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Clinical and Economic Impact of a Digital Intensive Behavioral Counseling Program on Medicare Beneficiaries at risk for Diabetes and Cardiovascular Disease

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Agenda

- **Research rationale**
- **The technology and study population**
- **Modeling methodology**
 - ❑ **Microsimulation framework**
 - ❑ **Cost projection**
- **Results**
- **Study strengths and limitations**
- **Conclusions**



The burden of cardiovascular disease and diabetes is significant

- Prevalence of CVD increases from 70-75% in persons 60-79 years old, to 79-86% among those aged 80 and older ¹
- The prevalence of diagnosed and undiagnosed diabetes among older adults was reported to 15.4% and 6.9%, respectively ²

Intensive behavioral counseling can reduce the risk of chronic diseases

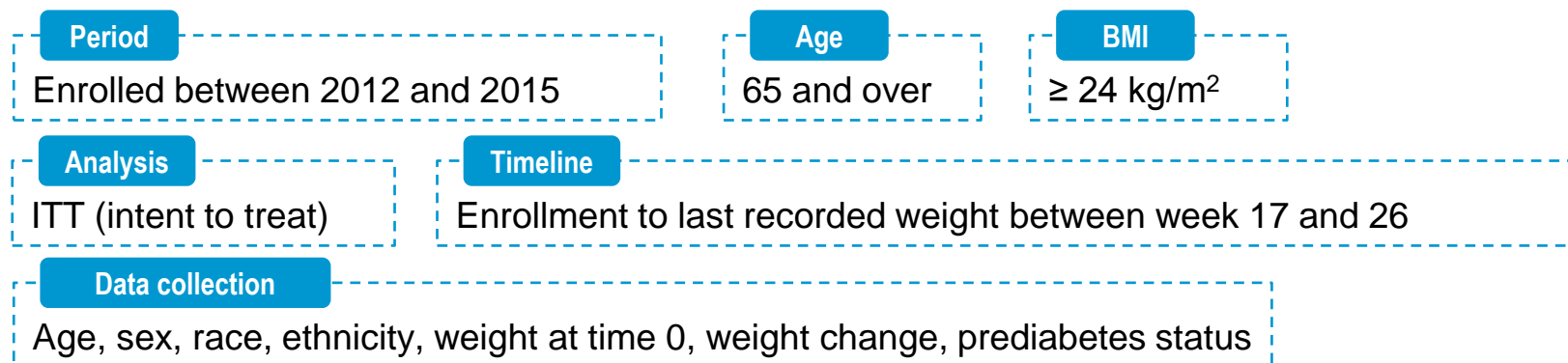
- IBC has been widely accepted as an effective approach to reduce body weight, improve clinical measures, and lower risk of obesity-related comorbidities (i.e., diabetes) ³⁻⁸
- The US Preventive Services Task Force (USPSTF) recommends IBC for at-risk individuals aged 40 to 70 ^{5,7}
- IBC has been shown to be effective with 4-6% weight loss and per person medical savings could exceed \$1,300 within 3 years, and grow to \$8,000-\$9,000 over 10 years ⁹⁻¹²



The objective of this study was to estimate the clinical and economic impact of an IBC program delivered to at-risk Medicare beneficiaries

The studied IBC program is digital and remotely delivered to population with excess body weight and CVD risk factors

- All digital, remotely delivered IBC intervention (Omada Health, San Francisco, California, <https://omadahealth.com/>)
 - Year-long behavior change program with weekly curriculum, social network support, dedicated professional health coach, and connected tracking tools (wireless scale, activity tracker)
 - Satisfies the CDC Diabetes Prevention Recognition Program standards
- The study population has excess body weight and CVD risk factors



Medicare-eligible beneficiaries achieved considerable weight loss after 26 weeks

Patient Characteristics	Overall (N = 1,121)	Completers (N = 1,003)
Male, %	36.0	36.0
Prediabetes, %	88.9	89.3
Diabetes, %	0	0
Weight loss achieved through IBC, %	6.8%	7.3%

Abbreviations: BMI, body mass index; HDL-C, high-density lipoprotein cholesterol; SBP, systolic blood pressure; SE, standard error; T-C, total cholesterol.

Completers: Participants completing ≥ 9 lessons.

Weight Loss - percent of initial weight

Population characteristics are fairly similar between overall group and those who completed the program

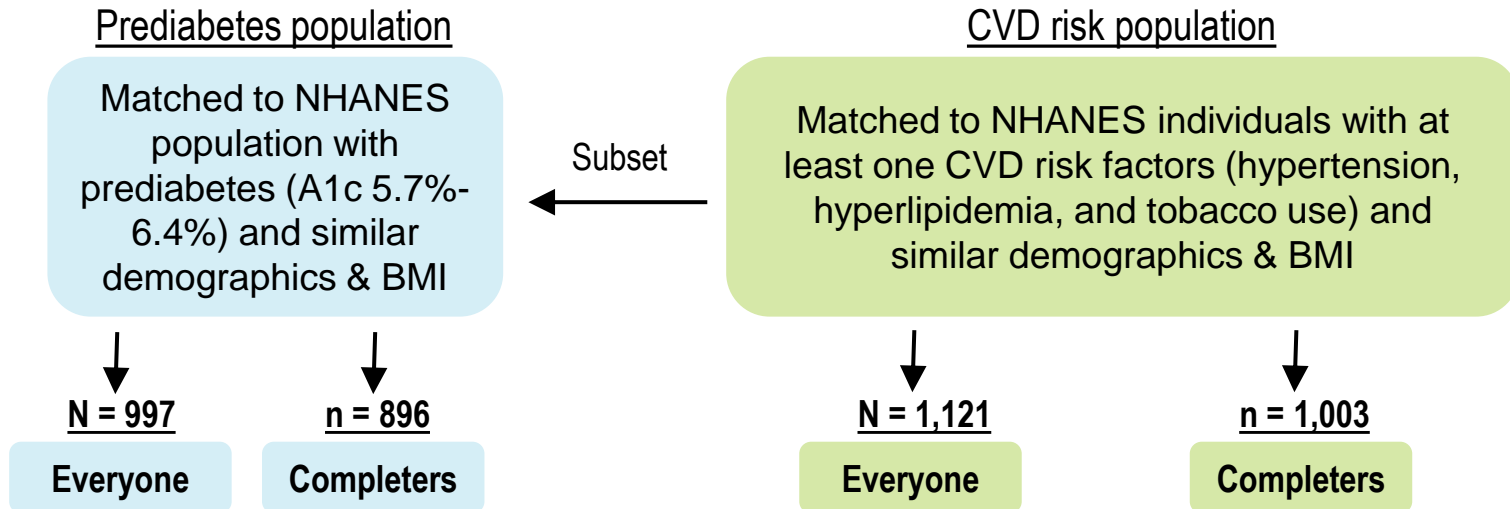
Patient Characteristics	Overall (N = 1,121)	Completers (N = 1,003)
Age, mean (SE), y	69.0 (0.13)	68.9 (0.11)
BMI, mean (SE), kg/m²	32.5 (0.16)	32.4 (0.16)
SBP, mean (SE), mm Hg	135.0 (0.65)	134.4 (0.70)
HDL-C, mean (SE), mg/dL	51.9 (0.40)	51.9 (0.42)
T-C, mean (SE), mg/dL	200.8 (1.39)	200.2 (1.45)
Hemoglobin A1c, mean (SE), %	6.0 (0.01)	6.0 (0.02)

Abbreviations: BMI, body mass index; HDL-C, high-density lipoprotein cholesterol; SBP, systolic blood pressure; SE, standard error; T-C, total cholesterol.

Values of SBP, HDL-C, T-C, Hemoglobin A1c and percentages of prediabetes/diabetes were estimated from a population with individuals matched from the National Health and Nutrition Examination Survey.

Completers: Participants completing ≥ 9 lessons.

1:1 propensity match each IBC participants to NHANES population



Control scenario: No weight loss occurs, and each person's year-to-year weight change follows the natural history of weight change.

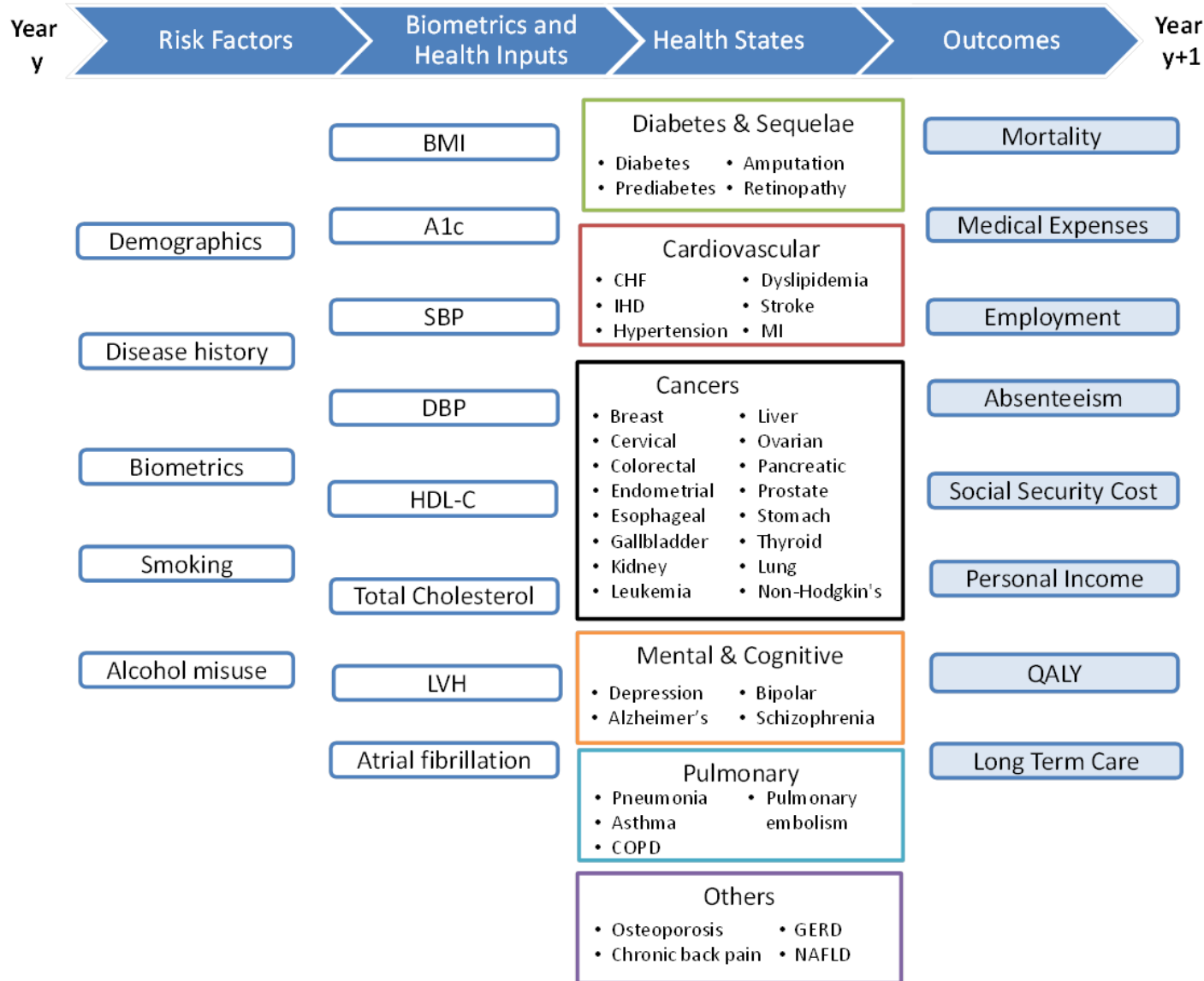
VS

Scenario 1 - Sustained weight loss: Weight loss due to the digital IBC program at year 1. Following natural history of weight change from year 2 onwards.

Scenario 2 - Partial weight regain: Weight loss due to the digital IBC program at year 1. Regain 1/3 of initial weight loss between year 2-6.* Natural history of weight change after year 6.

* Published 2-year results of this digital IBC program suggest weight regain was less aggressive than this assumption. ¹⁻²

A published and validated microsimulation platform to predict clinical and economic outcomes in the US



Abbreviations: BMI=body mass index, CHF=congestive heart failure, CKD=chronic kidney disease, DBP=diastolic blood pressure, GERD= gastroesophageal reflux disease, HbA1c=hemoglobin A1c, HDL=high-density lipoprotein, IHD=ischemic heart disease, LVH=left ventricular hypertrophy, NAFLD=non-alcoholic fatty liver disease, OSA=obstructive sleep apnea, PVD=peripheral vascular disease, SBP=systolic blood pressure.

Direct medical expenditures based on MEPS and divided into 5 settings

Pooled 2009-2013 Medical Expenditure Panel Survey (MEPS) data

Generalized linear model with gamma distribution and log link

Explanatory variables
 Demographics (age group, sex, race, ethnicity); presence of diabetes, hypertension, congestive heart failure, ischemic heart disease, retinopathy, and end-stage renal disease; history of myocardial infarction, stroke, and various cancers; smoking status; and body weight

Regression equation for the obese population

+

Regression equation for the non-obese population

Direct medical expenditures

Cost by settings



Inpatient



Outpatient



ED Visit



Prescription Drugs



Other

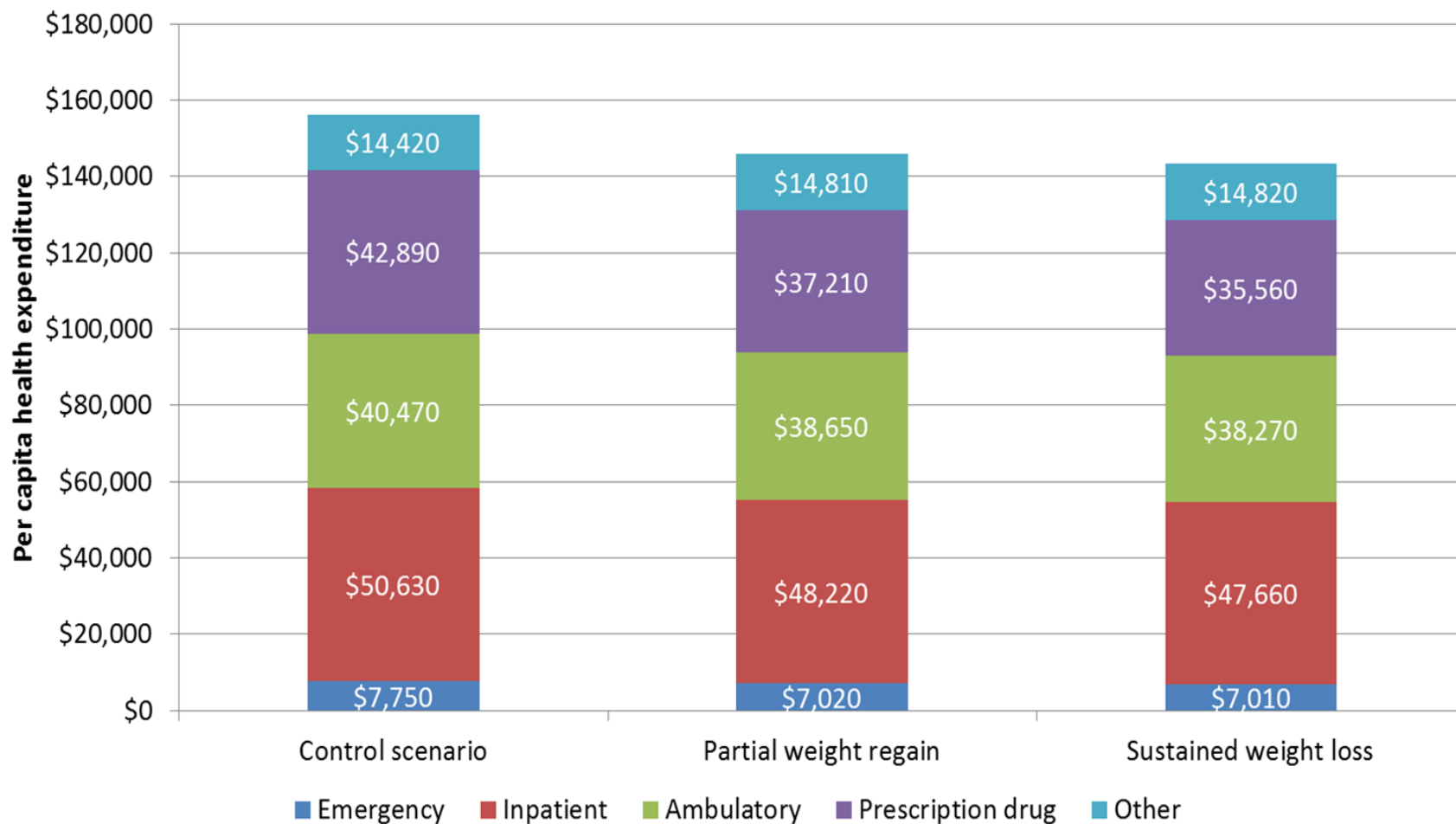
Greater weight loss translates into better clinical outcomes over time. Large improvement if weight loss is sustained.

	Overall (N=1,121, weight loss 6.8%)						Completers (N=1,003, weight loss 7.3%)					
	Partial weight regain			Sustained weight loss			Partial weight regain			Sustained weight loss		
Time horizon (year)	3	5	10	3	5	10	3	5	10	3	5	10
Disease onset relative reduction, %												
Diabetes	37.6	28.4	5.3	43.1	35.7	19.5	44.1	32.5	10	44.1	40.8	23.3
History of ischemic heart disease	9.2	8.7	11.1	11.6	15.9	17.7	13.1	15.5	13.3	10.5	11.3	18.7
History of myocardial infarction	16.2	19.7	19.8	8.2	17.1	26.5	17.1	21.4	23.1	13.4	23.7	29.1
History of congestive heart failure	5.1	12.9	13.3	6.6	12.8	20.1	15.1	12.6	16.6	15.5	12.1	17.3
History of stroke	14.4	15.1	9.2	18.4	14.5	16.2	11.5	23.3	16.1	11.1	19.5	11.1
Per capita medical expenditures saved, \$	1,720	3,840	11,550	1,770	4,240	14,200	1,540	3,710	12,170	1,990	4,710	15,960

All numbers are relative changes from the control scenario (see slide 7 for more details)

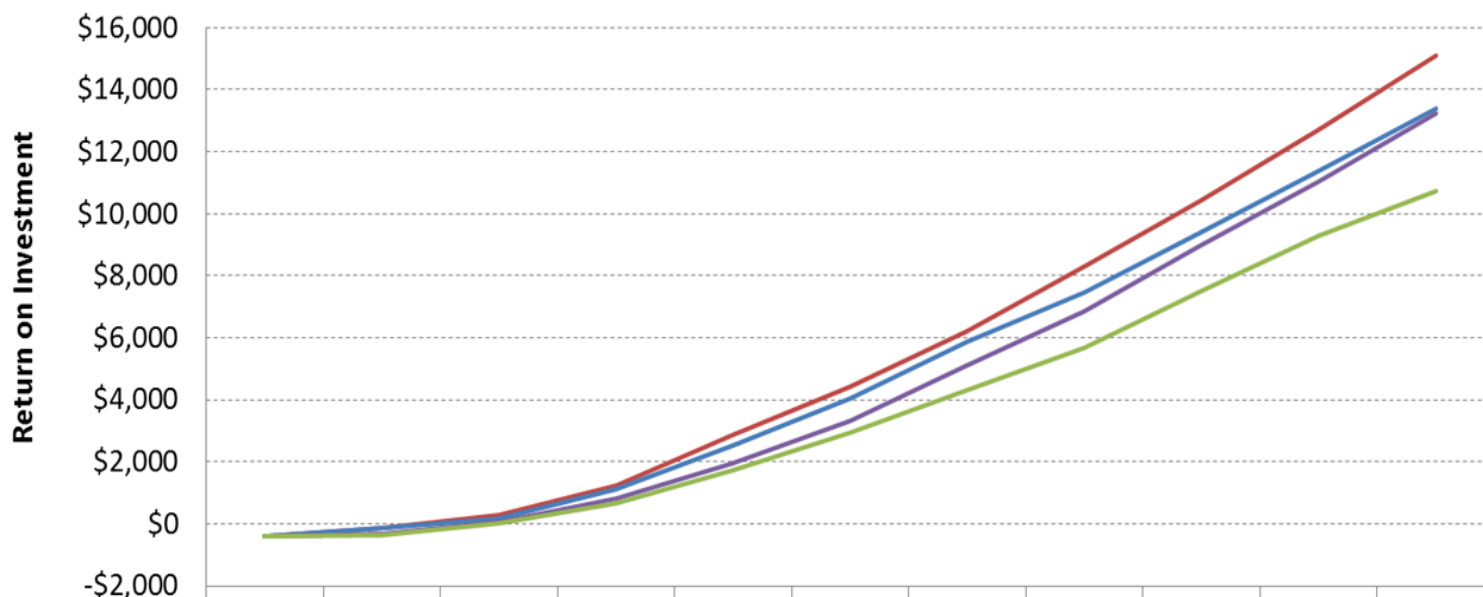
Dollar estimates are present values using 3% discount rate

Considerable savings for both partial and sustained weight loss over 10 years



Based on the population with CVD risk factors. Results for the prediabetes population were very similar.

Program completers with prediabetes bring positive economic return within 2 years, and up to \$15,090 in savings over 10 years

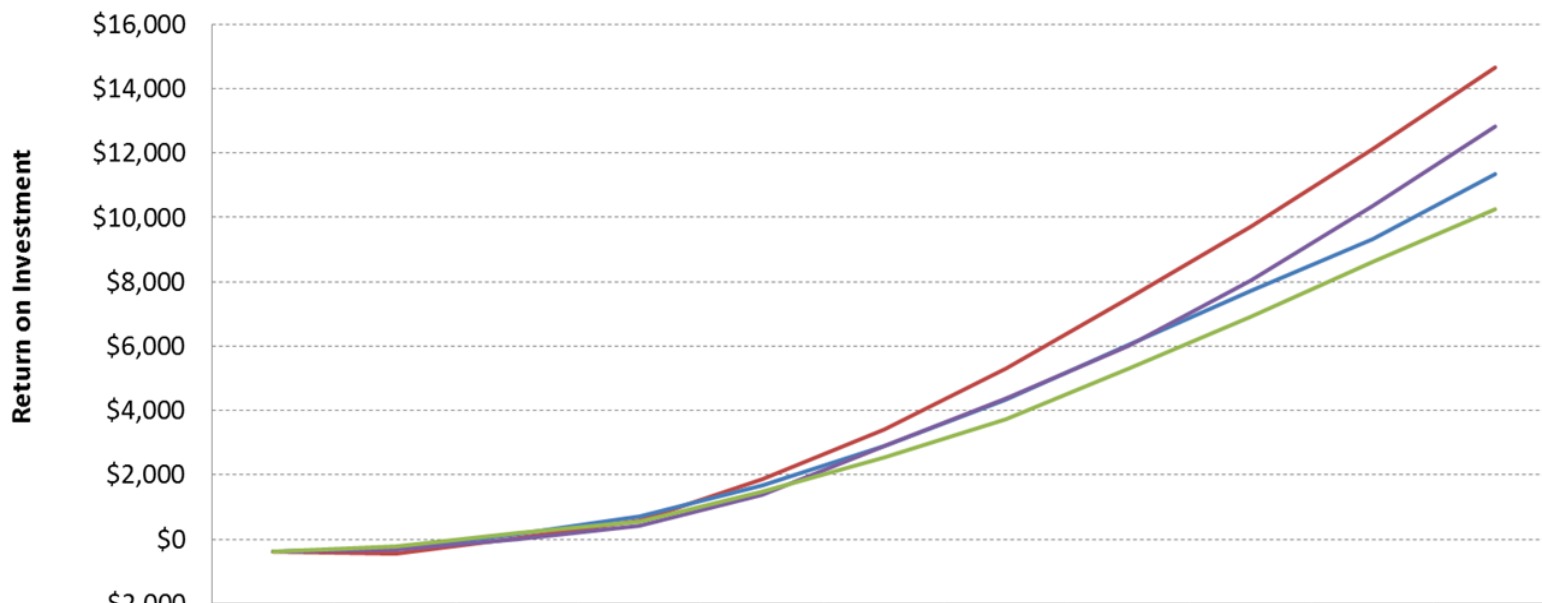


	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
— Sustained weight loss (completer)	-\$400	-\$120	\$300	\$1,250	\$2,850	\$4,410	\$6,220	\$8,280	\$10,440	\$12,710	\$15,090
— Partial weight regain (completer)	-\$400	-\$150	\$170	\$1,100	\$2,540	\$4,050	\$5,870	\$7,460	\$9,400	\$11,380	\$13,390
— Sustained weight loss (ITT)	-\$400	-\$330	\$60	\$800	\$1,940	\$3,330	\$5,100	\$6,850	\$9,000	\$11,050	\$13,240
— Partial weight regain (ITT)	-\$400	-\$360	\$10	\$660	\$1,720	\$2,940	\$4,310	\$5,690	\$7,500	\$9,300	\$10,710

Program cost: \$400 upon program enrollment, \$400 in year 1, \$300 in year 2, and \$200 in year 3.

Return on investment is calculated as the difference between the medical cost savings due to improvements in health and the cost of participating in the program (Return on investment = direct medical saving –initial program cost at year 0 –maintenance costs). All cost in 2015 USD.

Population with CVD risk factors achieved similar but slightly less ROI than the prediabetes population



	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
— Sustained weight loss (completer)	-\$400	-\$460	\$40	\$590	\$1,870	\$3,410	\$5,320	\$7,500	\$9,720	\$12,110	\$14,660
— Partial weight regain (completer)	-\$400	-\$300	\$160	\$710	\$1,670	\$2,880	\$4,350	\$6,050	\$7,730	\$9,330	\$11,340
— Sustained weight loss (ITT)	-\$400	-\$320	\$10	\$410	\$1,390	\$2,880	\$4,370	\$6,000	\$8,050	\$10,340	\$12,840
— Partial weight regain (ITT)	-\$400	-\$220	\$190	\$540	\$1,480	\$2,540	\$3,730	\$5,320	\$6,920	\$8,620	\$10,250

Program cost: \$400 upon program enrollment, \$400 in year 1, \$300 in year 2, and \$200 in year 3.

Return on investment is calculated as the difference between the medical cost savings due to improvements in health and the cost of participating in the program (Return on investment = direct medical saving –initial program cost at year 0 –maintenance costs). All cost in 2015 USD.

Study strengths and limitations

• Strengths

- Modeled actual weight loss outcomes achieved by a sizeable population of Medicare beneficiaries
- Published, validated, and comprehensive microsimulation framework that projects a unique pathway for each individual
- Can model the impact of BMI on primary (clinical biometrics such as cholesterol level, blood pressure), secondary (disease states), and tertiary (medical expenditures) outcomes
- Enables the analysis of hundreds of subpopulations

• Limitations

- Senior participants in the digital IBC program represent those who chose to voluntarily improve their lifestyle, and may not necessarily reflect the characteristics of the general Medicare beneficiaries
- Many clinical values required to run the simulation were imputed with propensity matching algorithm with NHANES records
- The medical expenditure equations used in the model reflect total expenditures — including Medicare payments, patient out-of-pocket costs and supplemental insurance payments

Conclusions

- This study shows that a digital, remotely-delivered intensive behavioral counseling (IBC) program helped seniors with risk factors for diabetes and cardiovascular disease achieve significant weight loss (6.8 - 7.2% over 26 weeks)
- Participants who completed the program and managed to sustain their weight loss enjoyed larger clinical and economic benefits than others
- Cumulative per capita medical expenditure savings over 3, 5 and 10 years ranged from \$1,720 to 1,770 (3 years), \$3,840 to \$4,240 (5 years) and \$11,550 to \$14,200 (10 years).
- Investment on all subpopulations are expected to break even within 2 years
- Most cost savings due to weight loss is expected to come from reduced prescription drug and hospital inpatient expenditures

Thank you!

