



# State of the Science in Intervening for Health Behavior Change

Bonnie Spring, PhD.  
Director, Center for Behavior and Health  
Northwestern University FSM, Chicago, Illinois  
[bspring@northwestern.edu](mailto:bspring@northwestern.edu)



# Overview

- Why do we need multiple health behavior change?
- Scientific/Practical Questions:
  - Increase healthy or decrease unhealthy?
  - How many behaviors can we tackle at once?
  - Intervene simultaneously or sequentially?
- Context and purpose:
  - clinical (high risk)
  - population (small changes to shift population distribution)
  - systems change (for sustainability)

Why do we need multiple health behavior change?

# Risk Behavior Bundling

4

- **ADULTS**

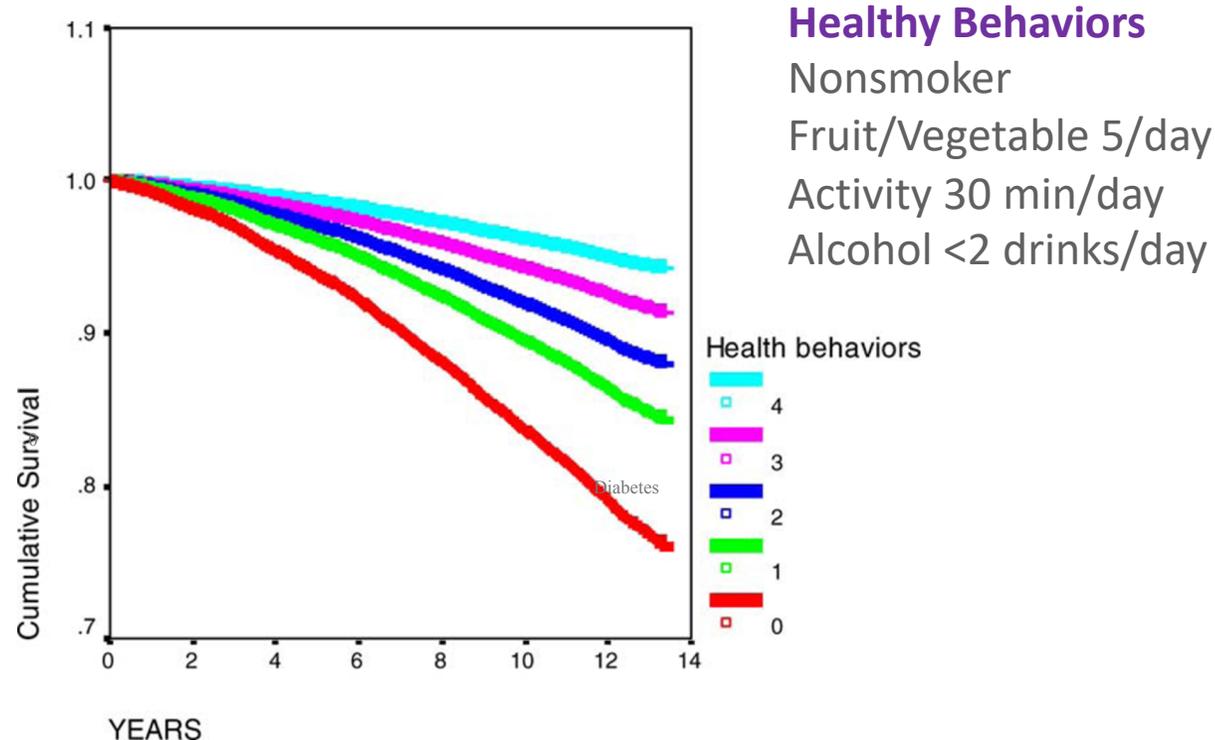
- 52% have  $\geq 2$  risk behaviors (smoke, inactive, overweight, risky drinking)
- 17% have  $\geq 3$
- Greater if < college degree, psych distress

- **YOUTH**

- Smoking by age 11 a/c 22% variance in 16 risk behaviors (includes weapons, violence, substance use)

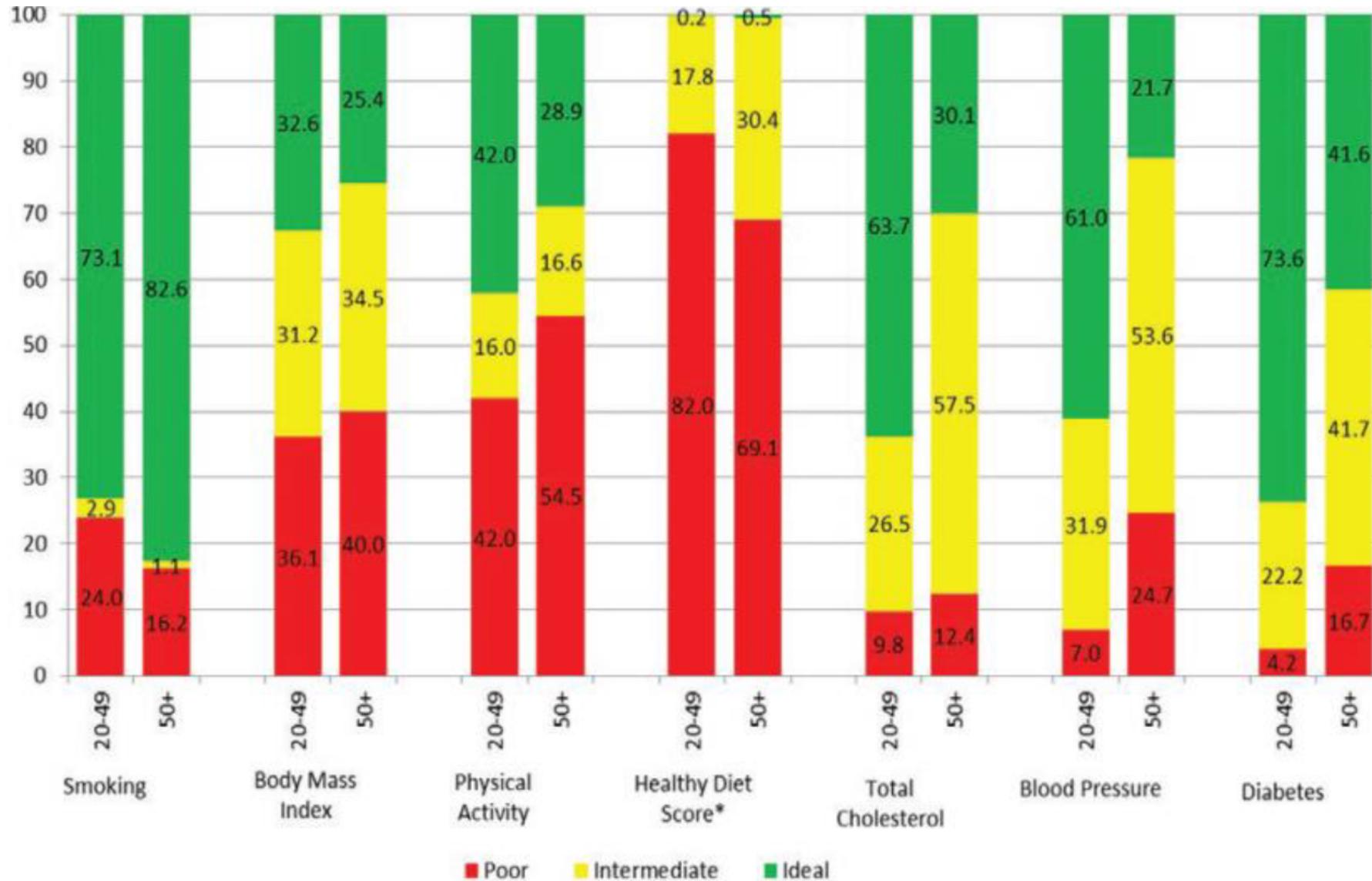
EPIC-Norfolk: 20,244 men and women aged 45–79, 11 yr f/up

4 health behaviors predict 4-fold difference in total mortality.  
Estimated impact = 14 y in chronological age



Fine et al, 2004; Coups et al, 2004; Durant et al, 1999)

# American Heart Association Cardiovascular Health Score



Source: NHANES 2013 to 2014.

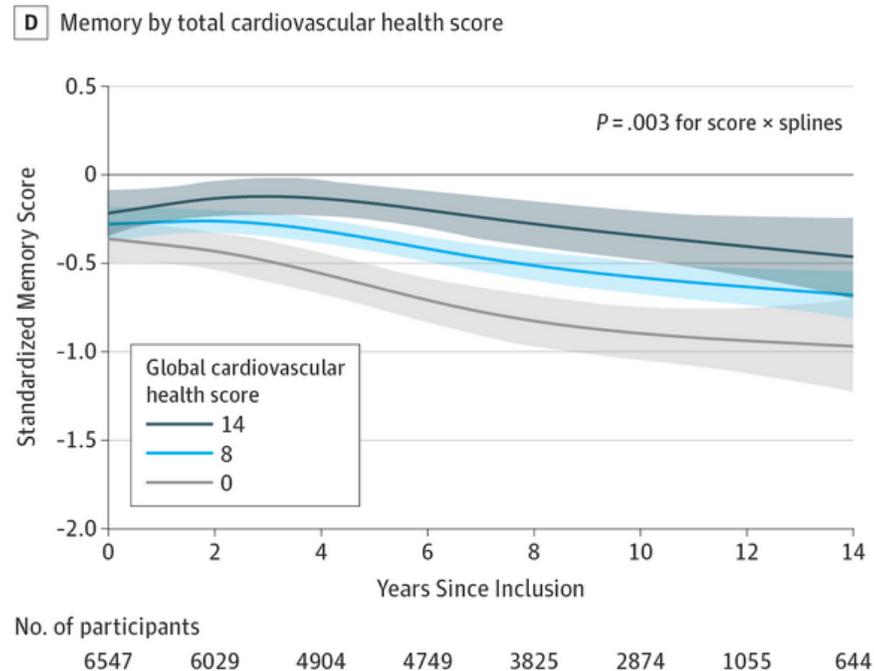
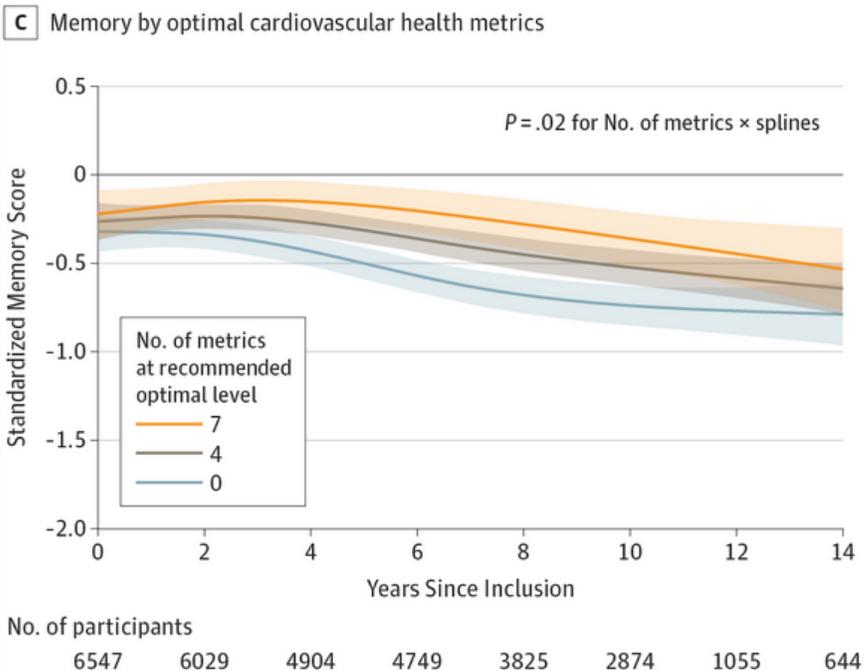
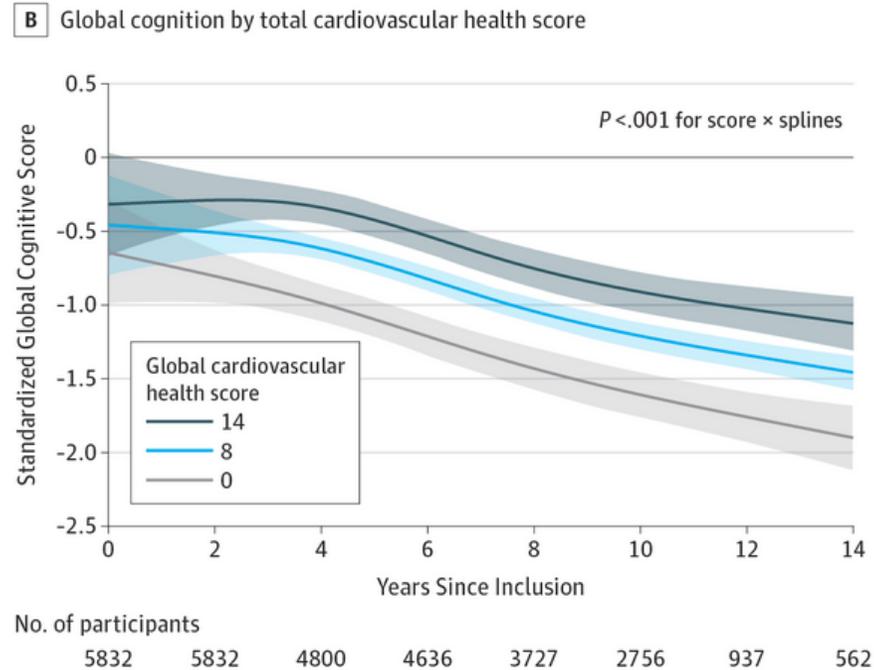
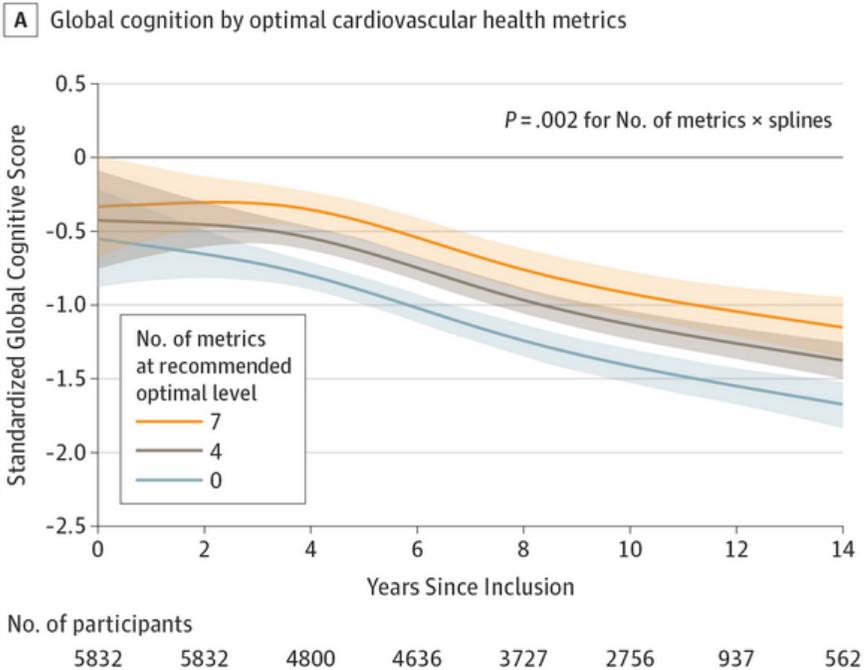


Figure 2. Mean Trajectories of Change in Global Cognition and Memory Predicted by a Multivariable Linear Mixed Model for a Specific Profile of Covariates, by Increasing Number of Recommended Optimal Cardiovascular Health Metrics and by Higher Total Cardiovascular Health Score

Samieri, et al. Association of Cardiovascular Health Level in Older Age with Cognitive Decline and Incident Dementia

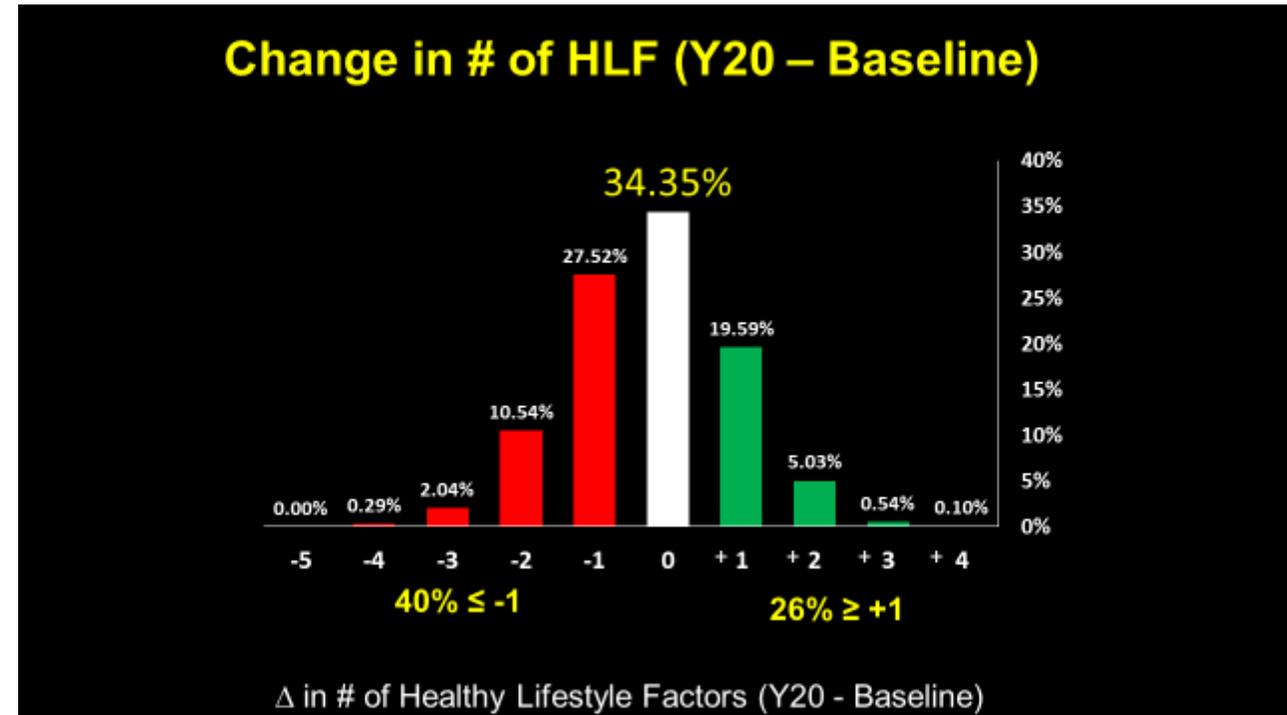
JAMA August 21, 2018 320(7):

# Skepticism that behavior can be changed

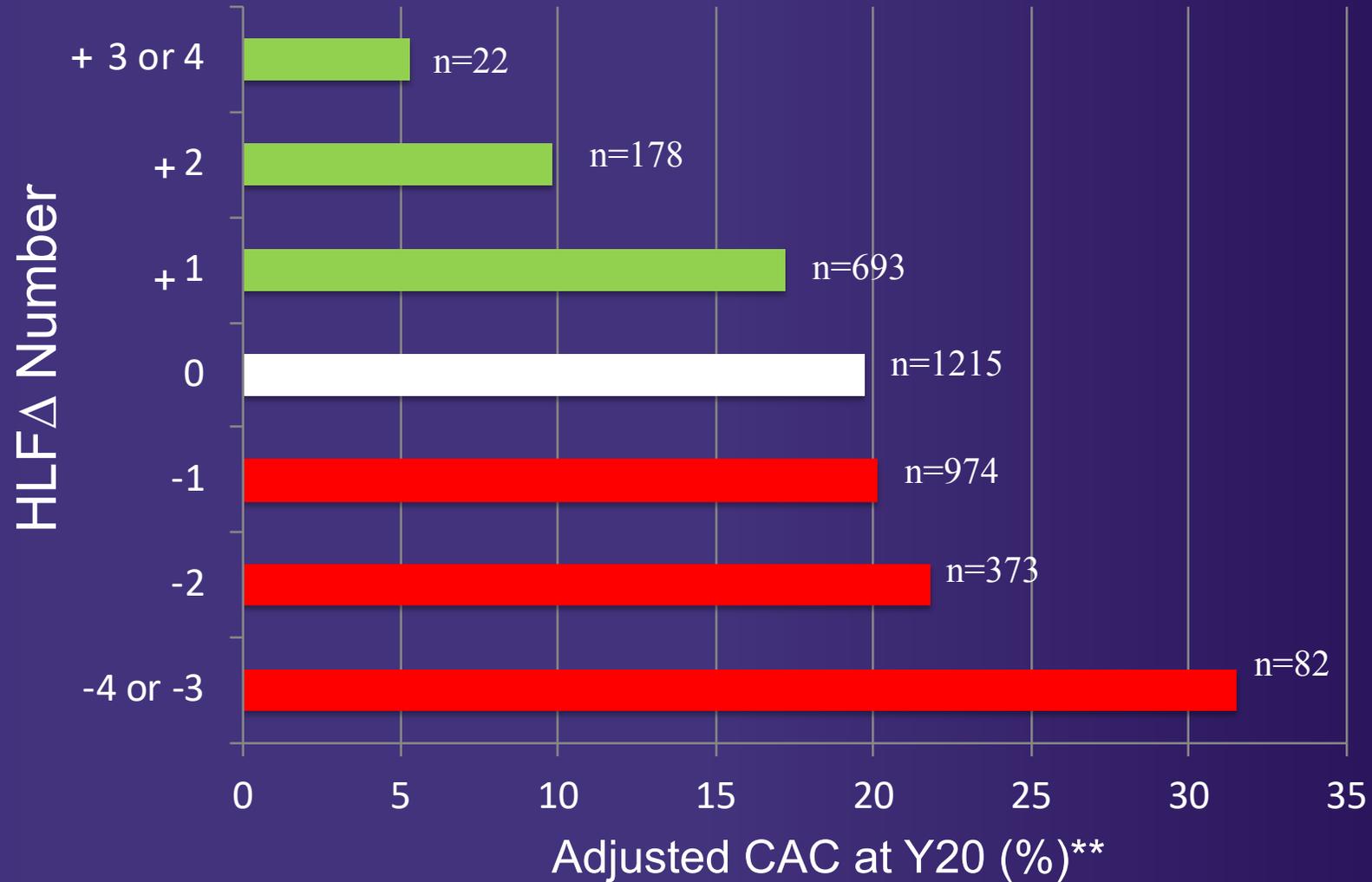
## CARDIA Study

- CARDIA: longitudinal, multi-site cohort study of African-American and white young adults aged 18-30 years first examined in 1985-86 (Y0)
- Balanced by race, sex, education, and age within centers (Birmingham, Chicago, Minneapolis, and Oakland)
- Seven exams (Year 0, 2, 5, 7, 10, 15 and 20)
- **N=3538** includes all who have Y20 assessment and not pregnant at Y0 or Y20
- **Only 10% have all 5 HLFs at Y0** (includes ETOH)

Is it all over by the time you're 18-30% ?  
Are the other 90% doomed to develop CVD?



# Prevalence of CAC at Y20 for each HLF change category



Spring, Moller,  
Colangelo et al,  
*Circulation*, 2014,  
130(1)

\*\* Adjusted for age, race, sex, and baseline number of HLFs and based on imputed data.

Can we accomplish multiple health behavior change?

# Large Community Studies of Multiple Behavior Change

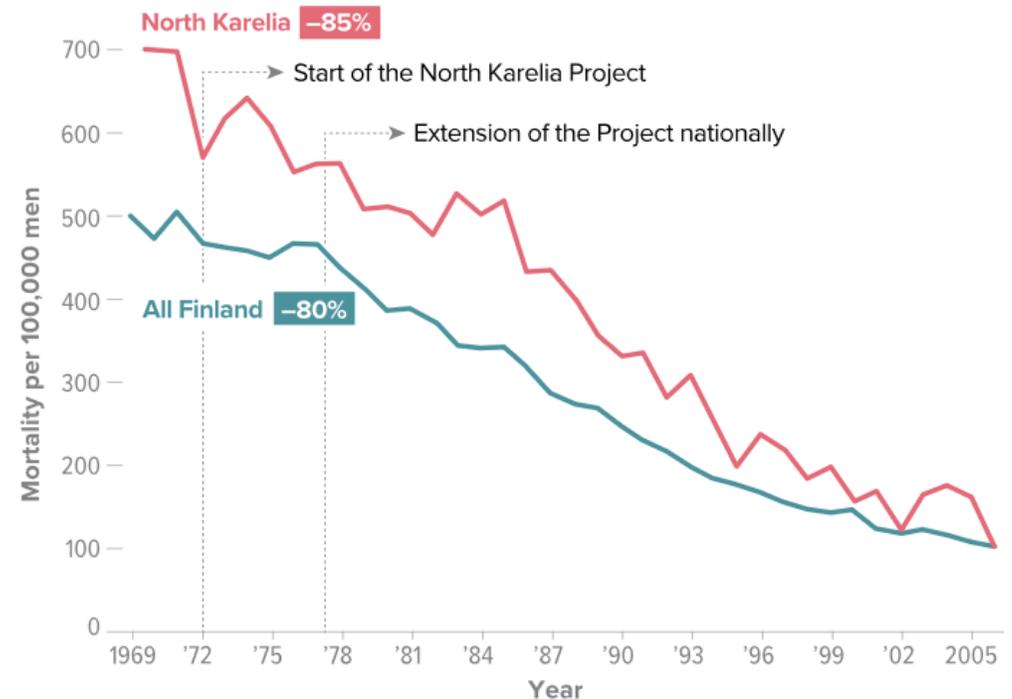
Small, inconsistent effects:  
Low intensity, contamination

- Multiple Risk Factor Intervention Trial
- Stanford Three City and Five City Projects
- Pawtucket Heart
- Minnesota Heart

## North Karelia Project

### MORTALITY RATES FROM CORONARY HEART DISEASE IN NORTH KARELIA AND IN ALL OF FINLAND

Age-adjusted, males ages 35-64 years, 1969-2006



SOURCE: P. PUSKA AND T. STÄHL / ANNUAL REVIEW OF PUBLIC HEALTH 2010

KNOWABLE

# Multiple Risk Behavior Change

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- **Ebrahim et al, Cochrane Review, 2011**
  - MRBC reduces total mortality and CV events in those with HTN or NIDDM but not in general population.
- **Alageel et al, BMJ Open, 2017**
  - MRBC significantly but modestly improves BP, weight, lipids in general population. Judged not clinically important

Increase healthy or decrease unhealthy?

# Make Better Choices 1

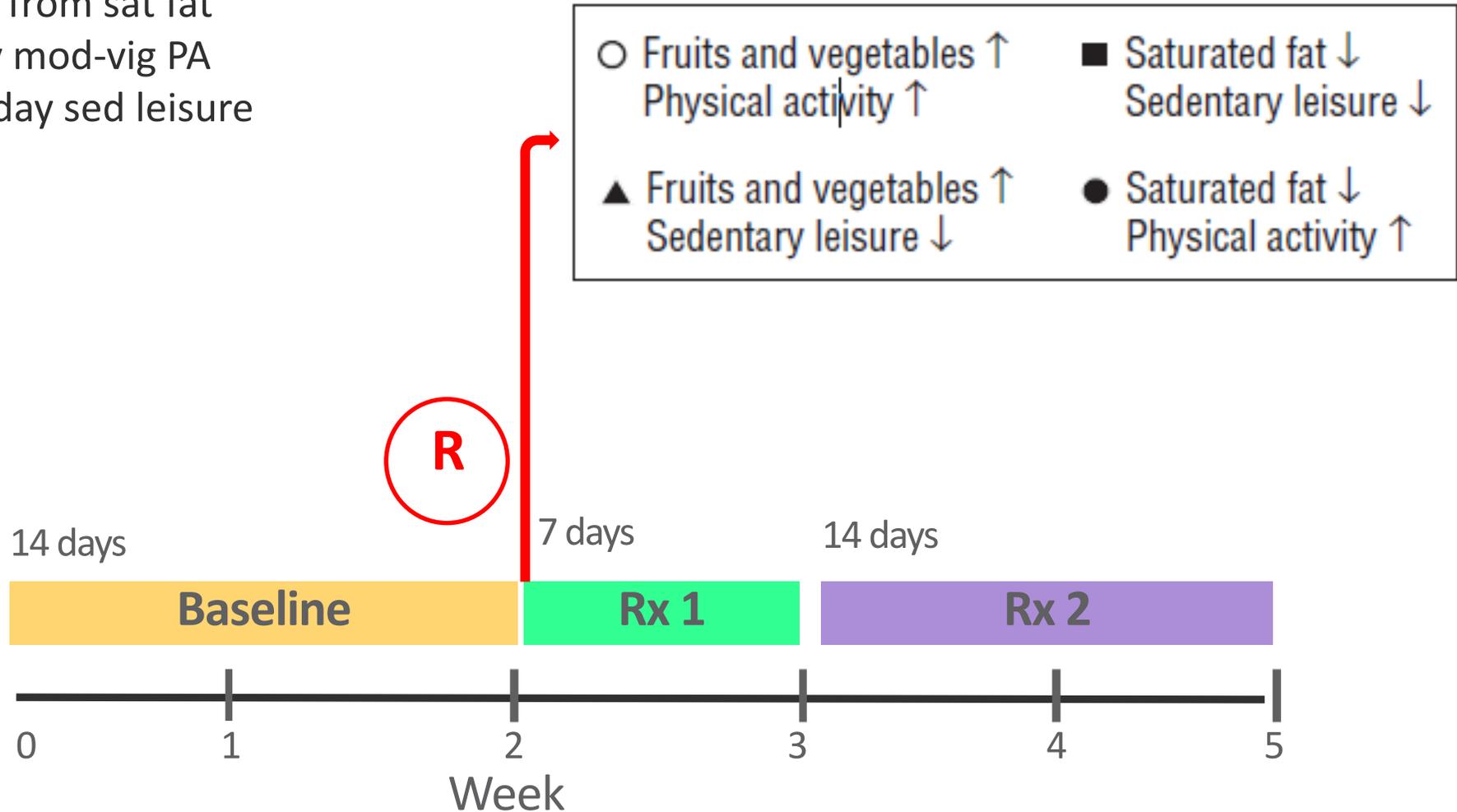
Spring, Schneider, et al. (2012) *Arch. Internal Med*

**N = 204 have ALL of**

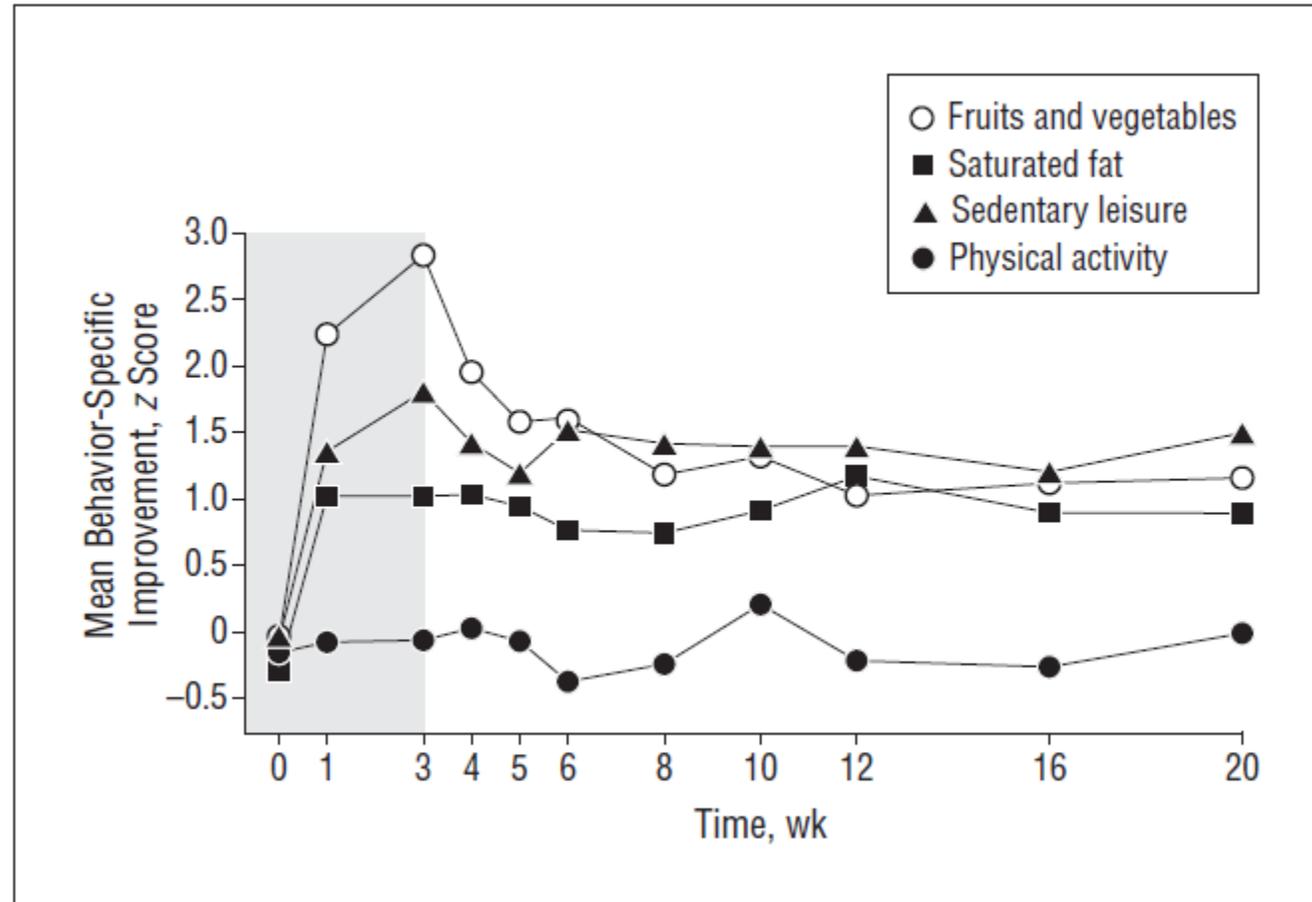
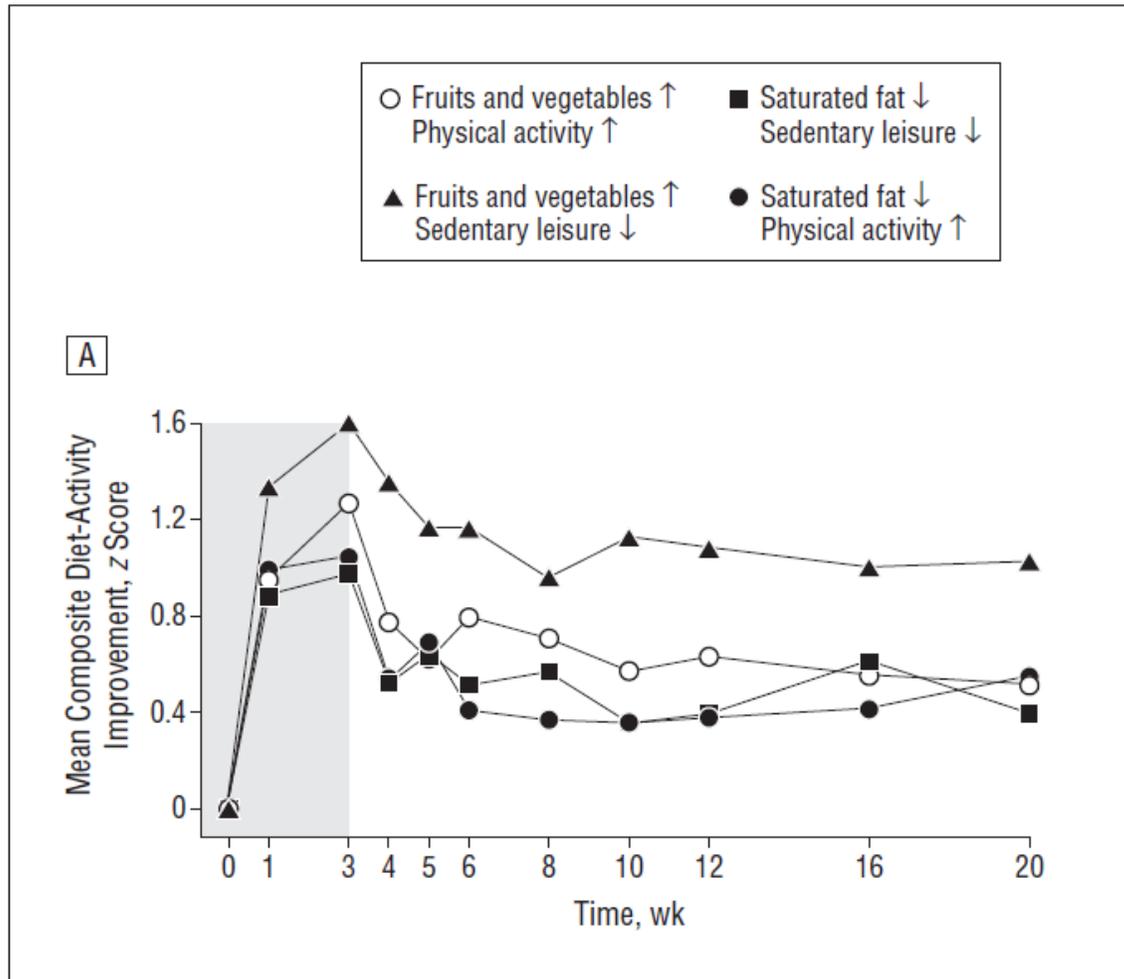
- Low FV = < 5 fruits/vegetables/day
- High Sat => 8% of kcal from sat fat
- Low PA =< 60 min/day mod-vig PA
- High Sed = >120 min/day sed leisure



Record daily



# Make Better Choices 1



# Simultaneous or Sequential?

# Simultaneous versus Sequential Intervention

- Mixed results (Spring; Vandelanotte; Hyman; King; Prochaskas)
- Too much delay impedes sequential (Hyman); too much burden impedes simultaneous (Spring)

# Make Better Choices 2 (MBC2)\*

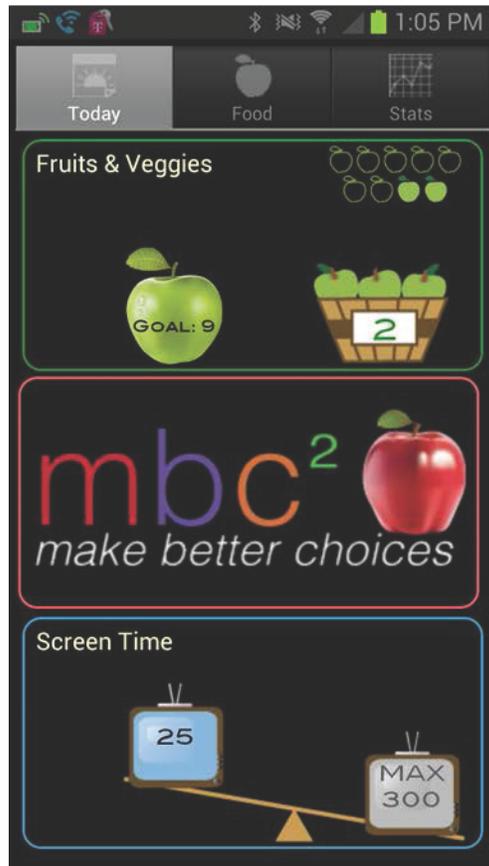
- **N:** 212 adults with all 4 risk behaviors: low FV, high Sat, low MVPA, high Sed
- **Randomized to 3 Treatments**
  - Sequential (target FV, Sed first, then MVPA)
  - Simultaneous (MVPA, FV, Sed)
  - Control (Stress & Sleep).
- **Outcome:** composite z diet and activity improvement at 6 & 9 months

- Treatment:** 12 weekly coaching calls: reach 1/3 goal every 2 wks; biweekly check-in 3- 6 mo f/up; monthly 6-9 mo. f/up
- Android app (+ loaned phone prn)
  - Wireless accelerometer.
  - \$5 incentive each week during 12 weeks acquisition phase if all goals met (\*rarely attained\*)

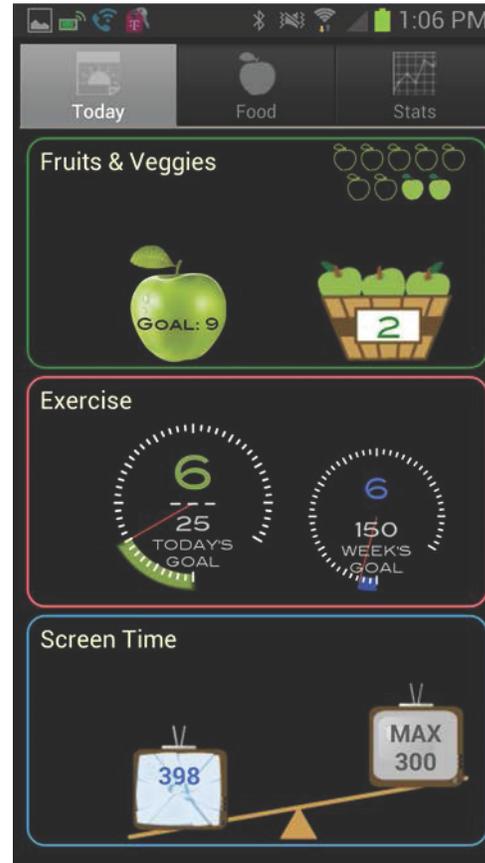
**Hypotheses: Simultaneous and Sequential > Control; Sequential > Simultaneous**

# MBC2 Smartphone Apps

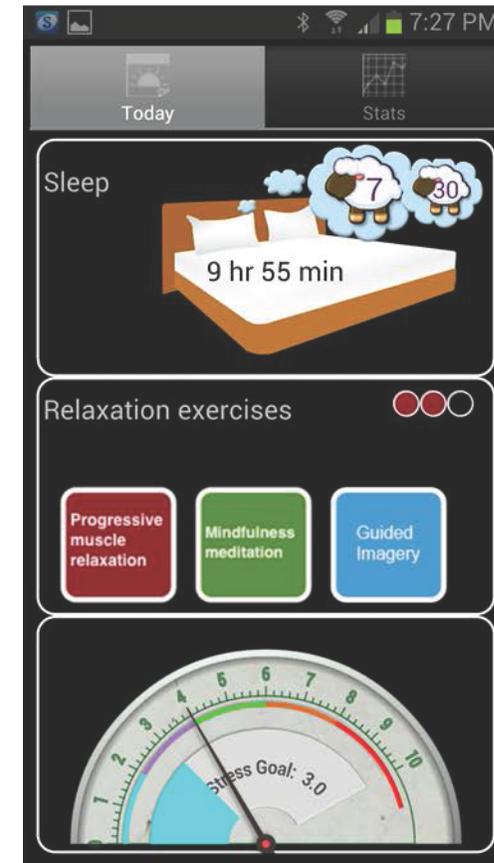
## Sequential



## Simultaneous



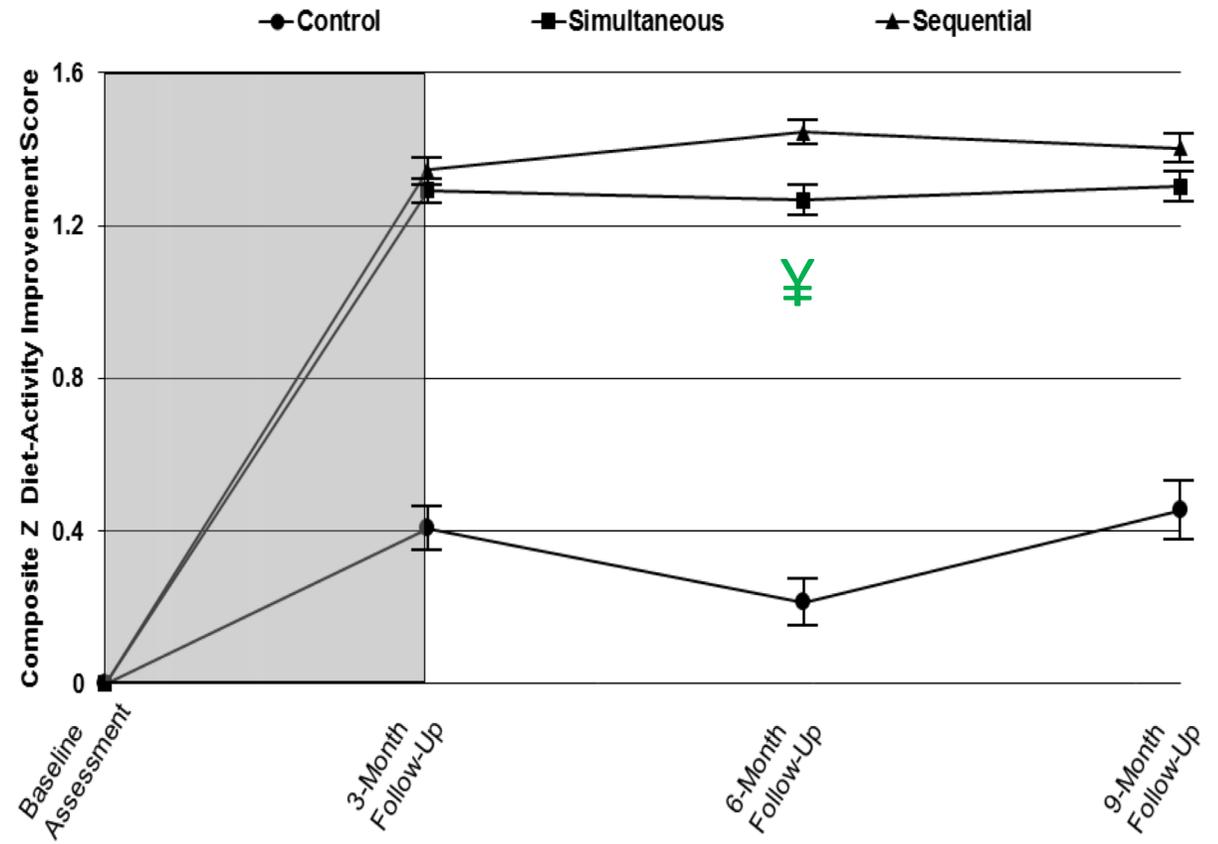
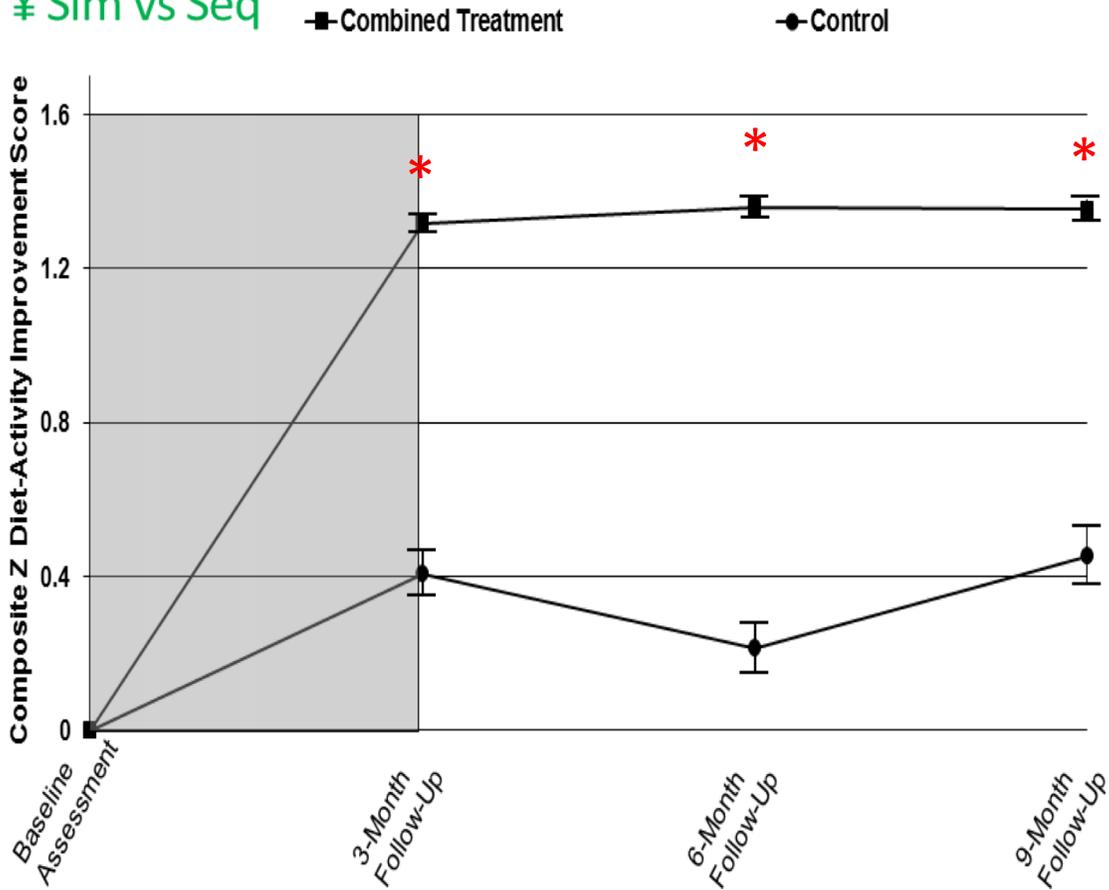
## Control



# Mean ( $\pm$ SE) Composite Z Diet/Activity Improvement Over Time

\* Trt vs. C

¥ Sim vs Seq



Error bars represent 1 SE. Gray background = treatment initiation phase (weeks 0-12); white background = follow-up maintenance

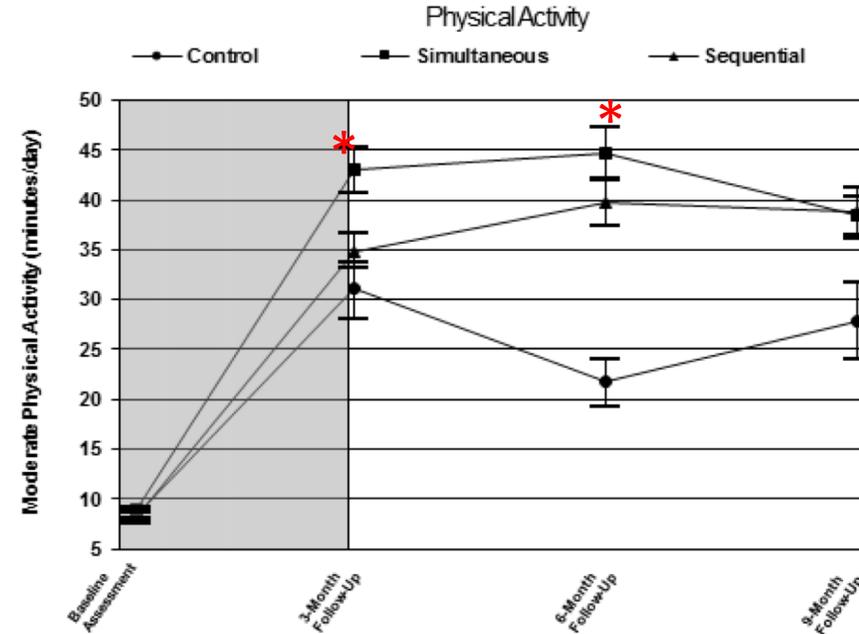
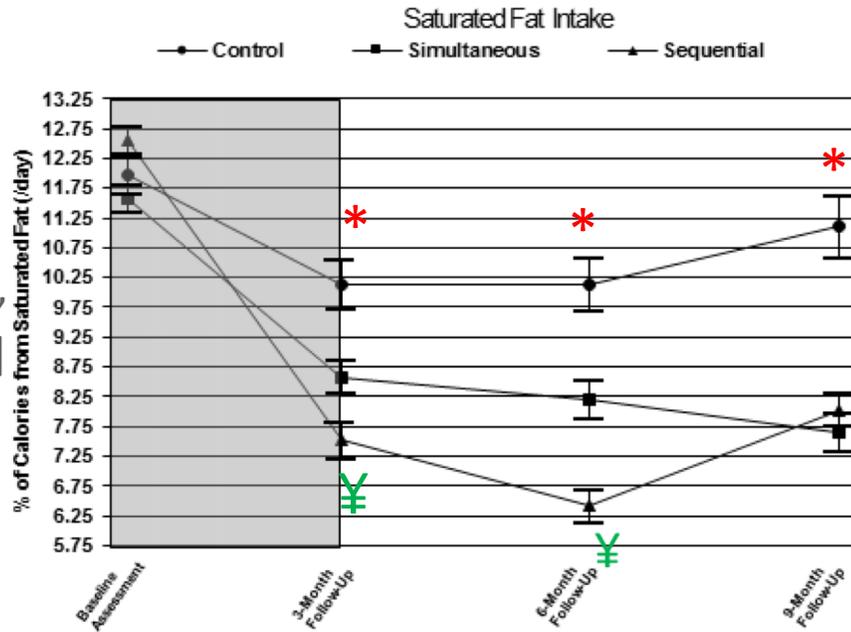
**Both Sequential and Simultaneous Treatments Produced Large Magnitude, Sustained Healthy Change in Diet and Activity**

# Effects of the 3 interventions on changes in each behavior (expressed in natural units)

\* Trt vs. C

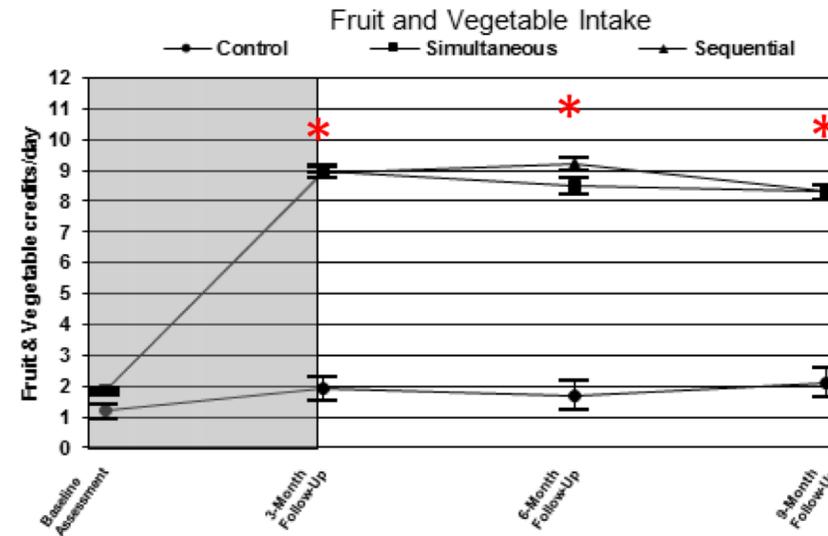
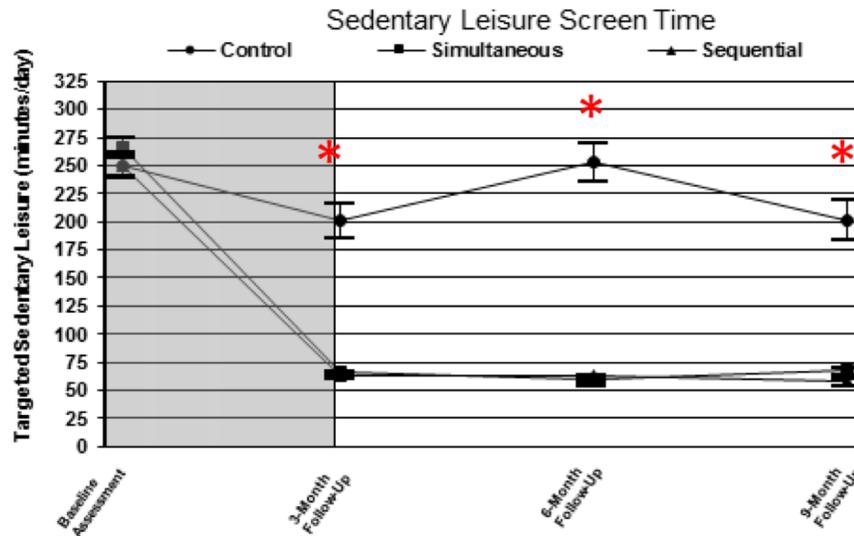
¥ Sim vs Seq

9m M diff: -3.7%,  
95% CI [-5.4, -2.1]

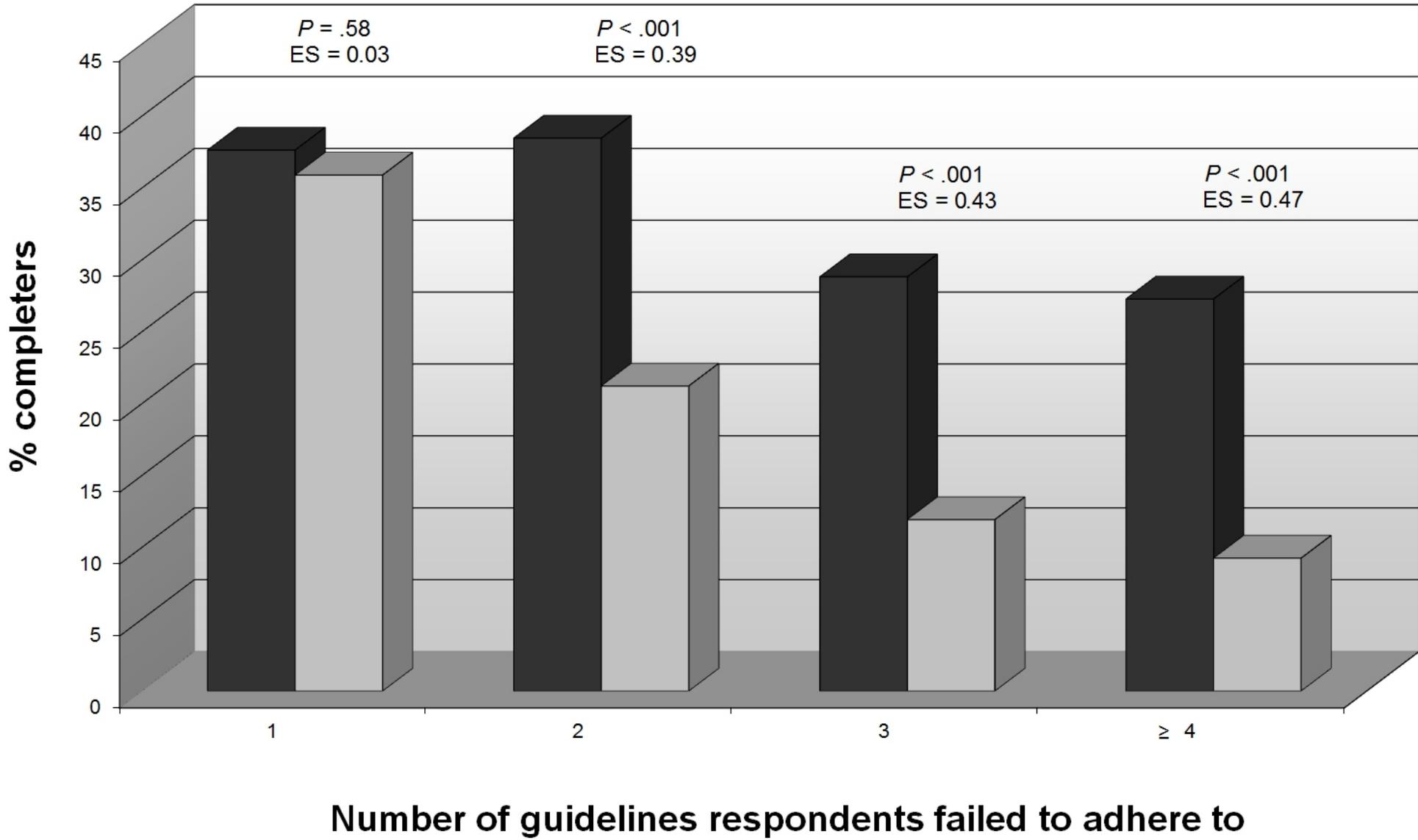
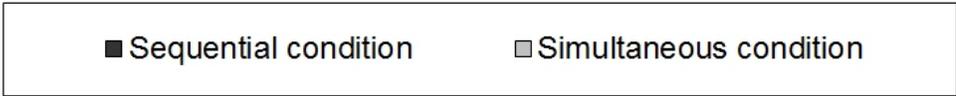


6m M diff: 15.8  
min/day MVPA,  
95% CI [0.7,  
30.9]

9m M diff: 126.9  
min/day, 95% CI  
[-153.4, -100.3]



9m M diff: 5.9 day  
95% CI [4.5, 7.2]



Noncompletion:  
 77.1% simultaneous  
 65.0% sequential

# Simultaneous versus Sequential Intervention

- Mixed results (Spring; Vandelanotte; Hyman; King; Prochaskas)
- Too much delay impedes sequential (Hyman); too much burden impedes simultaneous (Spring)
- Consider that burden shows individual and contextual differences
- When manageable, efficiency of concurrent simultaneous intervention trumps sequential

# Building Health Promotion Into Care Delivery Systems

# Need for Health Promotion for Cancer Survivors

- -Prevalent poor quality diet, obesity, and physical inactivity. Many survivors become more overweight and physically inactive as their time since initial diagnosis increases, particularly if emerging functional impairments impede the ability to be physically active ; (Blanchard, Courneya, & Stein, 2008; S. M. Bluethmann et al., 2015; Sprague et al., 2010)

Patnaik *et al.* *Breast Cancer Research* 2011, **13**:R64  
<http://breast-cancer-research.com/content/13/3/R64>



**RESEARCH ARTICLE**

**Open Access**

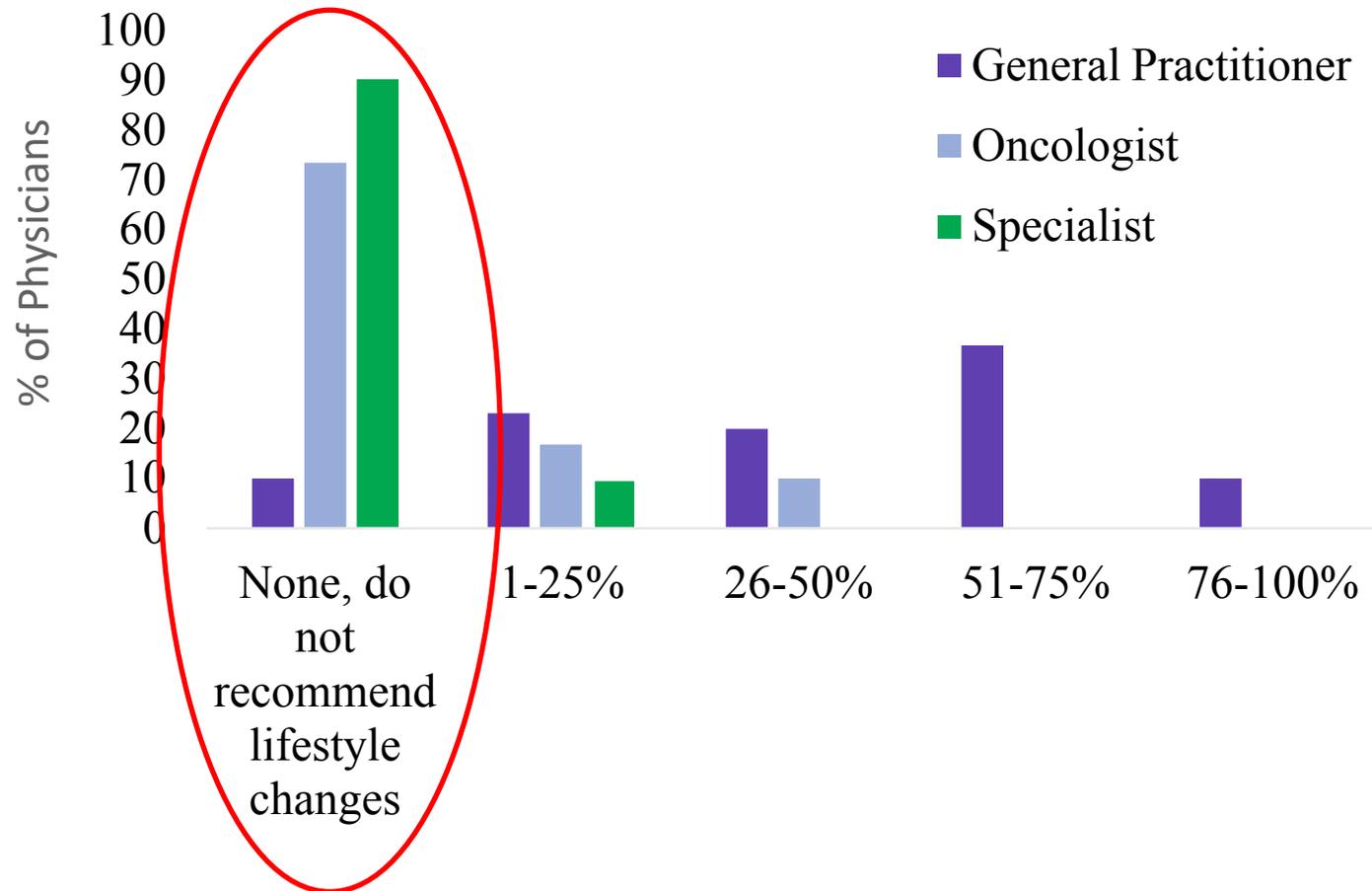
## Cardiovascular disease competes with breast cancer as the leading cause of death for older females diagnosed with breast cancer: a retrospective cohort study

Jennifer L Patnaik<sup>1\*</sup>, Tim Byers<sup>1</sup>, Carolyn DiGuseppi<sup>1</sup>, Dana Dabelea<sup>1</sup> and Thomas D Denberg<sup>2</sup>

# Physician Survey (Northwestern)

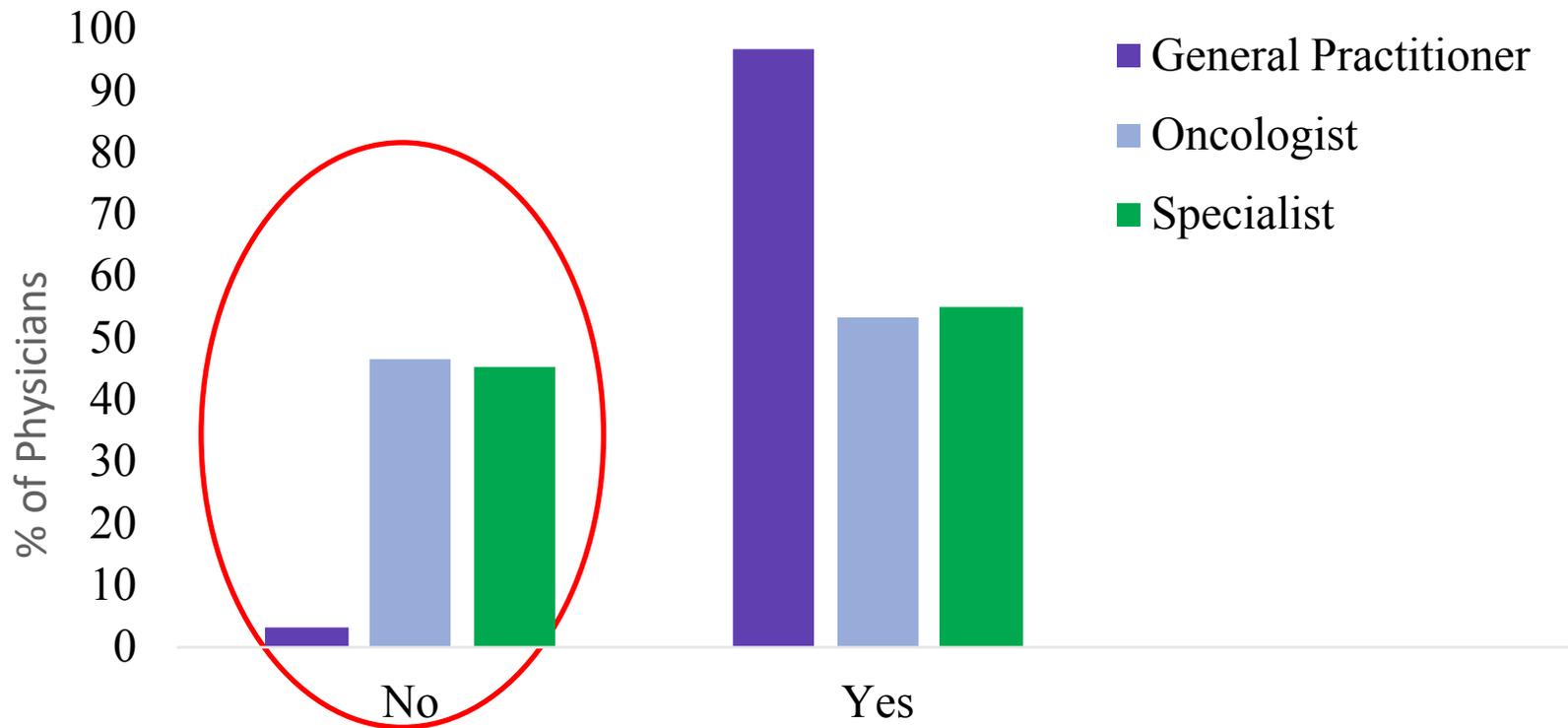
- **Sample:**
  - **30 Surgical or Medical Oncologists (50% each)**
  - **30 General Practitioners (Family Medicine, Internal Medicine)**
  - **31 Specialists addressing breast cancer (OB-GYN), prostate (urology), melanoma (dermatology)**
- **62.6% Female**
- **87.9% White; 93.4% Non-Hispanic; 8.8% Asian (most represented racial/ethnic minority in sample)**
- **ages 31-65 (fairly equal distribution within 3 age categories)**
- **Experienced: 7 had >31 years; 22% had <5 years**

# In what percent of your cancer patients in remission, do you recommend ways of improving their lifestyle, such as smoking cessation, weight loss, or increasing physical activity?



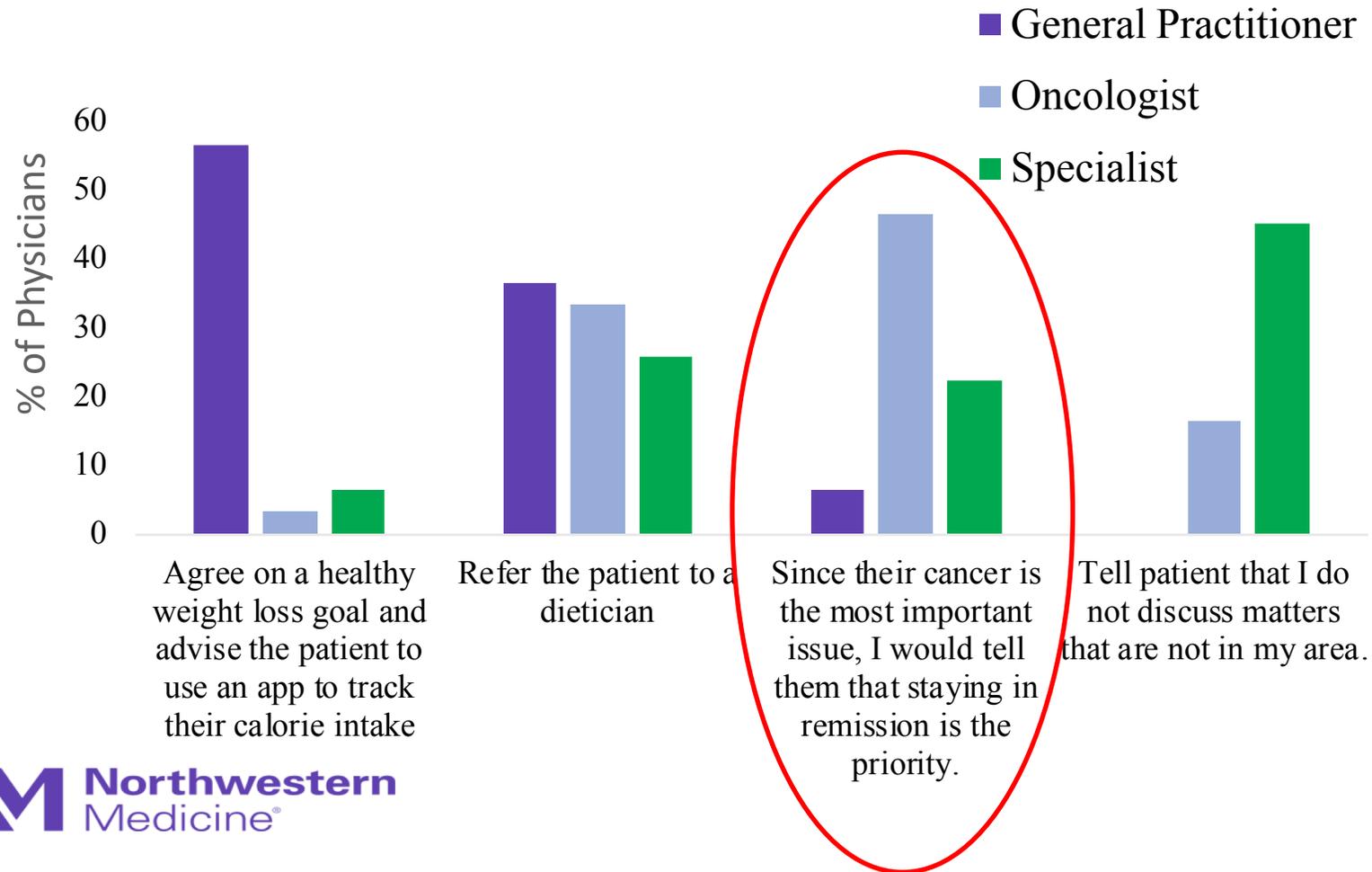
— 73.3% of oncologists versus 10% of general practitioners said they never give lifestyle recommendations,  $\chi^2(1)=24.75, p<.001$

# If a way to counsel cancer patients in remission about improving their lifestyle were available to you, would you refer your patients?



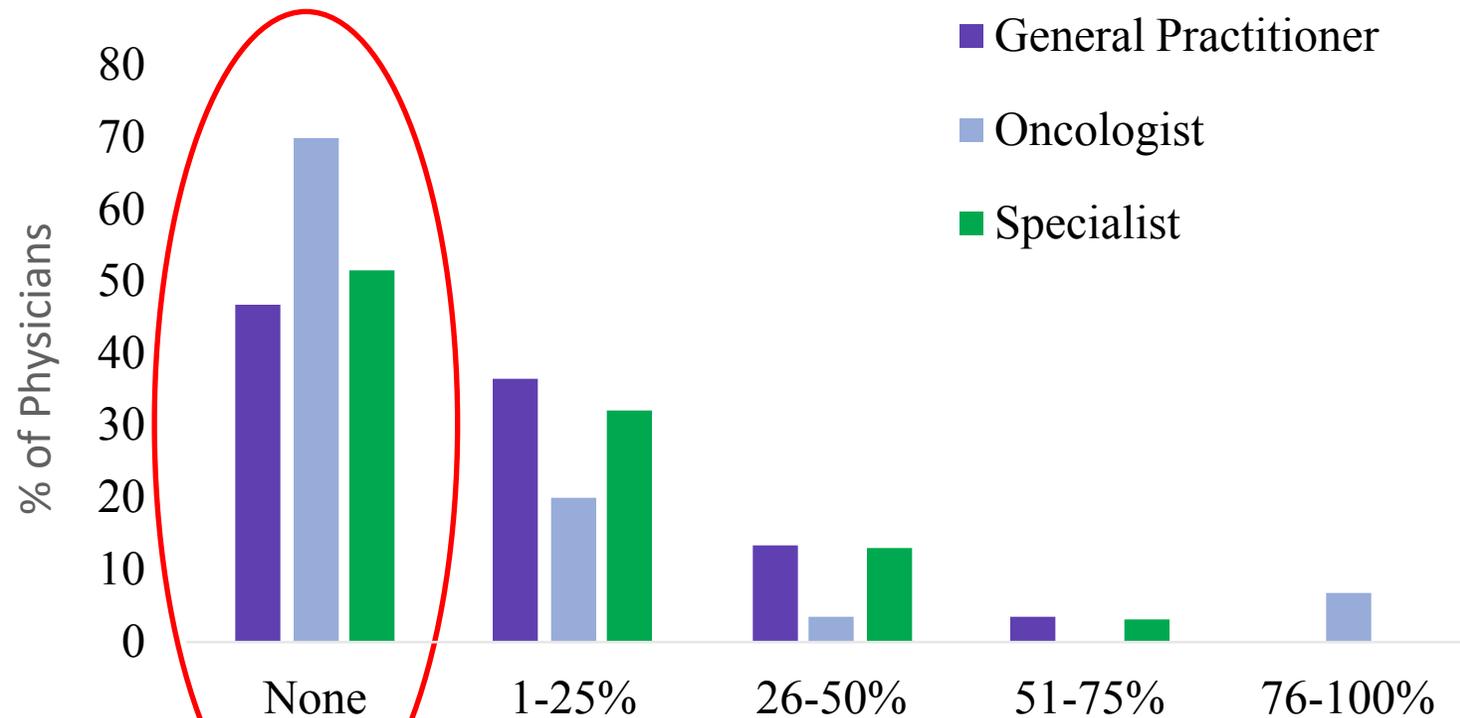
– Only about half of oncologists versus most general practitioners would refer to a health promotionist

# If an overweight cancer patient in remission asked you how they could become healthier by losing weight, what would you do? Please select one.



46.7% of oncologists versus 6.7% of GPs would tell the patient that staying in remission was the  $X^2(1)=12.27, p<.001$ . Most GPs would agree on a weight loss goal

# What percent of your cancer patients in remission do you think stay adherent to their cancer treatment if they're also trying to lose weight?



– 72.5% of oncologists versus 46.6% of GPs said no patient would adhere to cancer treatment if also trying to lose weight

# Oncologist Interviews

- **Tradeoffs in Attention and Priorities (zero-sum game)**

“Most people are saying that patients cannot do both. It’s like chewing gum and walking.”

- **Production Pressure:** especially in this academic environment where there is stress to produce, stress to generate revenue, see as many patients, increase access, increase billing, you can't have half hour conversations with people about weight loss. We don't have a sit-down in the conference room and talk about 15-20 minutes about this. That's another two patients.

- **Tunnel Vision:** “We're so focused on the life or death aspect of cancer, everything else falls through the crack,... that's going to require a different way of thinking for oncologists meaning, “You know what I got to also pay attention to that kind of stuff.” Whereas before I could be like, “We don't have to worry about it because right now I'm just trying to keep you alive”

# Conclusions

- Increasingly, major medical bodies recognize that preventing and reversing health risk behaviors and preserving health behaviors reduces morbidity, preserves longevity, and potentially increases quality of life
- Some skepticism remains about the feasibility of changing health risk behaviors and maintaining healthy lifestyle gains
- How many behavior changes can be tackled at once appears to be an individual difference variable that depends on the extent of social and self-regulatory resources and health threats
- Some specialist physicians may implicitly discourage patients' healthy lifestyle change efforts for fear of overwhelming the patient and disrupting medical adherence.
- New MOST techniques can help optimize intervention efficiency by maximizing intervention impact at least resource consumption.



# Thank you!

- NIH
  - R01DK108678 (Spring)
  - R01DK097364 (Spring)
  - T32CA193193 (Spring)
- AHA
  - 14SFRN20740001 (Spring)
  
- NIH
  - NCI RLCCC (Platanias)
  - U54EB020404 (Kumar)
  - UL1TR001422 (Lloyd-Jones)



**Back row (L to R):** Angela Pfammatter, PhD; Alexa Mitsos; Philip Rak, MBA; Sean Arca; Gene McFadden; Bonnie Spring, PhD, ABPP; Laura Martindale; Shirlene Wang; Ekaterina Klyachko, PhD; Gleb Iakovlev; Susan Hood, PhD  
**Front row (L to R):** Sara Hoffman, MS; Alejandra Povedano; Elyse Daly; Sasha Cukier; Margaret DeZelar; Hannah Rumsey; Tammy Stump, PhD; JC Subida