m	65	102
>24m	209	949

# Colon Cancer with , General Health scale

Original VR12 scale vs. Original SF36 scale

Adjusted baseline scores of General Health by time difference group in patients with localized or regional colon cancer who underwent surgical treatment

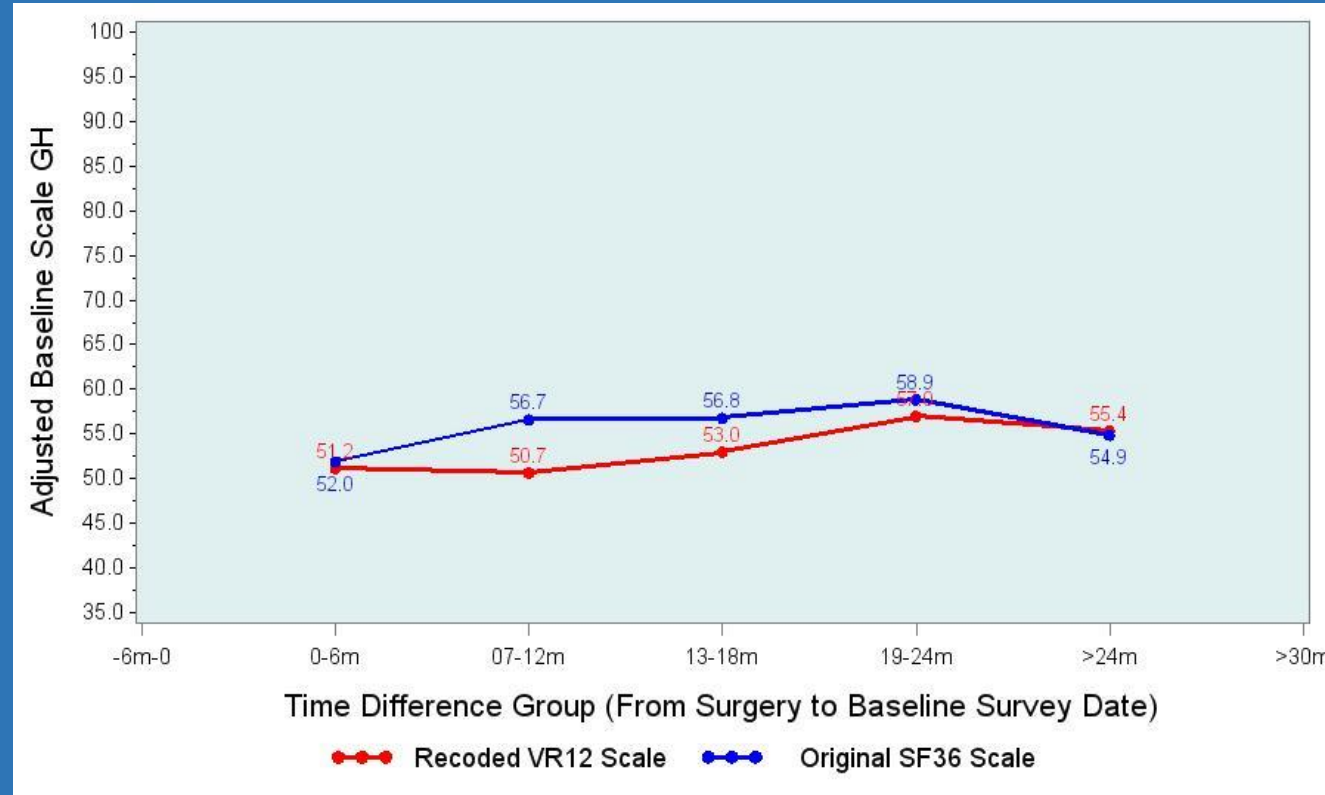




# Colon Cancer, General Health scale

Recoded VR12 scale vs. Original SF36 scale

Adjusted baseline scores of General Health by time difference group in patients with localized or regional colon cancer who underwent surgical treatment

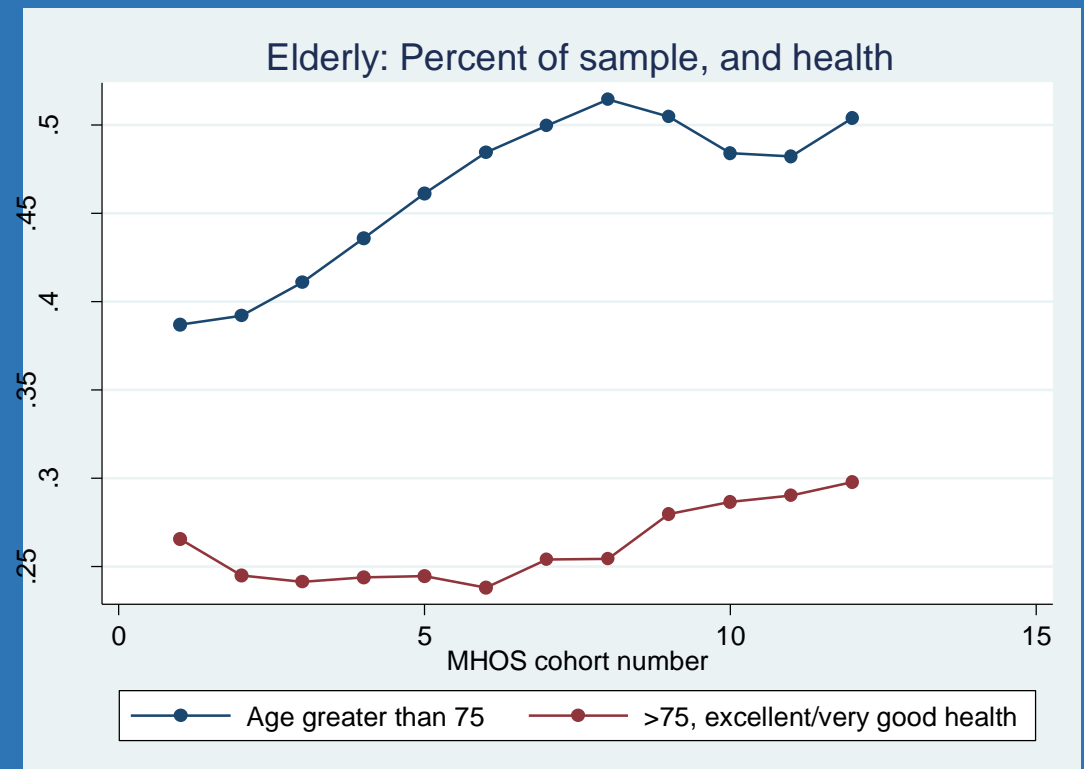
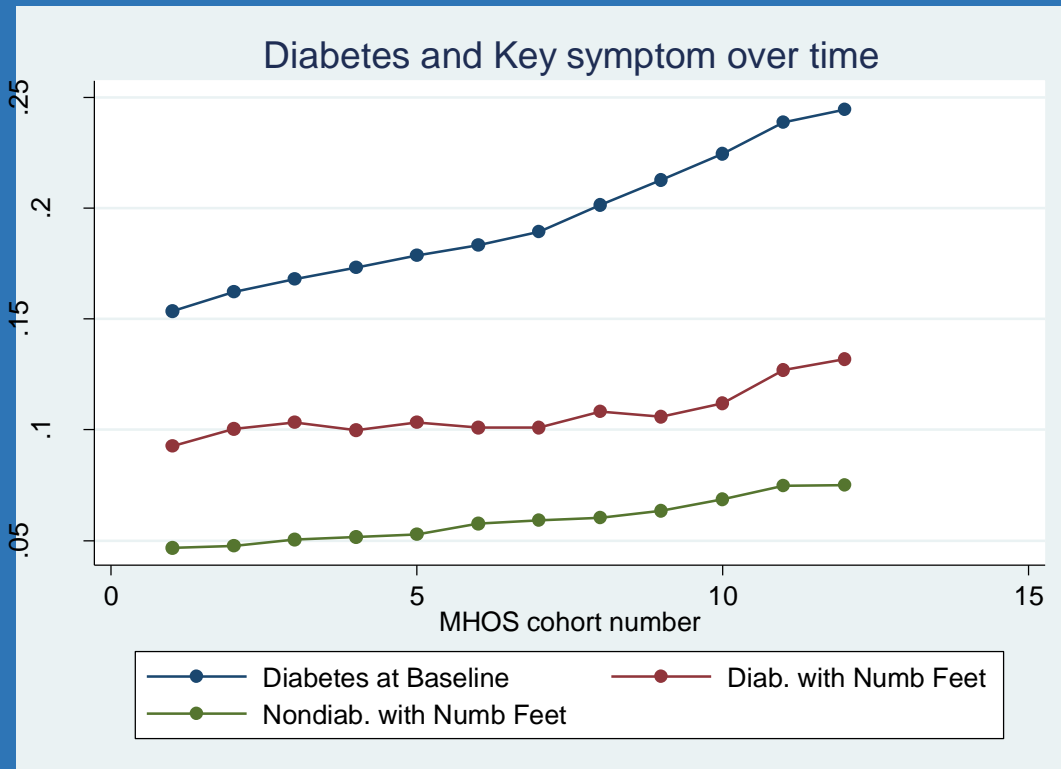


# Guidance for using extensibility values

- Extensibility is an additional error component
  - Applies where comparisons are unbalanced by survey version
  - Similar to a standard error
  - Non statistical error dominates in large samples
  - Sampling error dominates in small samples (<1000)
  - Typically 1-2 points on a 0-100 scale
    - But larger for the role scales, where responses changed

# Other Sample Evolution Issues

- Ideas change about who has disease and symptoms
- Health care or plan membership has an impact



# Limitations

- Extensibility is not perfect
  - Items in a scale differ slightly in content
  - Non-zero extensibility limits analysis of very large samples
- Extensions
  - The algorithm was developed from the MHOS in those 65 years of age or greater
  - Phone respondents are sicker but more positive
  - Proxy response, language also affects responses
- Sample evolution not fully understood
  - Secular trends in health, health knowledge, and Medicare Advantage

# Conclusions

- Novel methodology (extensibility) enabled more accurate rescaling of the items from the VR-12 to numerically match scales of the SF-36<sup>®</sup>
- Other “obvious” methods of rescaling failed
- The new algorithm allows for more aggressive use of data, even when many items are missing
- Sample evolution problems are complex and could impact SEER analysis

# Future research

- Development of algorithms to match individual items between the VR-12 and SF-36<sup>®</sup>, which may improve extensibility further
- Development of algorithms to address “sample evolution” problems that should improve upon the use of indicator variables to adjust for differences among MHOS cohorts

## Suggested References:

Website: About the VR-36/VR-12/VR-6D, How to use the instruments... A website devoted to the suite of VR measures giving the history and applications with a comprehensive bibliography and the process for obtaining the documentation and scoring algorithms.

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Schalet BD, Rothrock NE, Hays RD, Kazis LE, Cook KF, Rutsohn JP, and Cella D. Linking physical and mental health summary scores from the Veterans RAND 12-Item Health Survey (VR-12) to the PROMIS Global Health Scale. *J Gen Intern Med* 2015 Oct;30(10):1524-30. doi: 10.1007/s11606-015-3453-9. Epub 2015 Jul 16. <http://www.ncbi.nlm.nih.gov/pubmed/26179820>

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Kent, E. E., Mitchell, S. A., Smith, A. W., Clauser, S. B., Ambs, A., & Hays, R. D. (2015). Health-related quality of life in older adult survivors of selected cancers: data from the SEER-MHOS linked data resource. *Cancer*, 121(5): 758-65.

Ambs, A., Warren, J. L., Bellizzi, K. M., Topor, M., Haffer, S. C., Clauser, S. B. (2008). Overview of the SEER—Medicare Health Outcomes Survey Linked Dataset. *Health Care Financing Review*, 29(4): 5-21.



Questions?