# Comparative Effectiveness of a Statewide Program for Primary Prevention of Falls in Older Adults

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# Falls-Free PA
## Public Health CER partnership between PA Department of Aging, CDC, and U Pittsburgh

FIGURE F-1 A Buddhist image of the life cycle as inscribed in a wall of a Thai temple.
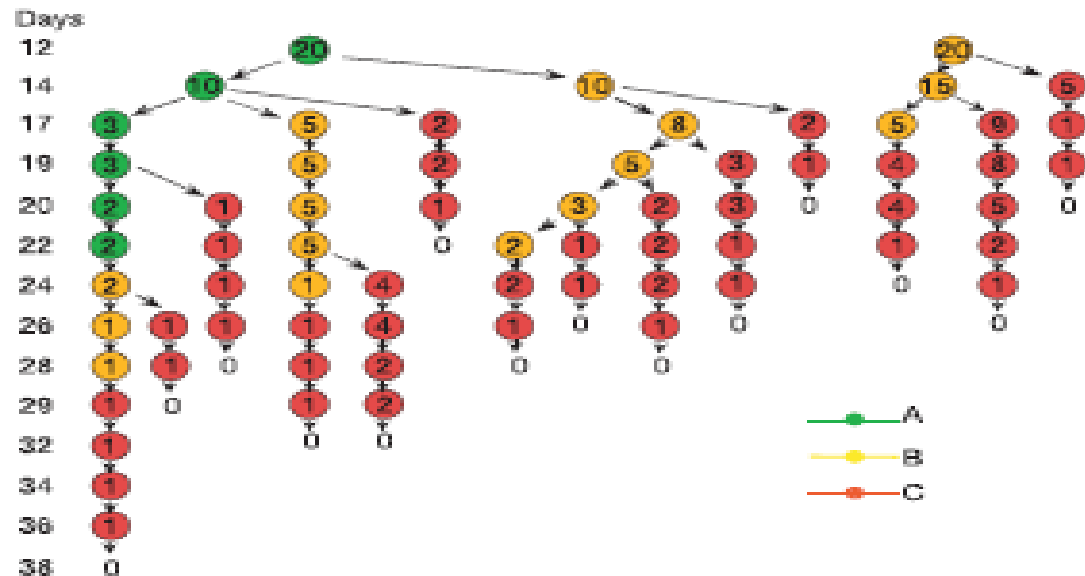
Kitayama 2000

**Figure 1** Behavioural phenotypes of ageing nematodes indicate progressive decline with stochastic onset and variable rates. Twelve days after a synchronized egg lay, we categorized 40 wild-type animals on the basis of their locomotory phenotypes A (green), B (yellow) and C (red). We reclassified individuals every 1–3 days until all animals had died. Numbers within the circles represent animals scored in a given class on a particular day. Similar results were observed in four additional independent trials. Of 217 class A animals, 194 proceeded through stages B and then C before death. Similarly, 254 of 262 class B animals became class C animals before dying. We never observed a reversal of class order (B to A or C to B).

Herndon et al., *Nature* 2002

# Falls in Older Adults

- Highly prevalent; high morbidity, mortality, cost

  - One third of seniors fall each year; half of seniors aged 80+. Half of 80+ who fall cannot get up

  - Deaths: 24.8/100,000 age 50+ (WISQARS, 2008)

  - Injuries: 3,680/100,000 age 50+(WISQARS, 2009)

  - Non-injurious falls also disabling: activity restriction, isolation, deconditioning, depression
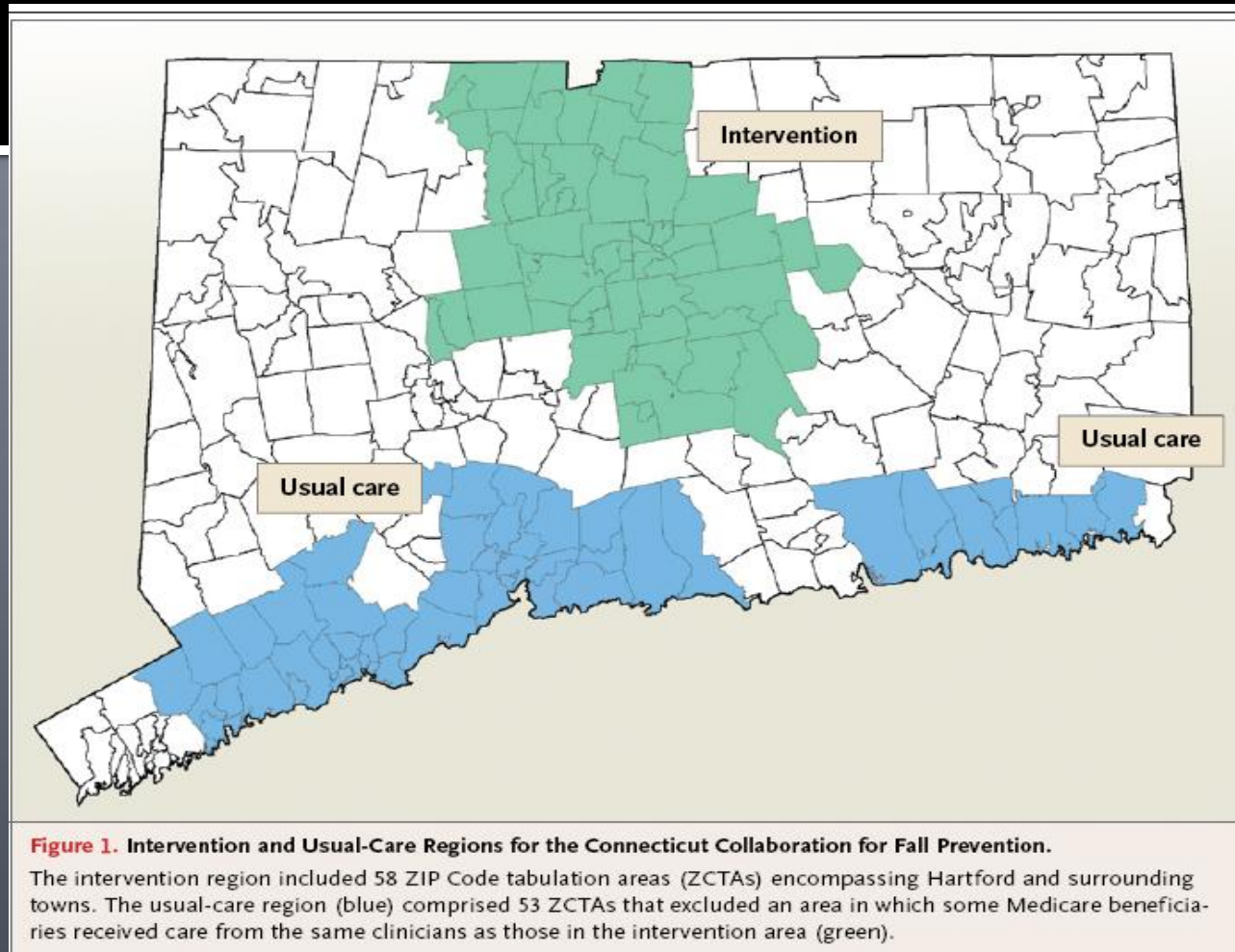
# Potential for Falls Prevention

- Multifactorial interventions reduce fall risk from 2-37%
- However, clinical interventions target highly selected risk groups and mobilize clinical resources not available in usual care
- An effective short-term, low-cost, community-based program could offer substantial public health benefit
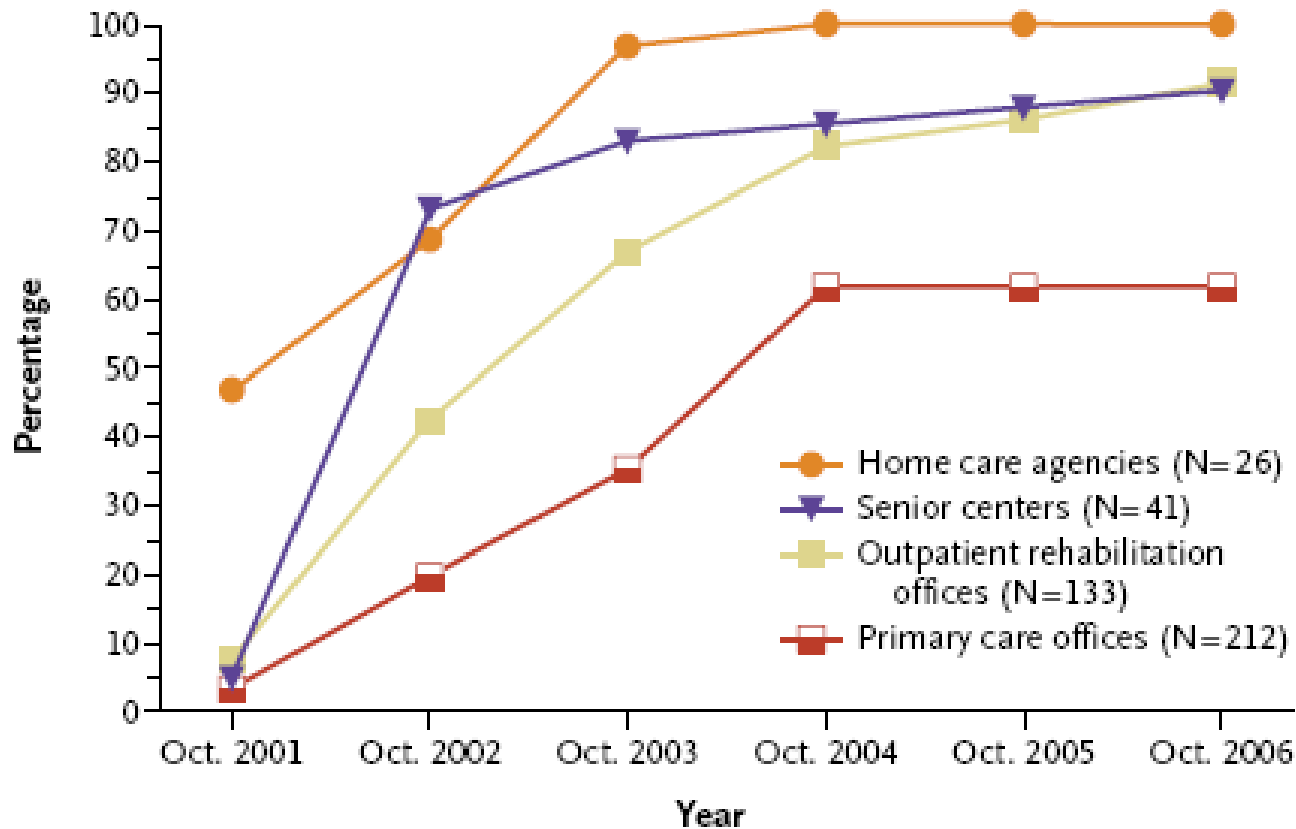
# Connecticut Collaboration for Falls Prevention

Tinetti 2008



Figure 1. Intervention and Usual-Care Regions for the Connecticut Collaboration for Fall Prevention.

The intervention region included 58 ZIP Code tabulation areas (ZCTAs) encompassing Hartford and surrounding towns. The usual-care region (blue) comprised 53 ZCTAs that excluded an area in which some Medicare beneficiaries received care from the same clinicians as those in the intervention area (green).

**Figure 2.** Proportion of Facilities in the Intervention Region That Received at Least One Outreach Visit.

**A  Serious Fall-Related Injuries**
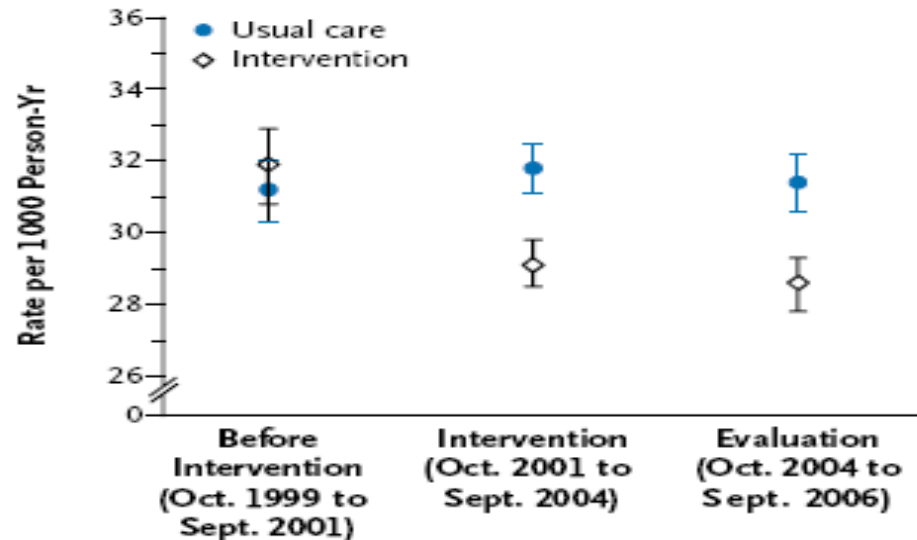
| Adjusted Rate per 1000 Person-Yr (95% CI) | Before Intervention (Oct. 1999 to Sept. 2001) | Intervention (Oct. 2001 to Sept. 2004) | Evaluation (Oct. 2004 to Sept. 2006) |
|---|---|---|---|
| Usual-care region | 31.2 (30.3–32.0) | 31.8 (31.1–32.5) | 31.4 (30.6–32.2) |
| Intervention region | 31.9 (30.8–32.9) | 29.1 (28.5–29.8) | 28.6 (27.8–29.3) |
| **Adjusted Rate Ratio (intervention relative to usual care)** | 1.02 (0.98–1.07) | 0.92 (0.89–0.95) | 0.91 (0.88–0.94) |

# State Falls Prevention Coalitions



http://www.ncoa.org/

# PA State Fall Prevention Coalition

The Pennsylvania Violence and Injury Prevention Program

- Provide in-depth state-specific data with regards to the burden of falls.

- Provide programmatic information on current fall prevention strategies.

- Build consensus on the development and evaluation of interventions to reduce fall-related injuries across the lifespan.

- Update the 2006-2010 *Pennsylvania Injury Prevention and Control Plan*.

# Healthy Steps for Older Adults and *Healthy Steps in Motion*

- The PA Department of Aging (PDA) has offered programs statewide through Area Agencies on Aging (AAA) since 2007 (initial pilot 2005-06)

- 40 of 67 PA AAA's have participated in the program, which is funded though federal and state sources ($1.2M in 2010-11)

- Each year 4000-7000 seniors complete the programs; about 20,000 have completed the programs to date.

- The falls prevention programs were developed under the auspices of Health Research for Action at UC-Berkeley
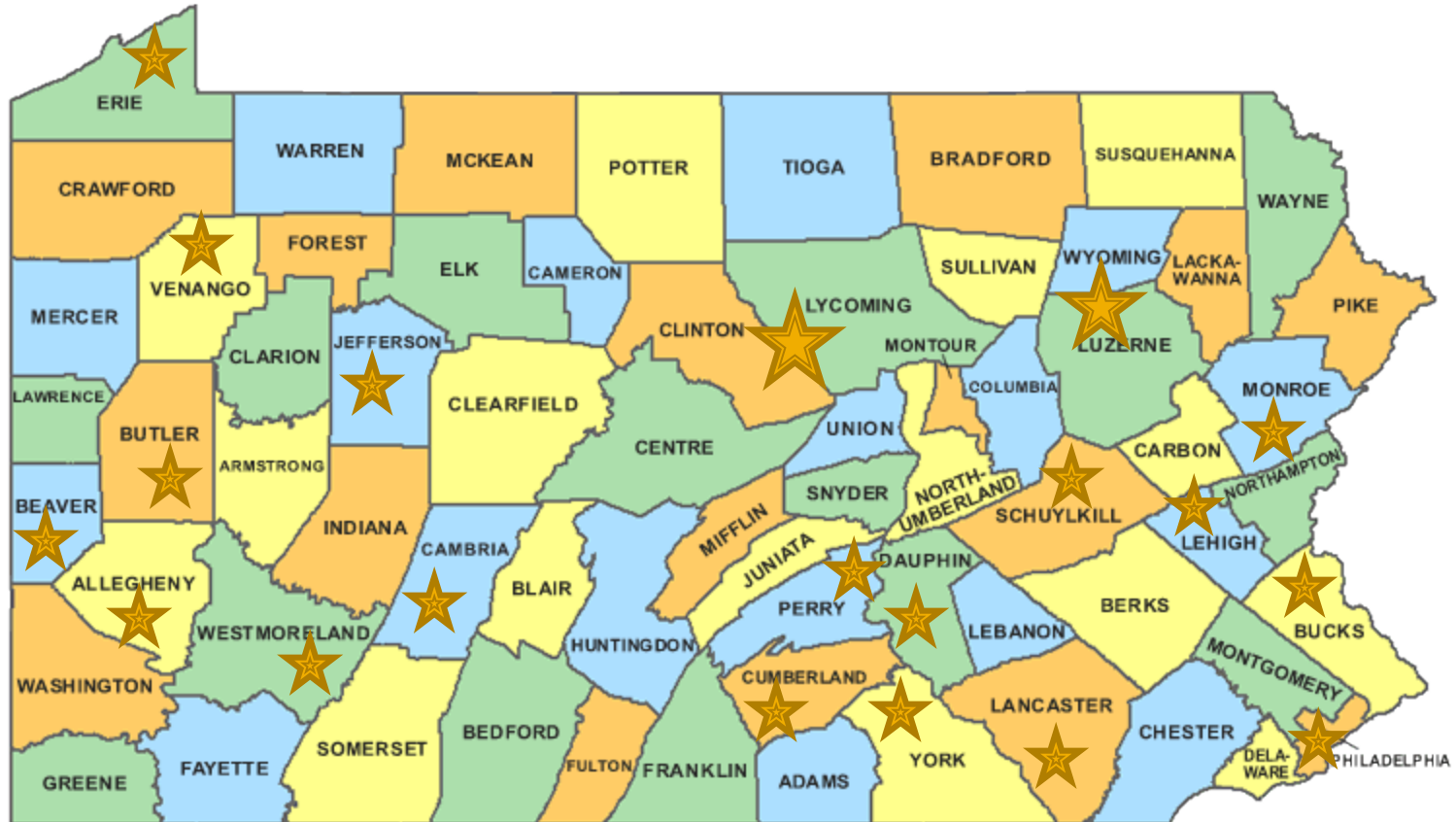
# PA *Healthy Steps*

- Falls prevention education (2-hr class in *Healthy Steps for Older Adults, HSOA*) and exercise (ongoing sessions in *Healthy Steps in Motion, HSIM*)

- Physical performance assessments of balance and mobility; referrals for physician care and home safety. Local staff trained by state team

- Data entry in a web-based system
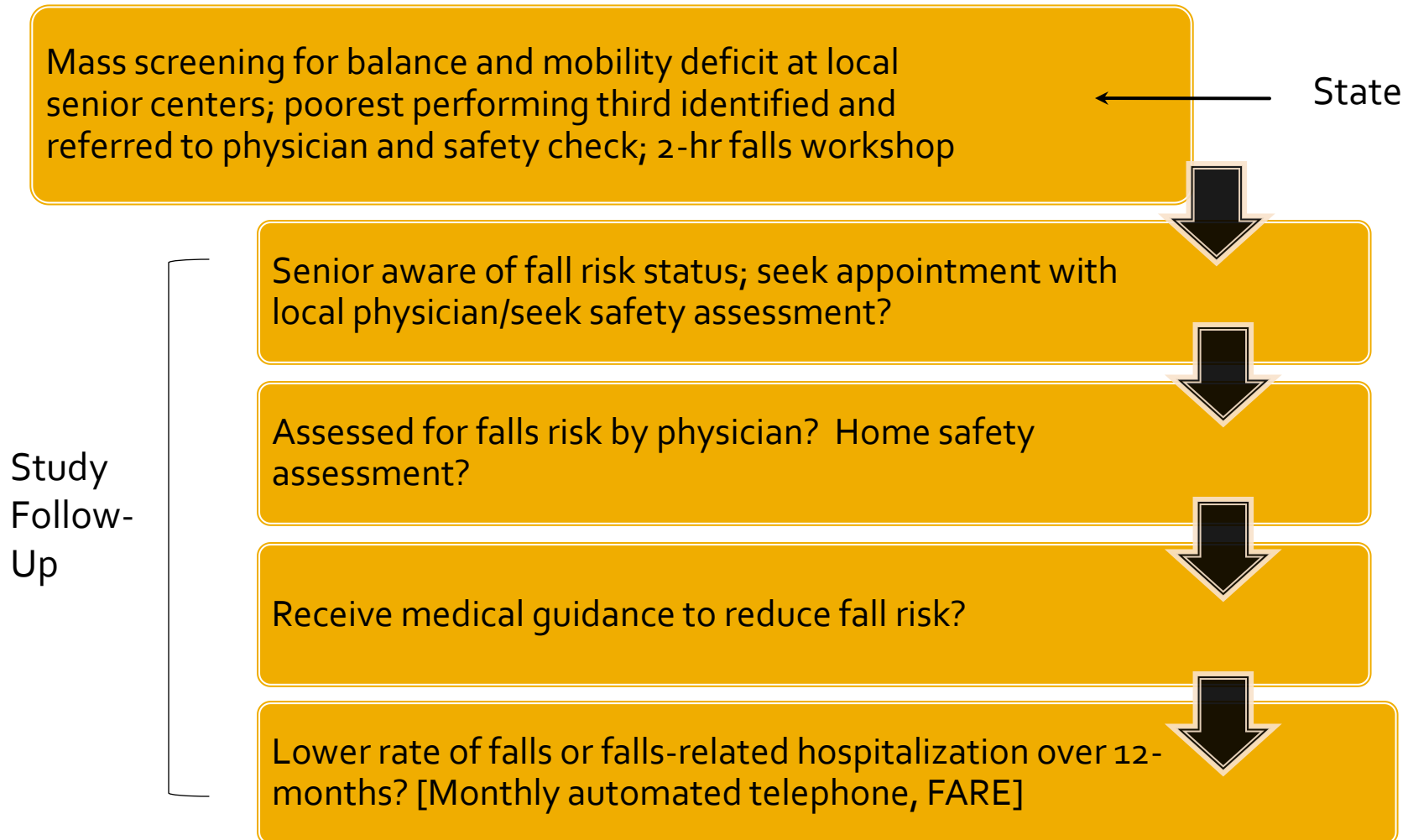
- Conducted at local senior programs across state

# PA Counties: *Healthy Steps*, 2011

# Primary Prevention Pathway

Mass screening for balance and mobility deficit at local senior centers; poorest performing third identified and referred to physician and safety check; 2-hr falls workshop

State

Senior aware of fall risk status; seek appointment with local physician/seek safety assessment?

Assessed for falls risk by physician? Home safety assessment?

Study Follow-Up

Receive medical guidance to reduce fall risk?

Lower rate of falls or falls-related hospitalization over 12-months? [Monthly automated telephone, FARE]
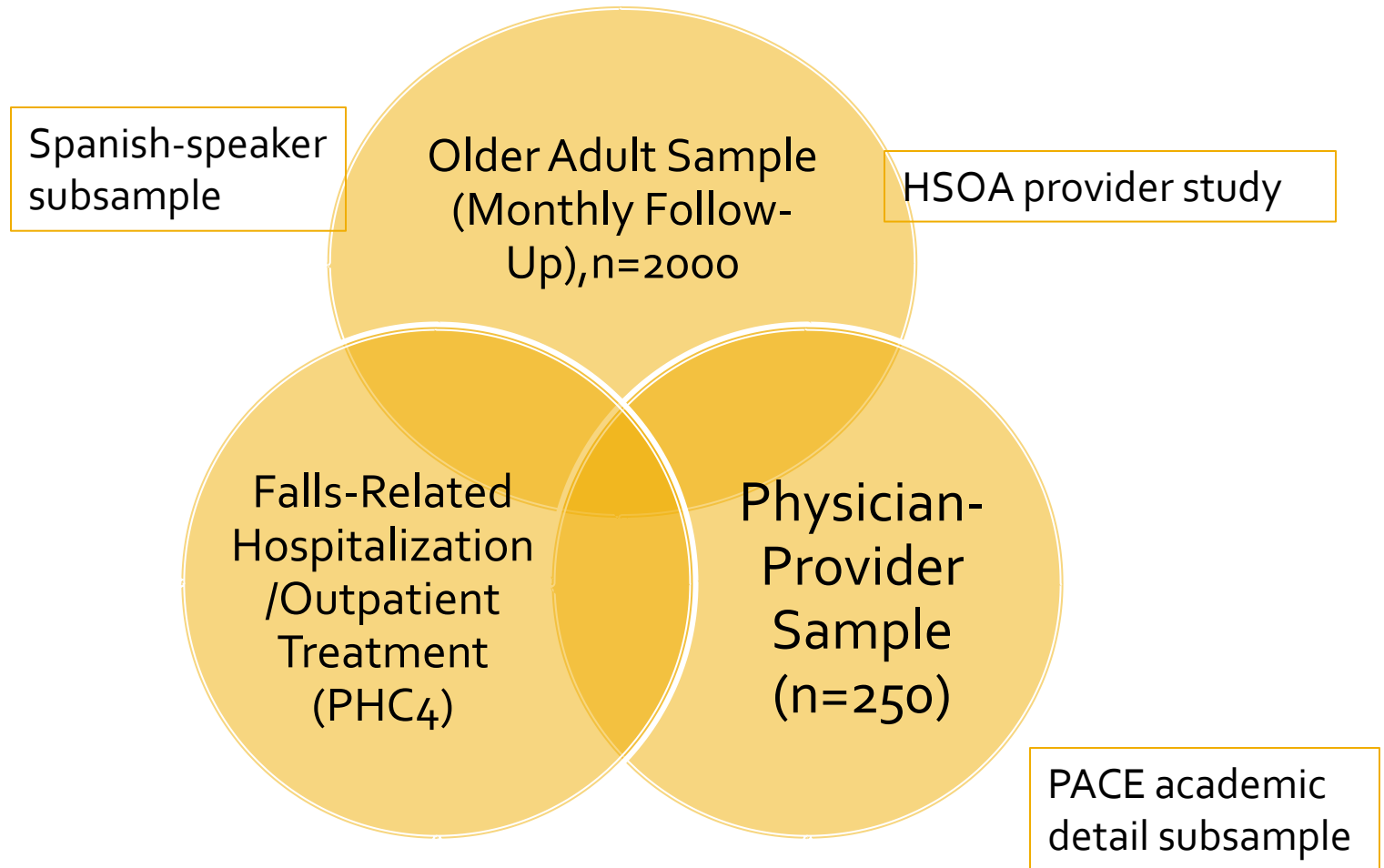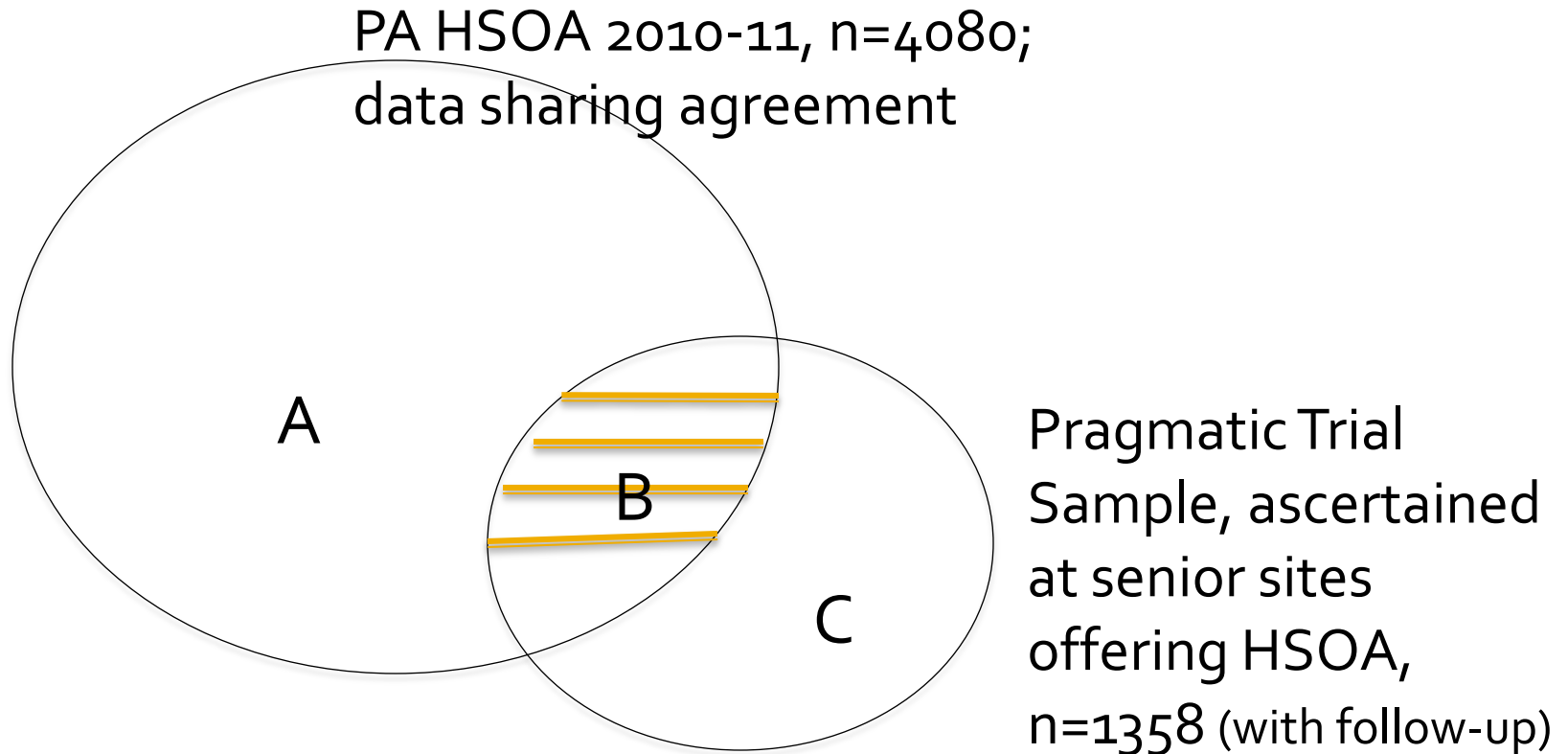
# Outcomes

- Primary
  - (i) fallers/falls per 1000 person-days of physical activity
  - (ii) injurious falls leading to hospitalization
- Secondary
  - Changes in activity profiles, falls self-efficacy, health-related quality of life
  - Cost effectiveness
- Implementation
  - Attendance, completion, satisfaction; program referrals for MD and home assessments: RE-AIM
- Ecologic-county analyses
  - Greater penetration of program/greater physician awareness associated with less falls-related hospitalization?

# Falls-Free PA: Study Components

# Analytic Strategies for Pragmatic Trial (PCT)



PA HSOA 2010-11, n=4080; data sharing agreement

A

B

C

Pragmatic Trial Sample, ascertained at senior sites offering HSOA, n=1358 (with follow-up)

Key PCT test: Falls experience in B vs. C, adjusting for falls risk factors
Assess representativeness of HSOA sample in PCT: A vs. B
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# Falls-Free PA: Recruitment



Thru 8/30/11
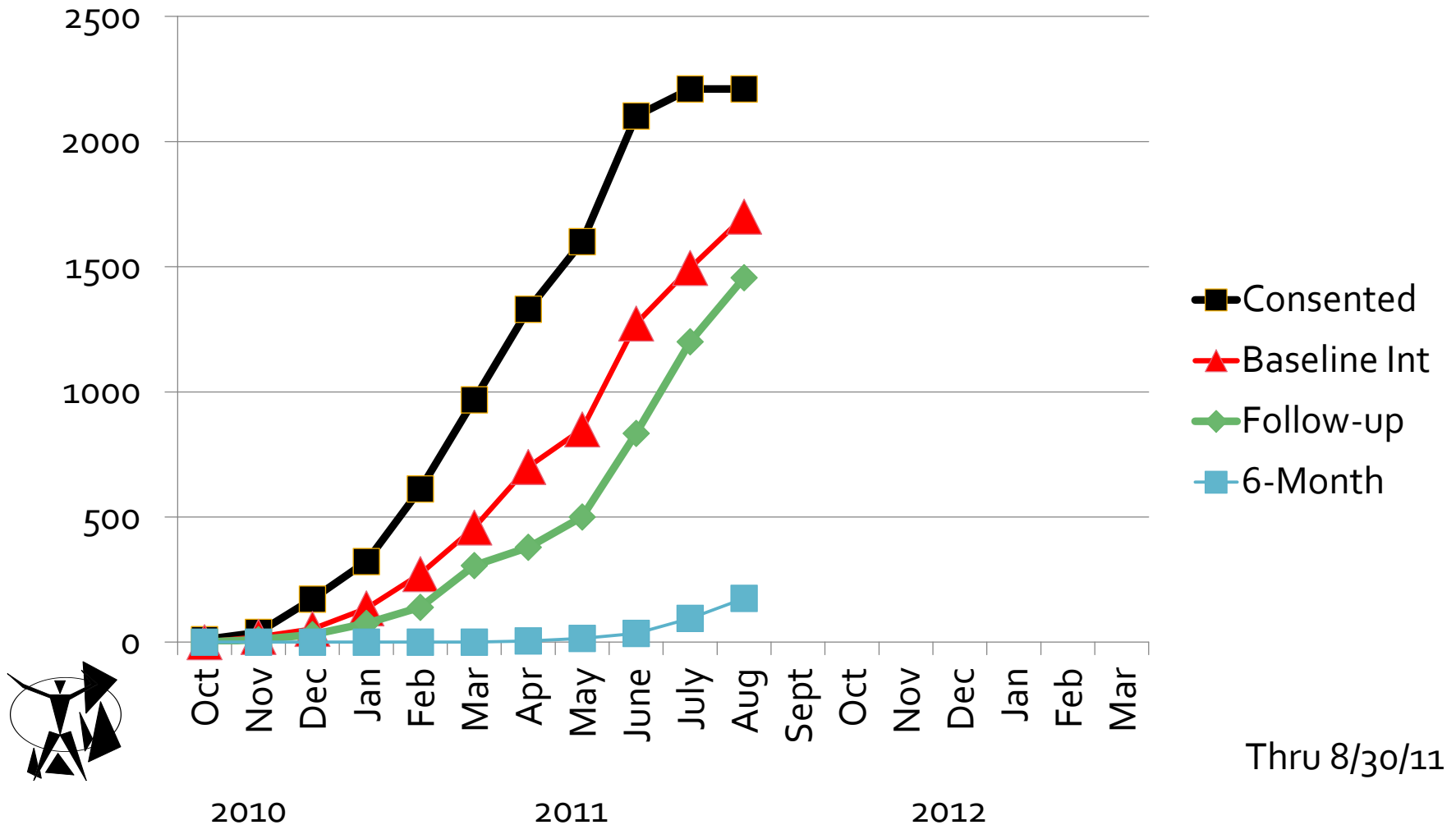
# Ascertainment and Response (9/20/11)

Provide contact info, n-2466

Consented, n=2206, 89.5%

Baseline, n=1750, 79.3%

Ineligible, n=32
Refused, n=166
No telephone, n=21

Goal: n=1800

# Seniors, Baseline, n=1534 (29 Aug 2011)

- 79.7% women; 8.7% African-American, 2.9% Hispanic; age: 76.2 (range, 50-97)
- 13.6% college degree
- 44.1% live alone
- 5.2% receive in-home services
- 1/2 report taking *Healthy Steps*; 7% *HSIM*
- 6% likely dementia
- 38.5% mobility problems; 6.0% self-care difficulties

# Follow-Up (through 8/31/11)

- 4484 monthly assessments
  - 89.1% automated IVR (5.4% opt out at baseline)
  - 1-9 months so far; median, 3 mo
  - Average completion rate each month: 80%
    - 2.5 min call
    - Email message sent to staff for each reported fall; personal telephone follow-up
    - People who opt out receive personal phone call

# Web-Based Integrated IVR-Data System

# Daily IVR Notifications

Subject ID: {1808-A} reported falling.
Month: 05

------------------------------------------------------------------------

Subject ID: {2704-A} reported falling.
Month: 04

------------------------------------------------------------------------

Triggers personal call to determine number of falls in month and circumstances of reported IVR fall

# Results from Follow-Up (median 3 mo follow-up)

- Mean days active in prior week (> 30 min performing physically demanding tasks): 5
  - (1.6% 0 days; 16% < 3 days; 21.5% 7 days)
- One or more falls in at least one month: 18.1%

  - Range 1-4/mo (82.2% one month with fall)
- One or more hospitalization in at least one month: 7.5%

  - Range 1-5/mo (87.4% one hospital admission)

# Association between Reported Falls, Hospital Care, and Activity: IVR Interview

|  | Reported Fall over Follow-Up | No Fall Over Follow-Up |
|---|---|---|
| Hospitalization, | 12.2 | 6.8** |
| Emergency department | 27.6 | 9.8*** |
| Active days per week (30 min/day) | 4.58 (1.8) | 5.04 (1.8)*** |

** p < .01, *** p < .001

# Adjusting Fall Rates for Differences in Exposure to Fall Risk (FARE)

The FARE: A new way to express FAlls Risk among older persons including physical activity as a measure of Exposure

Gert Jan Wijlhuizen [a,*], Astrid M.J. Chorus [a], Marijke Hopman-Rock [a,b]

[a] Department of Health Promotion, TNO Quality of Life, Leiden, The Netherlands
[b] Body@Work, Research Center Physical Activity, Work and Health, TNO VU University Medical Center, The Netherlands

Physical activity is related to falls (less activity, less fall risk)

Seniors at high risk of falls reduce activity to reduce fall risk

Need to take exposure to physical activity into account in calculating falls incidence

Replace person-days of follow-up by **active** person-days

# Computation of FARE measures

- Two numerators:
  - Number of fallers, number of months with a fall
- Two denominators:
  - Person days: number of months followed *28
  - Active person days: months * mean weekly active days * 4
    - Alternative: sum of active days over months * 4
    - Alternative: replace 0 active days with 0.5

# Fallers (3-mo follow-up), by Self-Rated Balance



Bar chart showing % Fallers by self-rated balance category:
- Excellent: ~0.06
- Very Good: ~0.13
- Good: ~0.19
- Fair: ~0.25
- Poor: ~0.375

Legend: % Fallers

Sample: 18.1% report fall
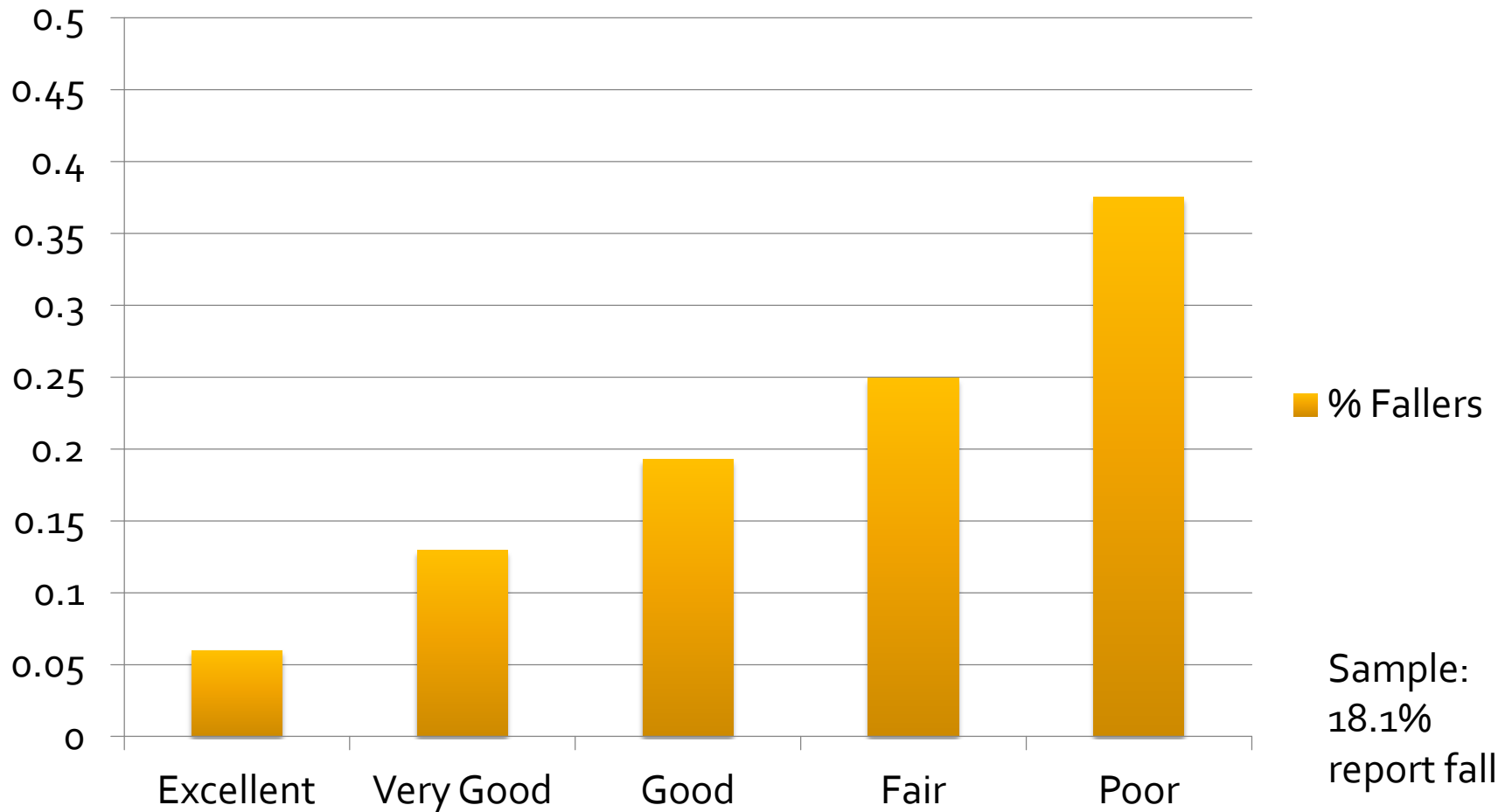
# Incidence of Falling (median 3 mo follow-up), by Self-Rated Balance

| Self-Rating (n) [active days] | Fallers/1000 p-d | Fallers/1000 a-d | Falls /1000 p-d | Falls /1000 a-d |
|---|---|---|---|---|
| Excellent     (167) [5.56] | .7 | .8 | .8 | 1.0 |
| Very Good  (348) [5.32] | 1.4 | 1.9 | 1.5 | 2.0 |
| Good          (477) [4.80] | 2.1 | 3.1 | 2.7 | 4.0 |
| Fair            (301) [4.54] | 2.8 | 4.3 | 4.2 | 6.4 |
| Poor          (64) [4.55] | 4.6 | 7.1 | 6.8 | 10.4 |
| Total         (1357) [4.95] | 2.0 | 2.8 | 2.7 | 3.8 |

# Person-Days vs. Active-Days
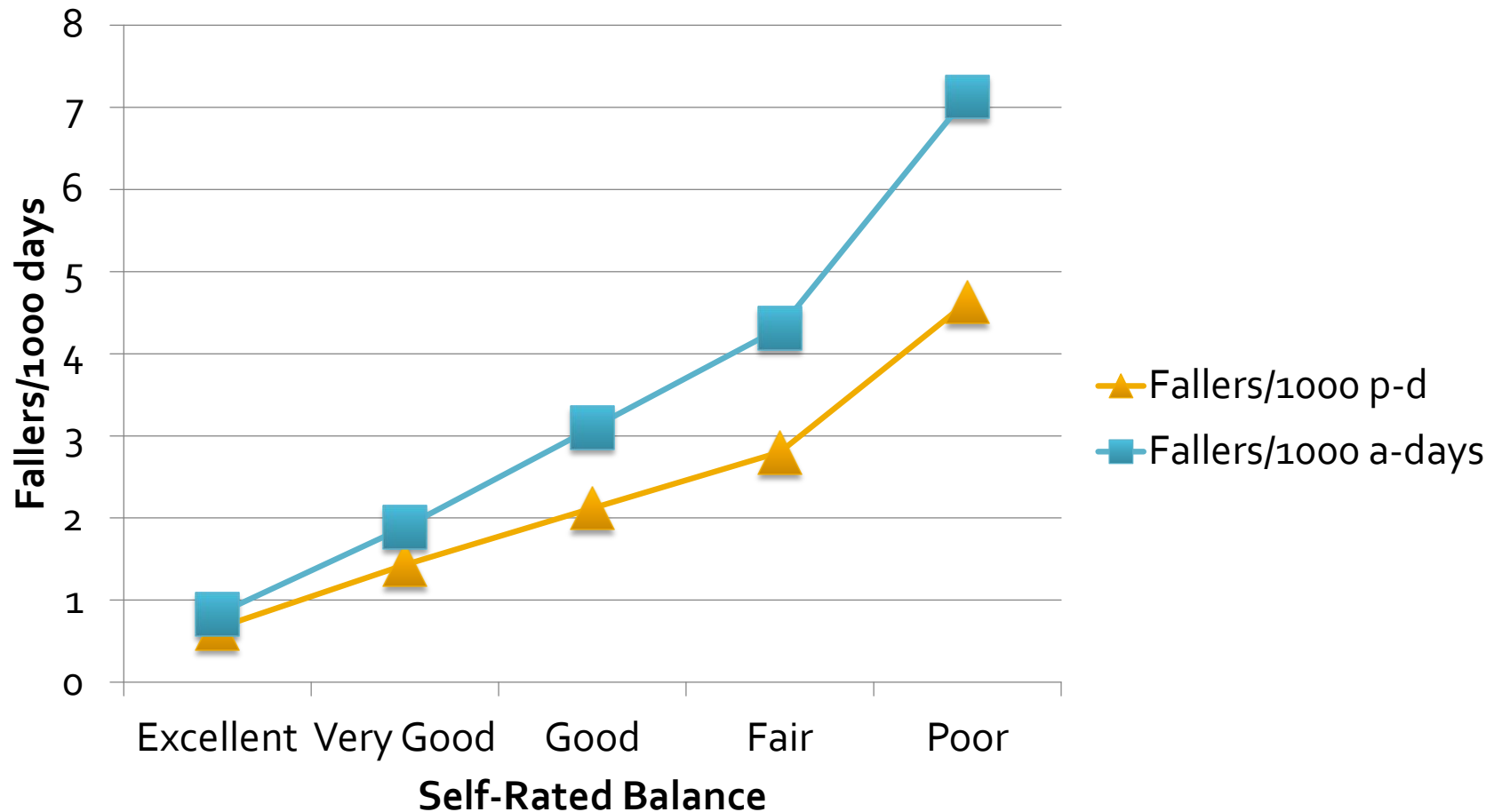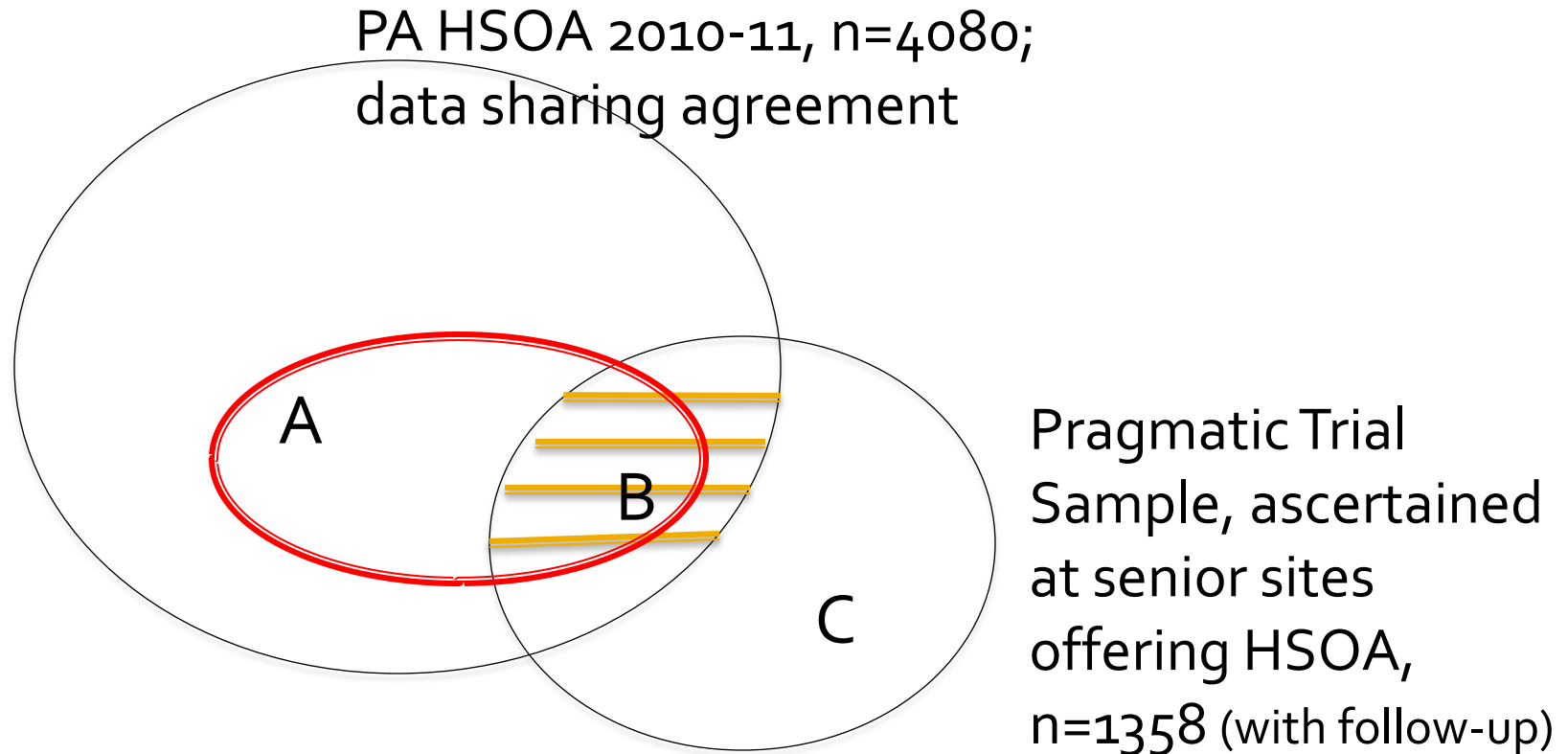
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Assess quality of comparator for PCT: B vs. C.

# Representativeness of HSOA Sample in PCT-1

|  | Statewide HSOA, n=3604 | PCT Sample, matched, n=464 |
|---|---|---|
| Age, mean (SD) | 76.1 (9.2)  Range: 50-103 | 75.7 (8.4)  Range: 50-95 |
| Female, % | 79.1 | 86.3*** |
| Race  White, % | 83.5 | 81.1 |
| Counties (most participation HSOA)  Allegheny, %  Bucks, %  Erie, % | 24.0  10.4  10.9 | 17.0  18.9  10.1 |

*** p < .01

# Representativeness of HSOA Sample in PCT-2

|  | Statewide HSOA, n=3604 | PCT Sample, matched, n=464 |
|---|---|---|
| *High Risk Status* |  |  |
| Get Up & Go Test, % | 28.7 | 23.9*** |
| One-Legged Stand, % | 41.2 | 43.5 |
| Chair Stands, % | 41.3 | 40.0 |

*** p < .001
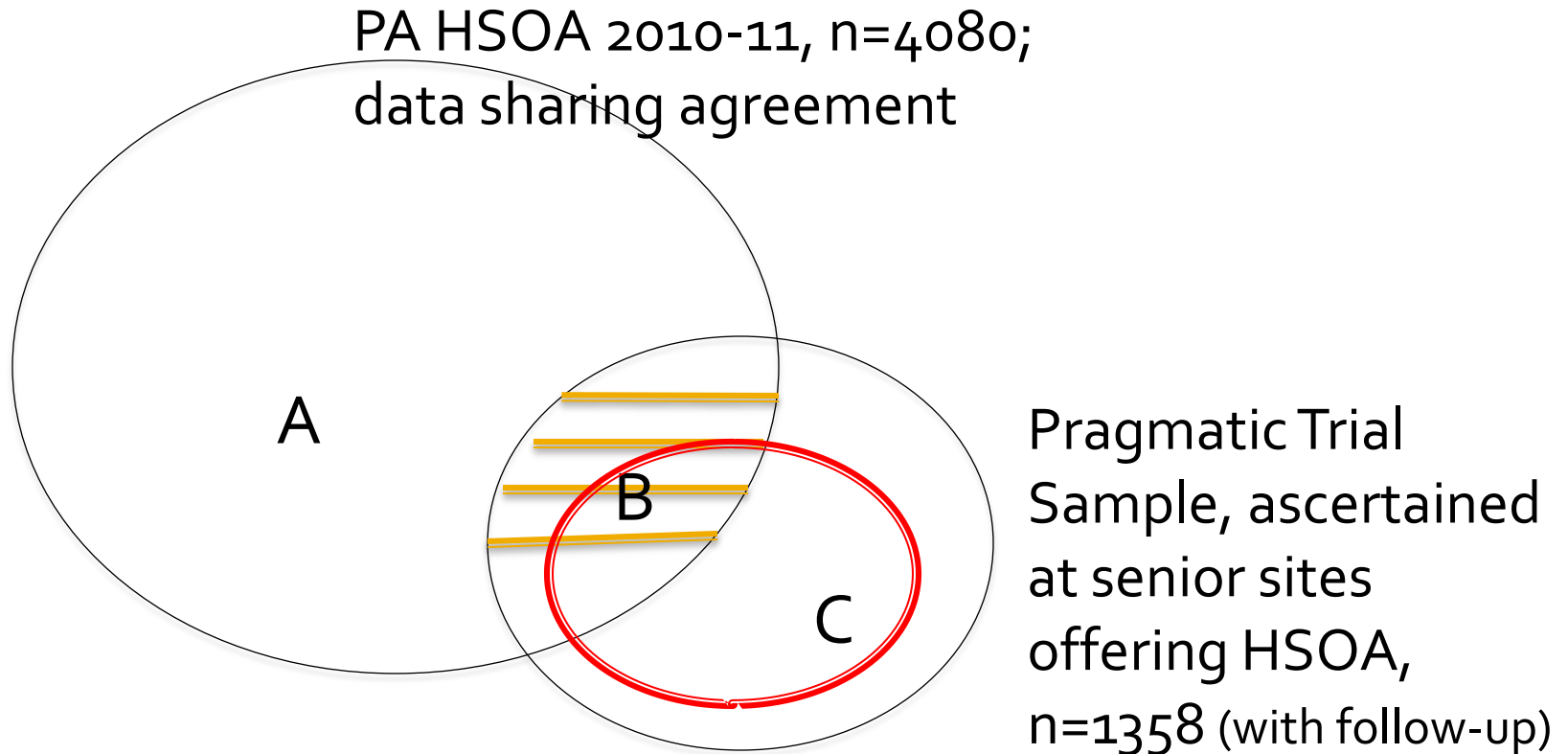
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# Quality of Comparator-Demography

|  | Non-HSOA (n=686) | HSOA (n=672) |
|---|---|---|
| Age, mean (SD) | 75.9 (8.7) | 75.8 (13.7) |
| Female, % | 74.9 | 85.0*** |
| Education<br>    College graduate, %<br>    <HS | <br>17.2<br>15.7 | <br>14.9<br>14.2 |
| Currently married, % | 35.4 | 34.9 |
| Race<br>    White, % | <br>91.5 | <br>85.3** |

** p < .01; *** p < .001

# Quality of Comparator-Baseline Falls Risk Status

|  | Non-HSOA (n=686) | HSOA (n=672) |
|---|---|---|
| Fair-poor mobility, % | 17.8 | 21.2 |
| Fair-poor balance, % | 24.2 | 29.7 |
| Fall in past year, % | 28.0 | 30.2 |
| Fall in past month, % | 7.3 | 7.0 |
| Mean days of activity, past week, 30+ min, mean (SD) | 4.92 (1.8) | 4.99 (1.7) |

N.S.

# Quality of Comparator-Follow-Up Indicators

| | Non-HSOA (n=686) | HSOA (n=672) |
|---|---|---|
| Any fall over follow-up, % | 18.5 | 17.7 |
| Hospital admission, % | 7.7 | 7.9 |
| Emergency department care, % | 12.1 | 14.0 |
| Months of follow-up, mean (SD) | 3.4 (1.6) | 3.0 (1.7)*** |
| | | |

*** p < .001

# Analytic Strategies for Pragmatic Trial (PCT)
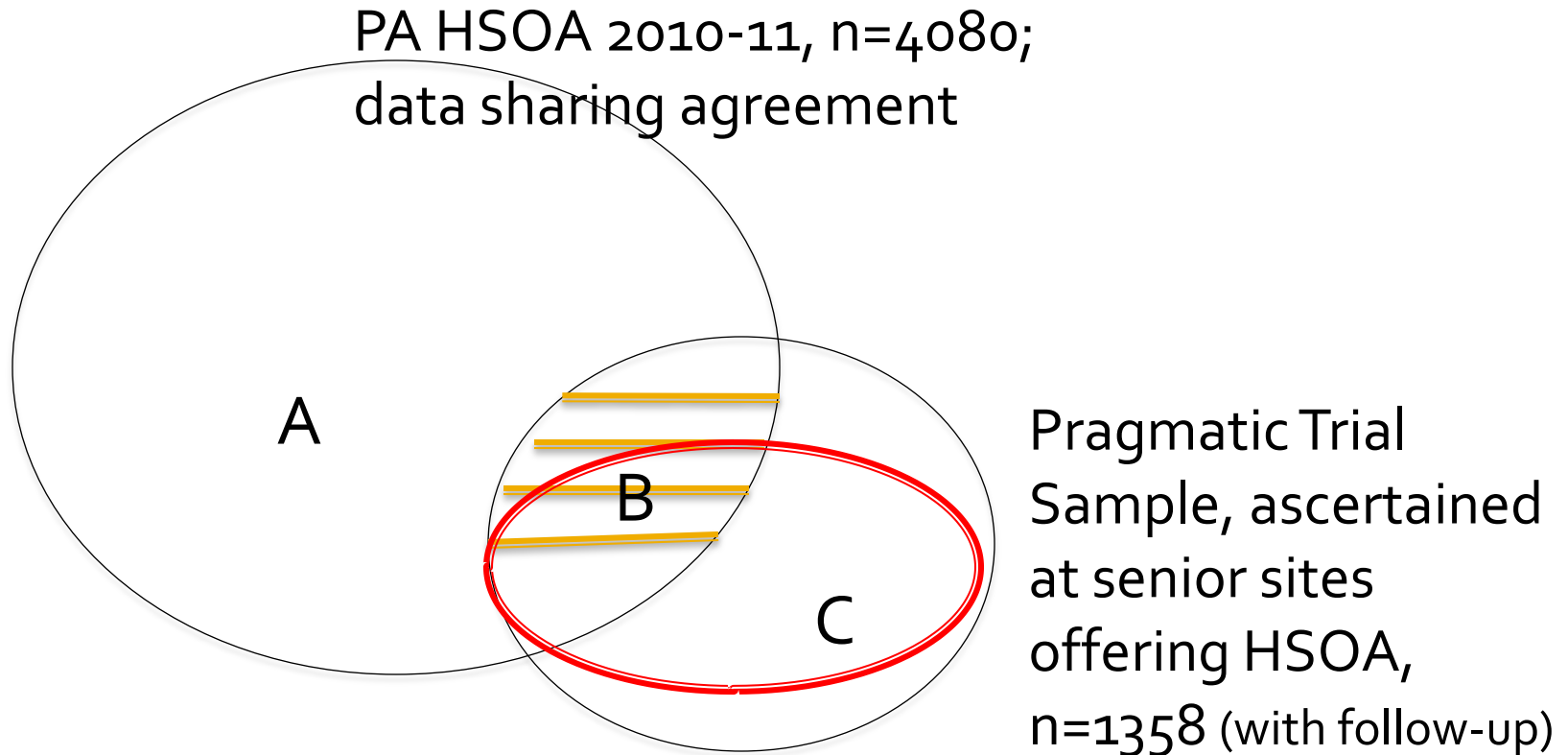
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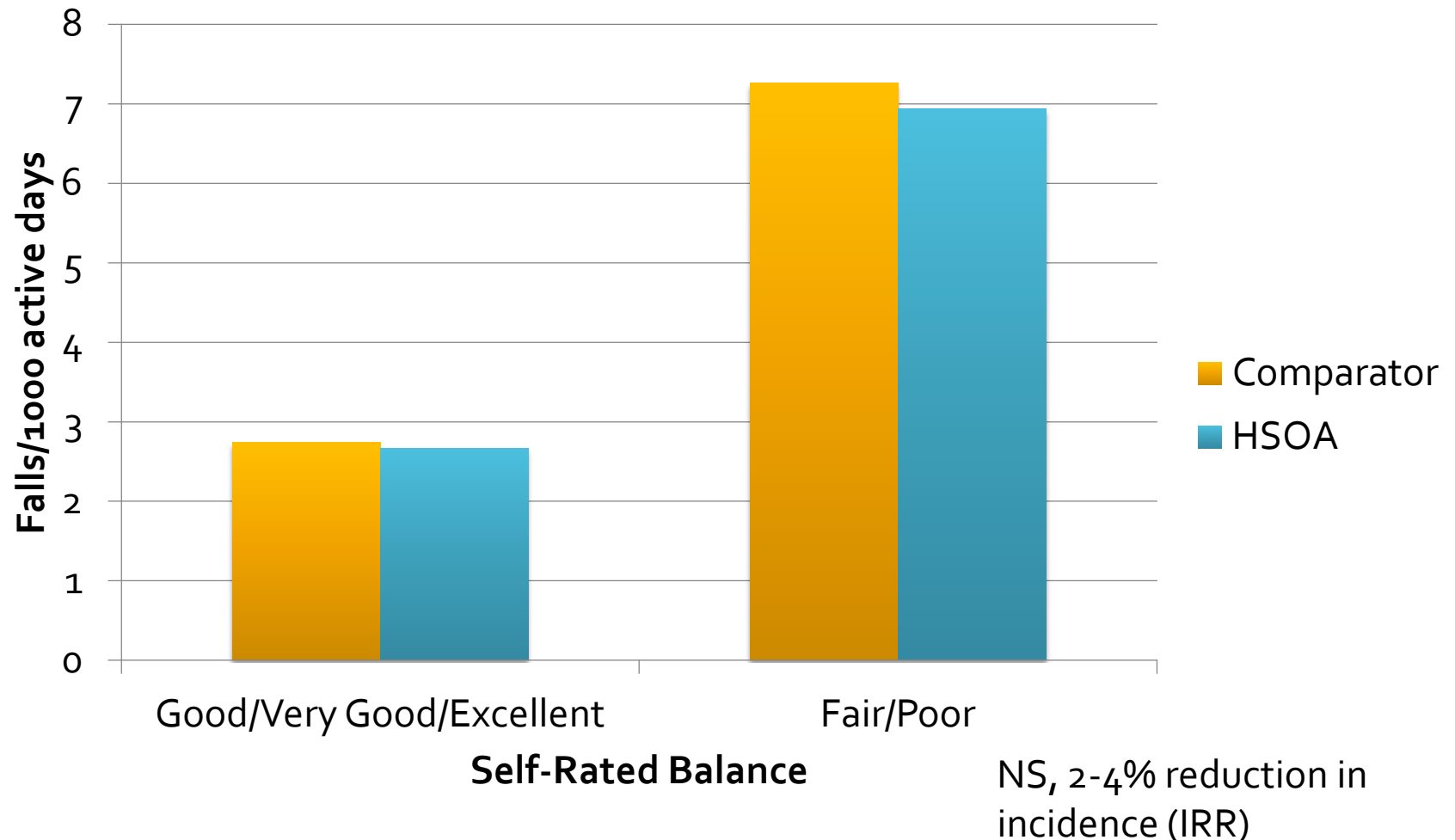Pragmatic Trial Sample, ascertained at senior sites offering HSOA, n=1358 (with follow-up)

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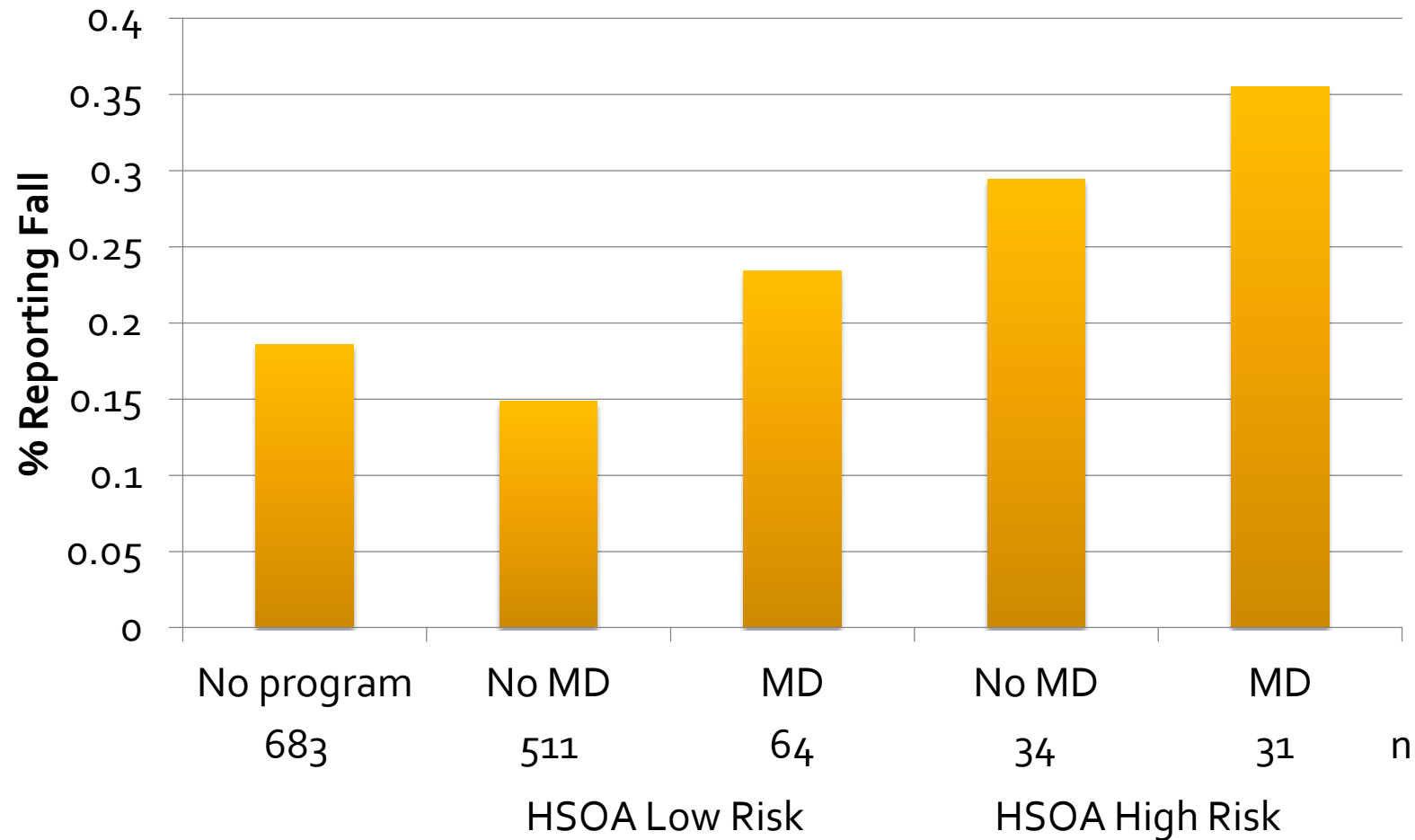Assess representativeness of HSOA sample in PCT: A vs. B

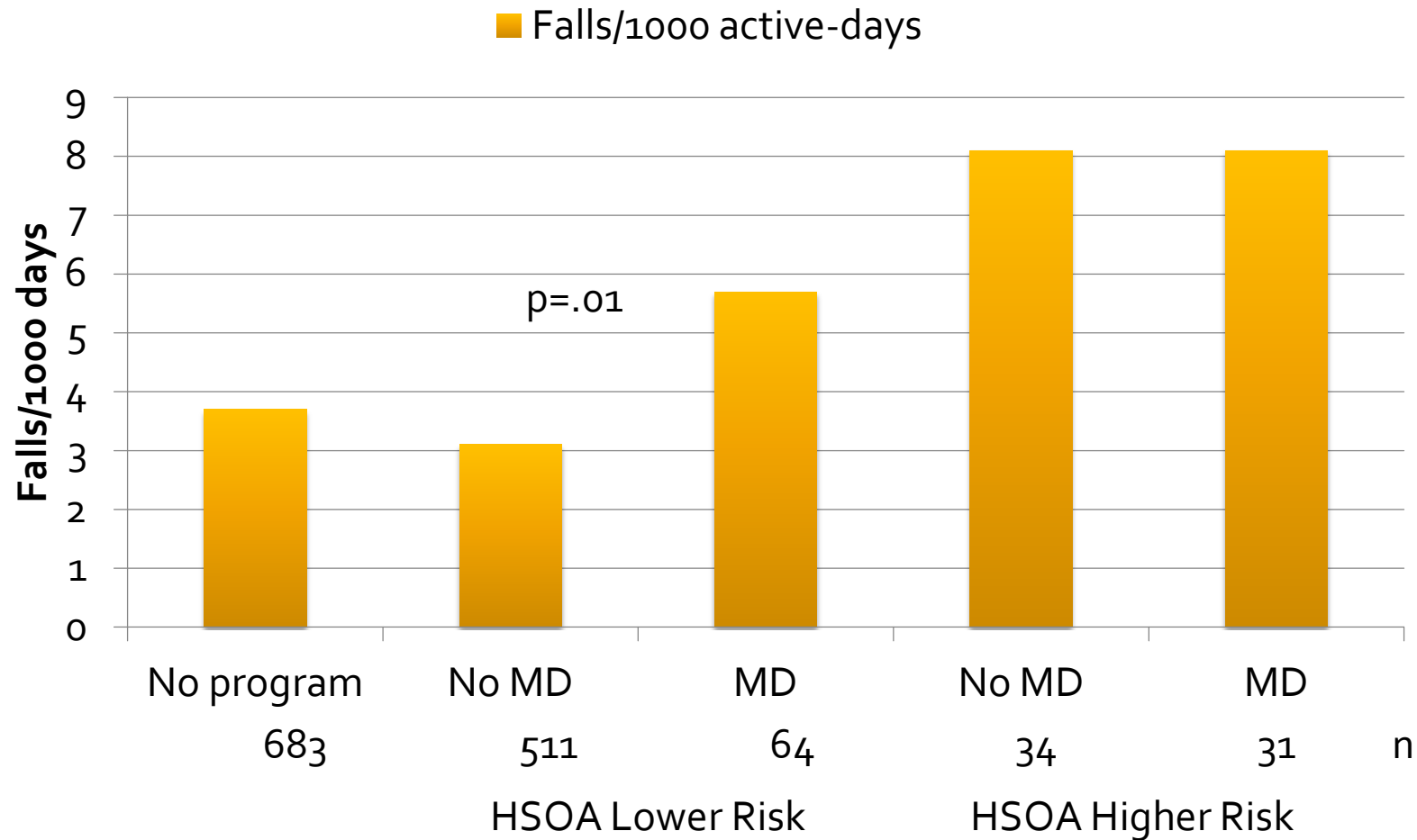Assess quality of comparator for PCT: B vs. C.

# Initial Findings (3 mo median follow-up): Pragmatic Trial Results

# Falls Incidence by Healthy Steps Status

# Falls Incidence by Healthy Steps Status

# Ecologic Analyses (PHC4)-In process

| Allegheny County | Fall-Related Inpatient Admissions | | Fall-Related Outpatient Visits | | Population | |
|---|---|---|---|---|---|---|
| | n | Total hosp admits | n | Total Admissions | N | % |
| Male | | | | | | |
| Age | | | | | | |
| 50-59 years | 438 | 13124 | 512 | 23656 | 83,924 | 14.4% |
| 60-69 years | 341 | 12404 | 277 | 20453 | 51,870 | 8.9% |
| 70-79 years | 487 | 12590 | 209 | 16932 | 36,134 | 6.2% |
| 80 years + | 1046 | 14665 | 244 | 11596 | 22,729 | 3.9% |
| Total | | | | | **582,805** | |
| | | | | | | |
| Female | | | | | | |
| Age | | | | | | |
| 50-59 years | 393 | 12744 | 633 | 30350 | 91,473 | 14.3% |
| 60-69 years | 509 | 13464 | 492 | 25724 | 61,408 | 9.6% |
| 70-79 years | 932 | 16349 | 388 | 22696 | 50,534 | 7.9% |
| 80 years + | 2818 | 25553 | 605 | 15868 | 47,335 | 7.4% |
| Total | | | | | **639,668** | |

# Falls-Related Hospitalization: Allegheny County
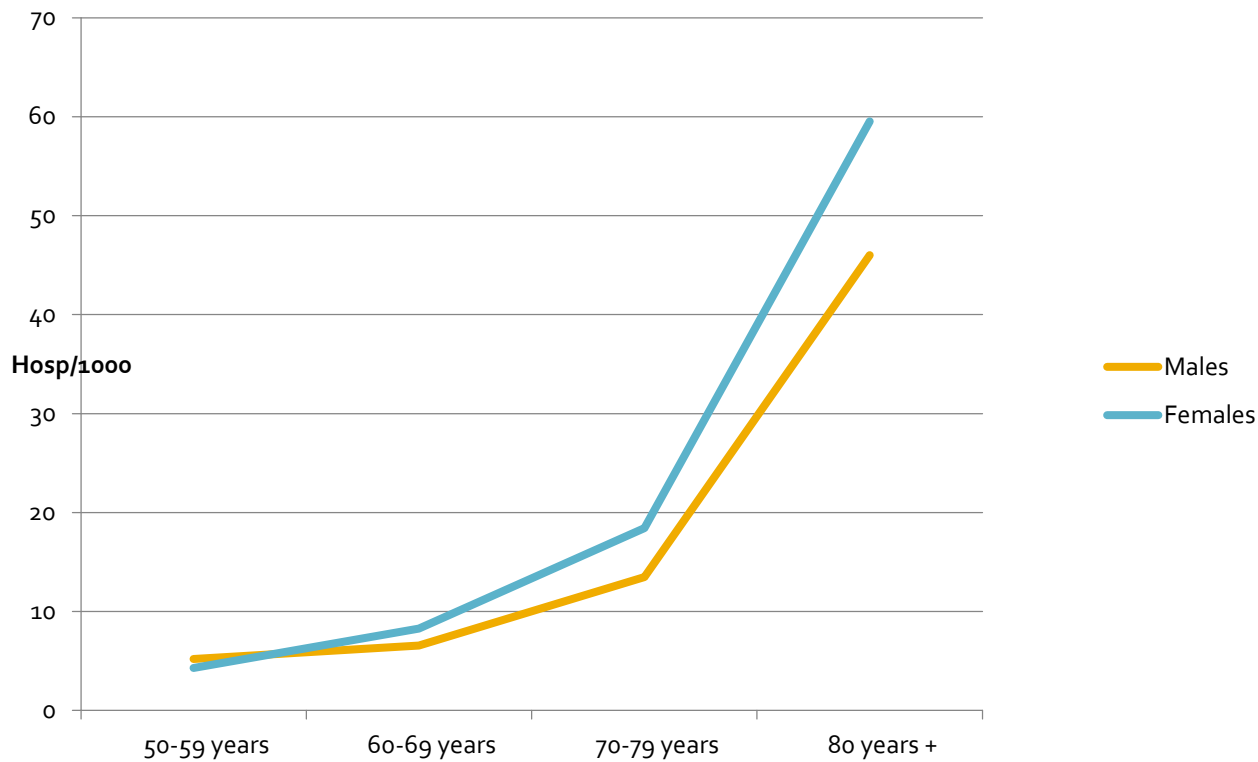
# Falls-Related Hospitalization: Allegheny County
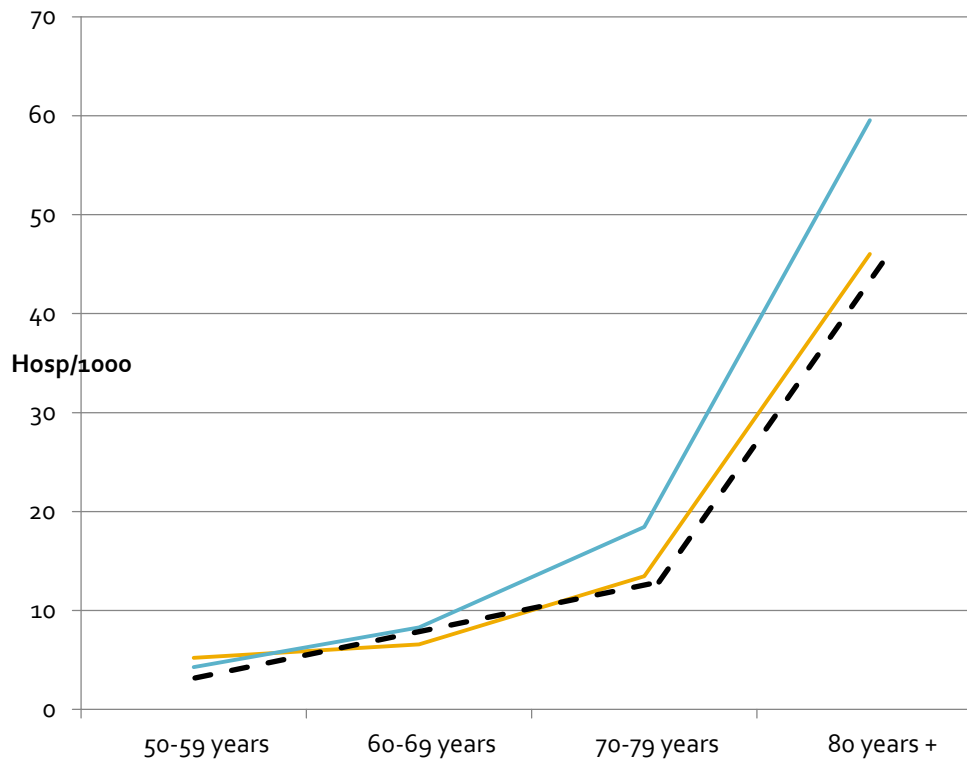


HSOA-Hypothetic, Related to penetration of program and physician awareness?

# Tasks Ahead

- PCT analyses, full follow-up (June, 2012)
- Physician/provider survey, linked to falls prevention/assessment
- PHC4 data analysis
  - Do counties with higher penetration of *Healthy Steps* and more informed physicians have lower incidence of falls-related hospitalization?
- Randomized trial
- Program evaluation
  - Semi-structured interviews with n=80 program staff across state

# RCT Design

```
HSOA performance          ≥ 1/3 tests at high          Randomized to
test screen at            risk: eligible               HSOA as usual,
senior centers                                         n=60

                                                       Randomized to
                                                       HSOA, enhanced
                                                       adherence, n=60

                          0/3 tests at high            Randomized to
                          risk: ineligible             enhanced HSOA
                                                       plus HSIM, n=60
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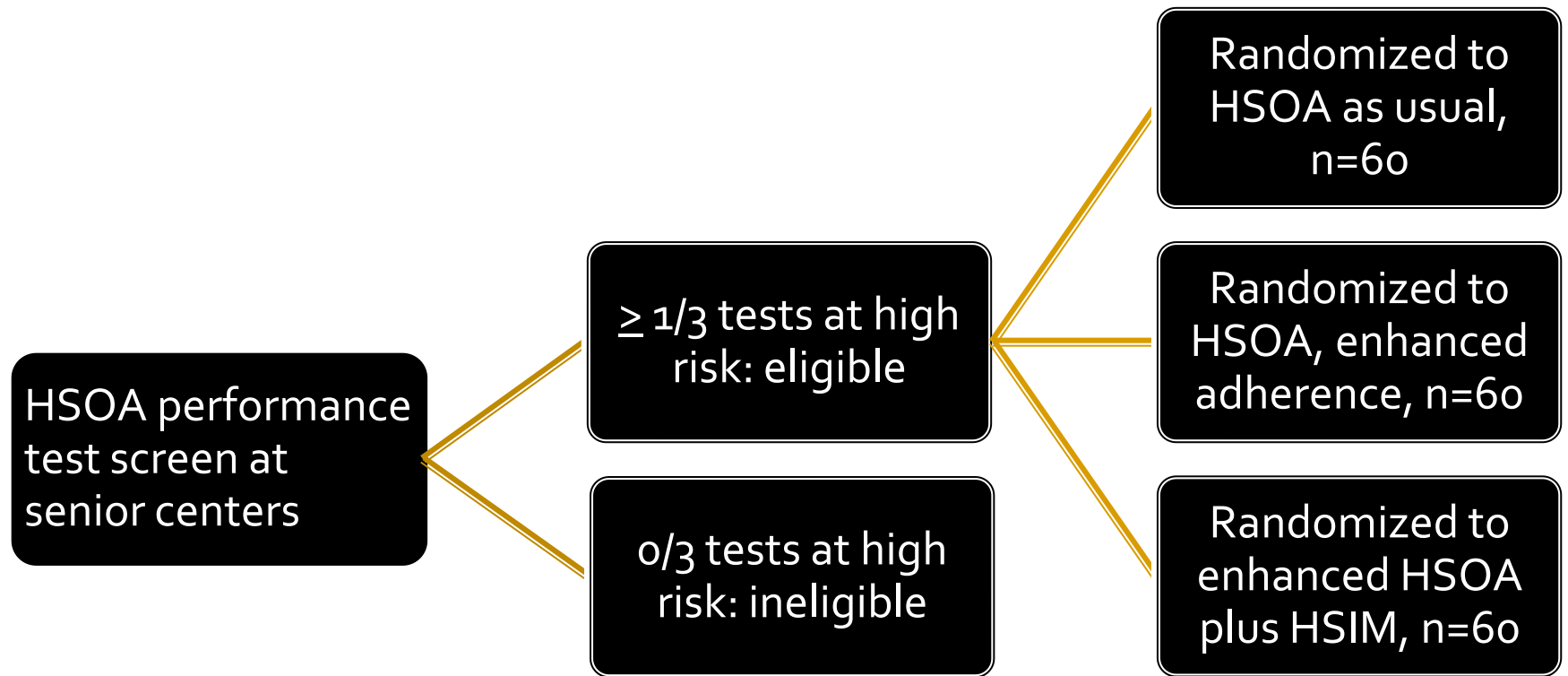
Enhanced adherence: follow-up on MD referral and home safety check.
HSOA, Healthy Steps for Older Adults; HSIM, Healthy Steps in Motion

# Acknowledgments

- Operations team
  - Jennifer King, Ed Luksik, Alexa Swails, Cassie Narkevic, Jean Nutini, Kristin Champlain, Johanna Sholder, Jason Flatt, Carol Morris, Rob Keene
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