Leveraging loss aversion and present bias to improve incentives for smoking cessation

Scott D. Halpern, MD, PhD

John M. Eisenberg Professor of Medicine, Epidemiology, and Medical Ethics & Health Policy

Director, Palliative and Advanced Illness Research (PAIR) Center

Steering Committee Member, Center for Health Incentives and Behavioral Economics (CHIBE)

University of Pennsylvania Perelman School of Medicine

@ScottHalpernMD

Disclosures

- Work to be presented supported by NIH and PCORI
- I also receive research support from the Greenwall and Donaghue Foundations, and Haas Family Charitable Trust
- I have never received any support from any industry of any kind, including the tobacco industry

Penn
University of Pennsylvania

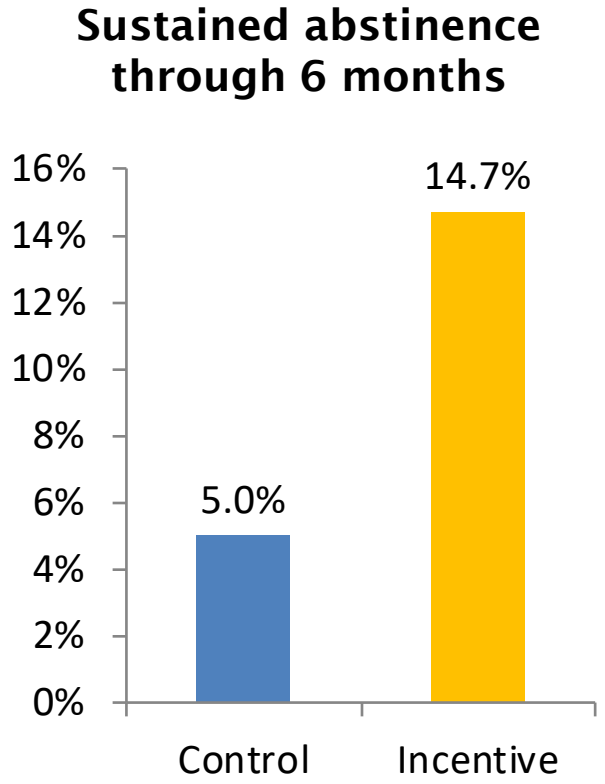
CHIBE

SPECIAL ARTICLE

A Randomized, Controlled Trial of Financial Incentives for Smoking Cessation

Kevin G. Volpp, M.D., Ph.D., Andrea B. Troxel, Sc.D., Mark V. Pauly, Ph.D., Henry A. Glick, Ph.D., Andrea Puig, B.A., David A. Asch, M.D., M.B.A., Robert Galvin, M.D., M.B.A., Jingsan Zhu, M.B.A., Fei Wan, M.S., Jill DeGuzman, B.S., Elizabeth Corbett, M.L.S., Janet Weiner, M.P.H., and Janet Audrain-McGovern, Ph.D.

878 General Electric employees, assigned to usual care (access to cessation counseling) or usual care + incentives worth $750



Penn
University of Pennsylvania

Volpp KG, et al. NEJM 2009; 360: 699-709.

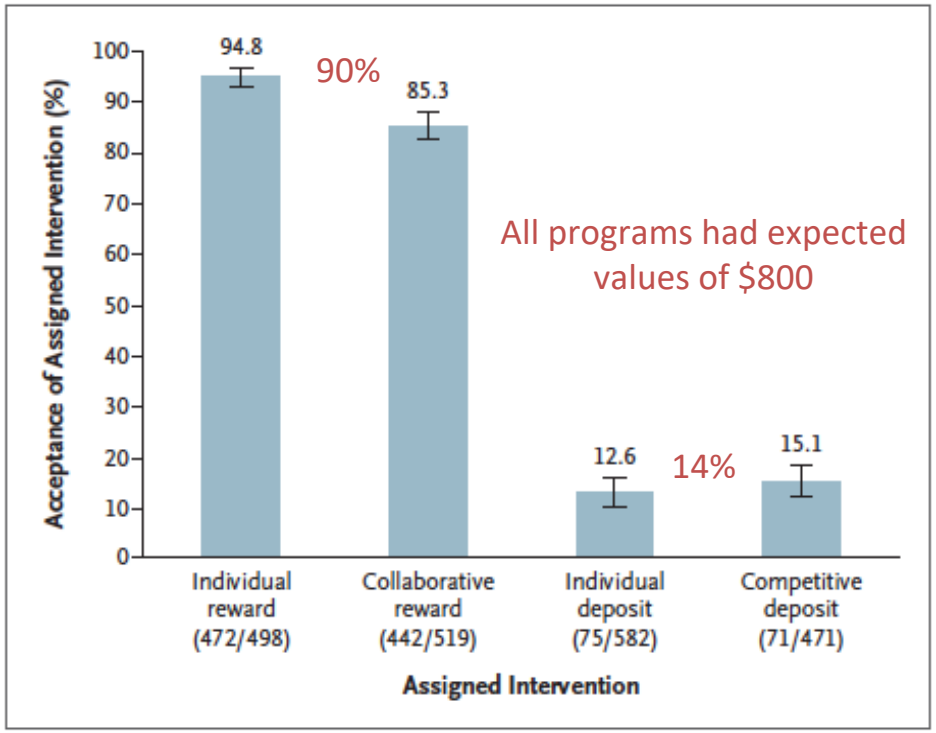
CHIBE

ORIGINAL ARTICLE

Randomized Trial of Four Financial-Incentive Programs for Smoking Cessation

Scott D. Halpern, M.D., Ph.D., Benjamin French, Ph.D., Dylan S. Small, Ph.D., Kathryn Saulsgiver, Ph.D., Michael O. Harhay, M.P.H., Janet Audrain-McGovern, Ph.D., George Loewenstein, Ph.D., Troyen A. Brennan, M.D., J.D., David A. Asch, M.D., M.B.A., and Kevin G. Volpp, M.D., Ph.D.

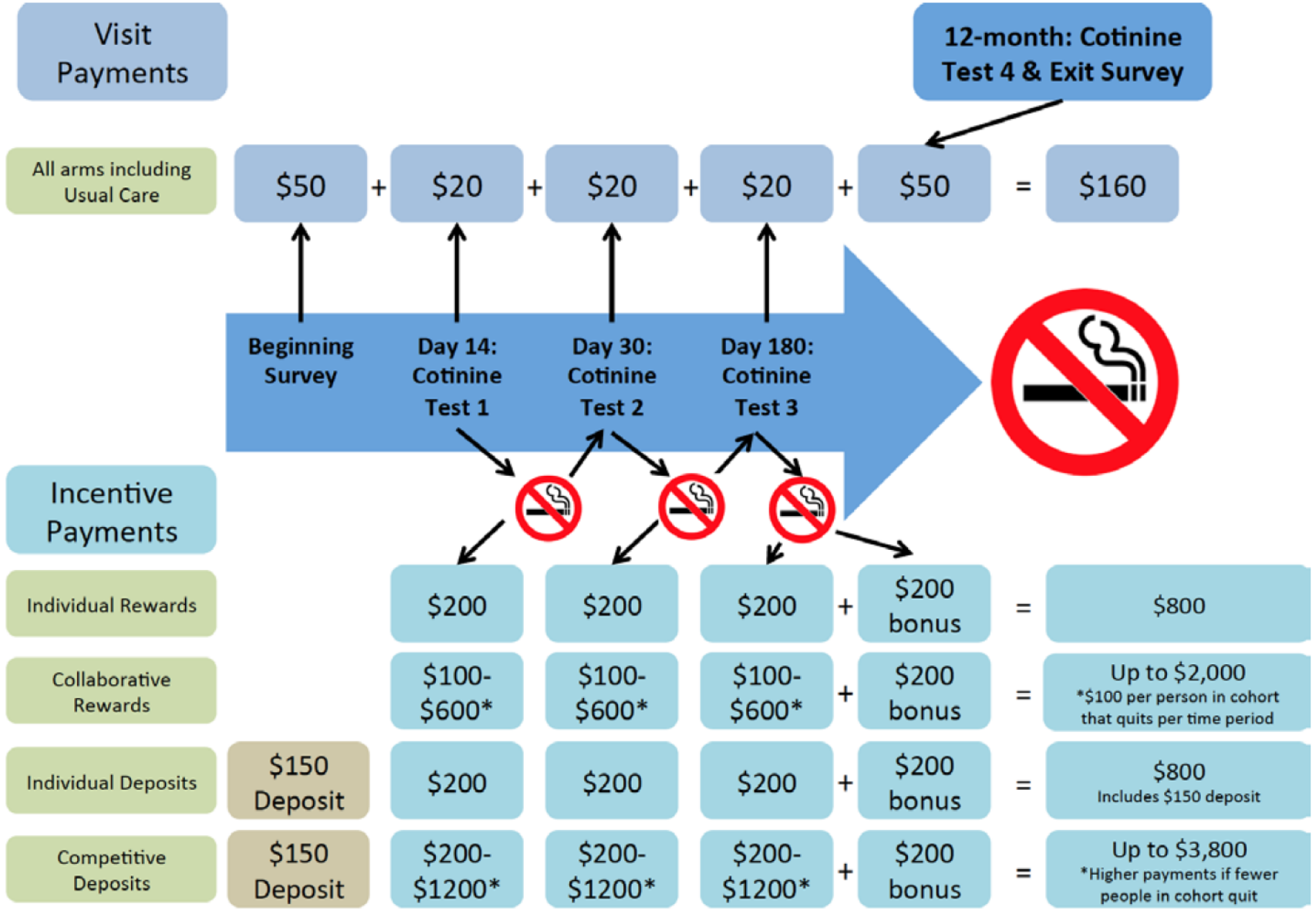
- Sample: 2,538 CVS Health employees or friends or family
- Usual care: access to information about benefits of cessation & to nicotine replacement therapy (NRT) & behavioral counseling



N Engl J Med 2015; 372:2108-17.

Penn University of Pennsylvania

CHIBE



Penn University of Pennsylvania

Halpern SD et al. N Engl J Med 2015; 372:2108-17.

CHIBE

No differences across arms in actual payments

Table S1: Observed incentive payouts to participants in the four incentive arms

	N	Mean	Median	Interquartile Range	Full Range
All participants achieving abstinence for 6 months					
Individual Reward	76	$800	$800	$800-800	$0-800
Collaborative Reward	83	$890.36	$800	$700-1100	$0-1,700
Individual Deposit	56	$557.14	$800	$0-800	$0-800
Competitive Deposit	52	$839.62	$900	$630-1100	$0-1,940

Penn
University of Pennsylvania

N Engl J Med 2015; 372:2108-17.

CHIBE

Sustained abstinence rates (ITT)

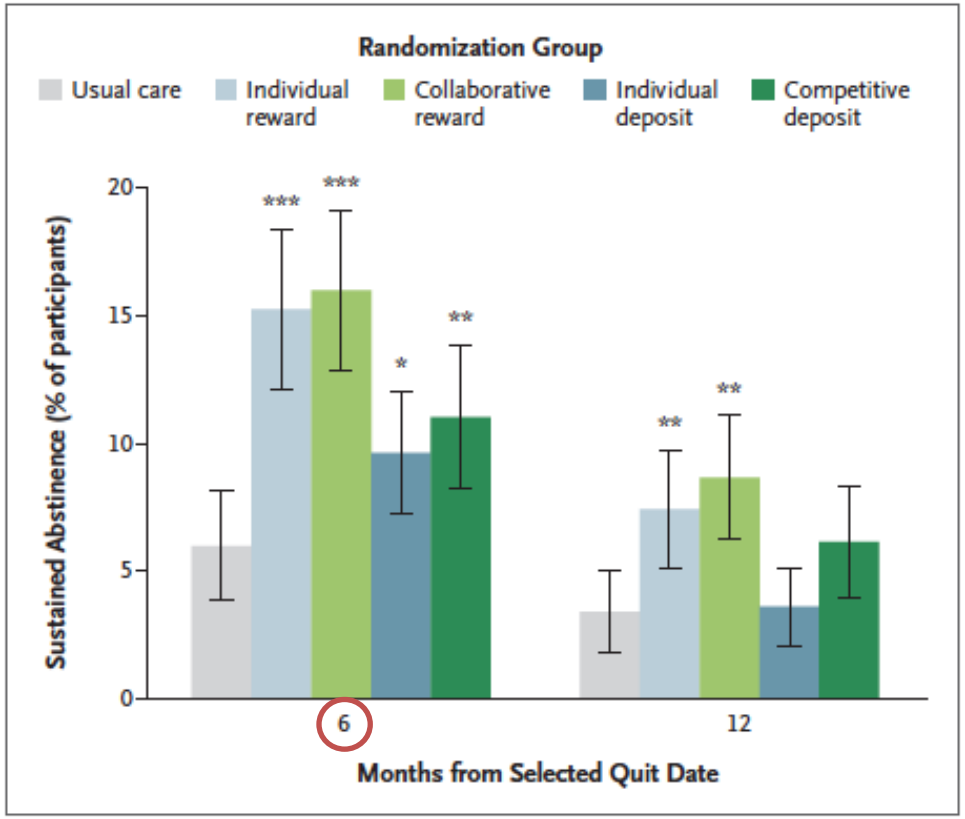
Rewards (15.7%) vs. Deposits (10.2%)

$p < 0.001$

Group (13.7%) vs. Individual (12.1%)

$p = 0.29$

Complier average treatment effect analysis shows that among people who would have accepted deposits, **deposits were more efficacious than rewards** (29% vs. 16%)



Penn
University of Pennsylvania

Halpern SD et al. N Engl J Med 2015; 372:2108-17.

CHIBE

SPECIAL ARTICLE

A Pragmatic Trial of E-Cigarettes, Incentives, and Drugs for Smoking Cessation

Scott D. Halpern, M.D., Ph.D., Michael O. Harhay, Ph.D., Kathryn Saulsgiver, Ph.D., Christine Brophy, Andrea B. Troxel, Sc.D., and Kevin G. Volpp, M.D., Ph.D.

N Engl J Med 2018; 378:2302-10.

6131 Known smokers were informed of the trial

2%

125 Declined to participate

6006 Were enrolled and underwent randomization
1191 (19.8%) Logged on to the trial website over course of the program (were "engaged")

Incentives programs each worth $600

813 Were assigned to the usual care group
129 (15.9%) Were engaged

1588 Were assigned to the free cessation aids group
277 (17.4%) Were engaged

1199 Were assigned to the free e-cigarettes group
253 (21.1%) Were engaged

1198 Were assigned to the reward incentives plus free cessation aids group
255 (21.3%) Were engaged

1208 Were assigned to the redeemable deposit plus free cessation aids group
277 (22.9%) Were engaged

All smokers at 54 U.S. companies who identified as smokers on health-risk assessment in prior year

Penn
University of Pennsylvania

Halpern SD, et al. NEJM 2018

CHIBE

6,131 Vitality members across 54 companies with opt-out enrollment

1. Basic Vitality program
Employee benefits plus tailored email messaging

5. Virtual Deposit Arm
Basic Vitality program, choice of any free aid, AND pre-funded deposit contract of $600 (loss framing of same incentive)

2. E-cigarette Arm
Basic Vitality program AND free e-cigarettes

3. Choice Cessation Aids Arm
Basic Vitality program AND choice of free NRT, varenicline, bupropion; e-cig option if fail

4. Reward Incentive Arm
Basic Vitality program, choice of any free aid, AND $600 incentives for confirmed tobacco cessation

Opted out = 125

Never engaged = 4,815

Engaged = 1,191

Penn
University of Pennsylvania

CHIBE

8 contrasts specified *a priori*, with significance thresholds adjusted using Holm method

Statistically significant

Not statistically significant

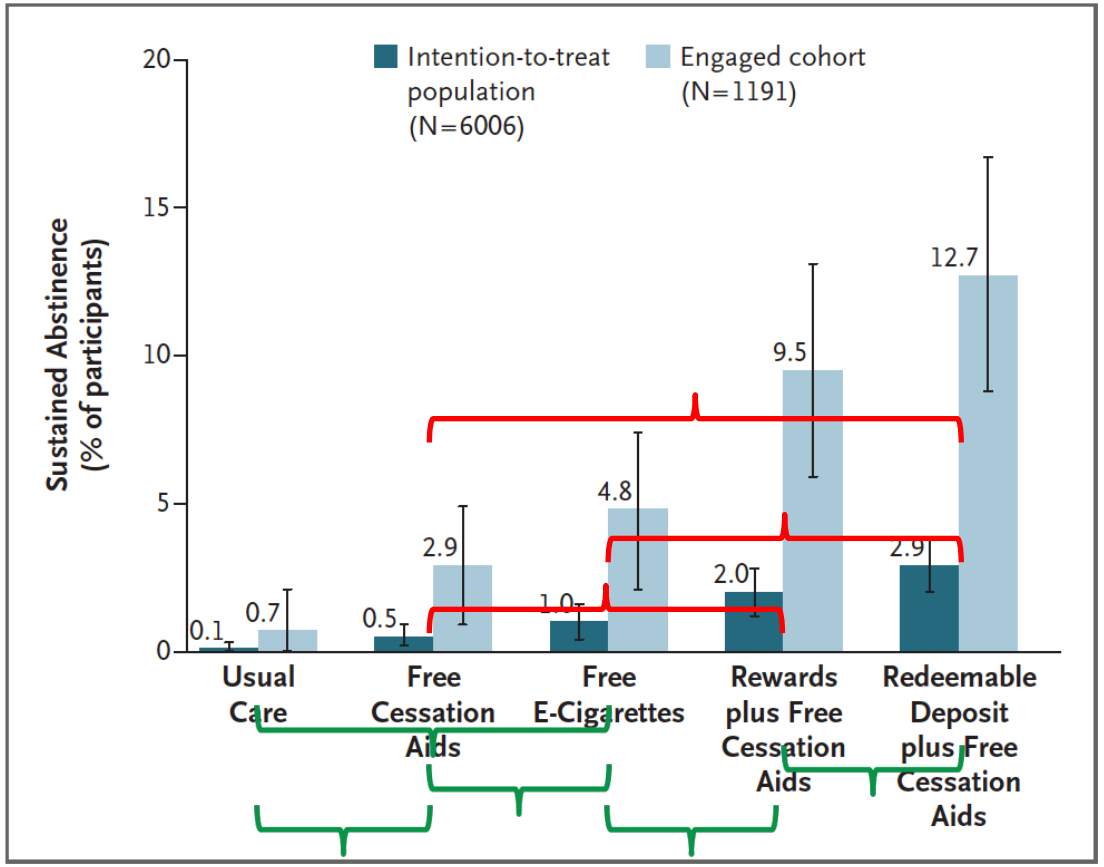


Figure 2. Sustained Smoking Abstinence at 6 Months after the Target Quit Date.

Halpern SD, et al. NEJM 2018

Answers to our questions

1. How successful are workplace smoking-cessation programs among all people to whom they are offered?

   Not very, but cost-effective

2. How effective are incentives when added to free nicotine-replacement therapy and pharmacotherapy (bupropion or varenicline)?

   Still triple quit rates

3. How effective are free e-cigarettes or free cessation aids when added to smoking cessation information without assistance on how to use?

   Not effective

4. Do deposit contracts that are funded in advance without participant contributions, but from which money is removed if abstinence milestones are not met, achieve higher quit rates than reward incentives?

   No

Halpern SD, et al. NEJM 2018

Penn
University of Pennsylvania

CHIBE

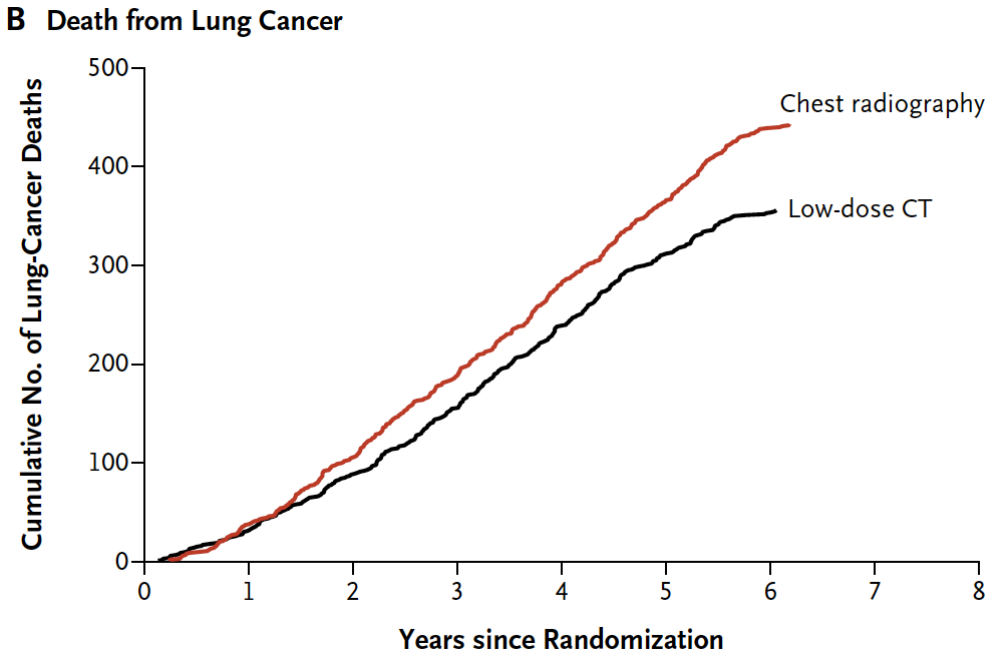
Discussion

The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 AUGUST 4, 2011 VOL. 365 NO. 5

Reduced Lung-Cancer Mortality with Low-Dose Computed Tomographic Screening

The National Lung Screening Trial Research Team*



Penn
University of Pennsylvania

CHIBE

Smoking cessation & lung cancer screening

1. USPSTF defines high risk as: 55-80 years old; 30+ pack-year history; active smoker or quit within past 15 years (2020 changes: 50-80 years, and 20+ pack-years)

2. Several studies estimate that 50% of patients meeting these criteria are actively smoking, and that there are ~ 5 million eligible active smokers in U.S.*

3. CMS began reimbursement for LDCT February 5, 2015

4. Requirements: (a) shared decision-making visit; (b) smoking cessation counseling

5. Lung cancer screening sites report: lack of patient interest; lack of staff training or time; complexities of reimbursement for smoking cessation services; lack of knowledge of what works best, let alone what is most cost-effective in this setting

Smoking cessation and SCALE collaboration

1. Patients who quit during LCS estimated to derive a 4-year increase in life expectancy

2. SCALE: NCI and VA fund 8 RCTs of smoking cessation interventions within LCS

3. Characteristics of 8 trials:
    a. Six have 7 sites or fewer (max 26)
    b. Sample sizes range from 500-1,650
    c. All use traditional informed consent
    d. Anticipated enrollment of 19% or fewer Black patients in 7 trials (37% in 1)
    e. All test ask-advise-refer, behavioral counseling, and/or pharmacologic interventions

4. In light of evidence for above interventions, diverse stakeholder panel recommends testing "mobile health applications" and "financial incentives"

Eligible Population

Current smokers

Order for LDCT scan

- Ages ≥ 18 years

Underserved

- Black, or
- Hispanic, or
- Rural residence, or
- Low SES (no greater than HS education or 2x fed poverty)

In 4 Health Systems

Penn Medicine
The University of Pennsylvania Health System

KAISER PERMANENTE®

Henry Ford Health System®

Geisinger

Penn
University of Pennsylvania

CHIBE

4-arm Pragmatic Trial

1. Ask-advise-refer

2. *and* free medications

3. *and* money to quit

4. *and* episodic future thinking (EFT) tool

Penn
University of Pennsylvania

CHIBE

Discussion

ORIGINAL ARTICLE

Explanatory and Pragmatic Attitudes in Therapeutical Trials

Daniel Schwartz, Joseph Lellouch

Unité de Recherches Statistiques, Institut National de la Santé et de la Recherche Medicale, 94 Villejuif, France

The "comparison between two treatments" is a problem which is inadequately specified even in its over-all characteristics. It may imply one of at least two types of problem which are basically different.

The first type corresponds to an explanatory approach, aimed at *understanding*. It seeks to discover whether a difference exists between two treatments which are specified by strict and usually simple definitions. Their effects are assessed by bio-

The second type corresponds to a pragmatic approach, aimed at *decision*. It seeks to answer the question—which of the two treatments should we prefer? The definition of the treatments is flexible and usually complex; it takes account of auxiliary

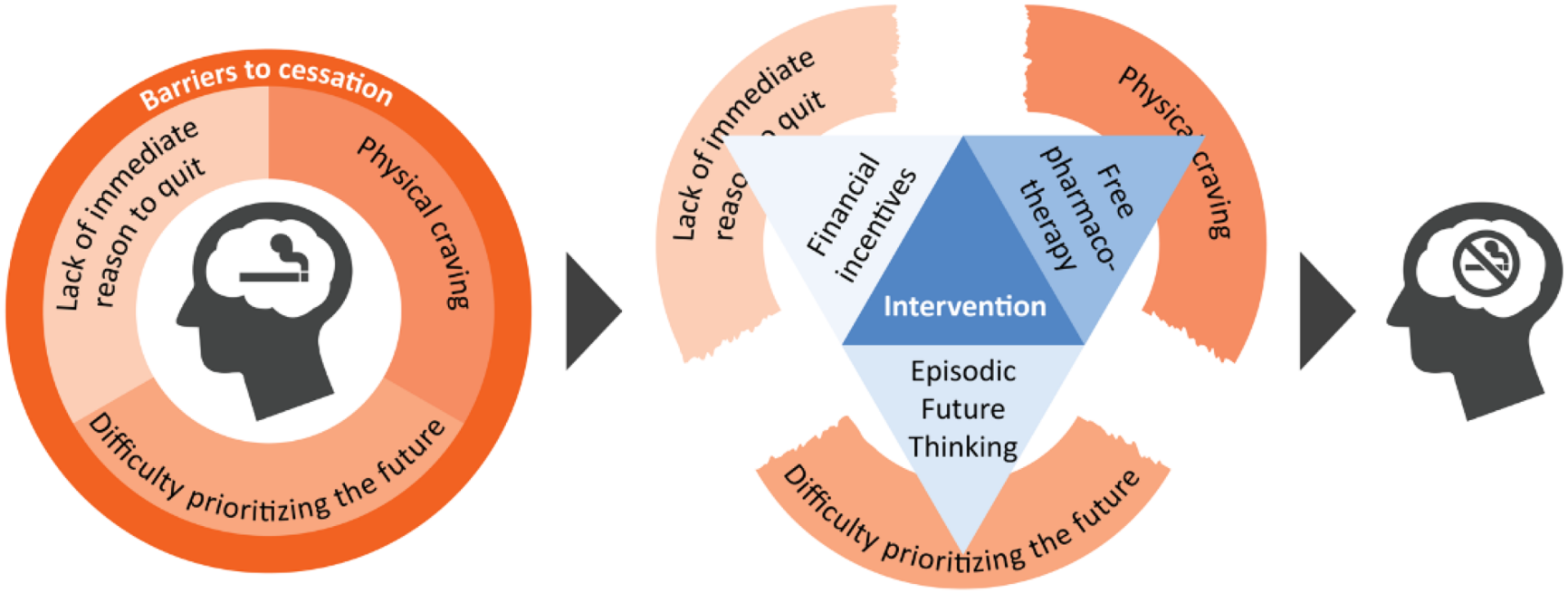
Penn University of Pennsylvania

J Chronic Disease 1967

CHIBE

Combining the 'forward thinking' of lung cancer screening programs and episodic future thinking to supercharge incentives in underserved populations

Figure 1: Conceptul model of barriers to smoking cessation that will be addressed by interventions in this RCT



Penn University of Pennsylvania · KAISER PERMANENTE® · Geisinger · Henry Ford Health System · CHIBE

Table 3: Pragmatism of the proposed trial on PRECIS-2 criteria*

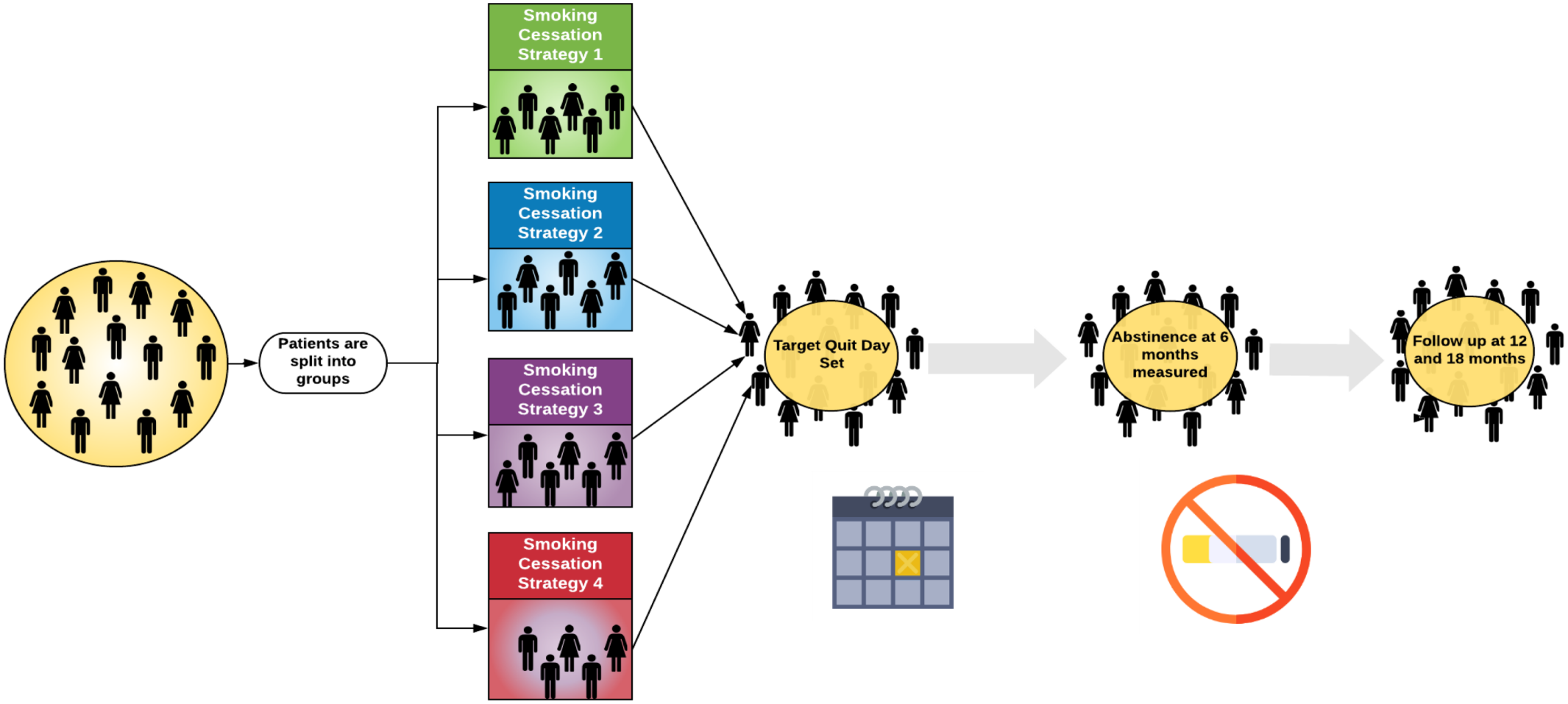
Domain	*Relevant trial features*
Eligibility	All underserved smokers getting lung-cancer screening
Recruitment	Built into routine workflow; use of opt-out consent
Setting	More than 30 screening centers within 4 large health systems
Organization	No clinician training required, minimal onsite research staff
Flexibility of delivery	Interventions delivered in ways compatible with usual care
Flexibility of adherence	Automated prompting of clinical staff to distribute iPads to promote enrollment and access to interventions
Follow-up	Outcomes data collected through automated, web-based research portal, including uploading of laboratory test results
Primary outcome	Most widely used outcome, of importance to all stakeholders
Primary analysis	Data available for all participants, intention-to-treat analyses

**Criteria from Loudon et al. The PRECIS-2 tool: designing trials that are fit for purpose. BMJ 2015*

Penn
University of Pennsylvania

CHIBE

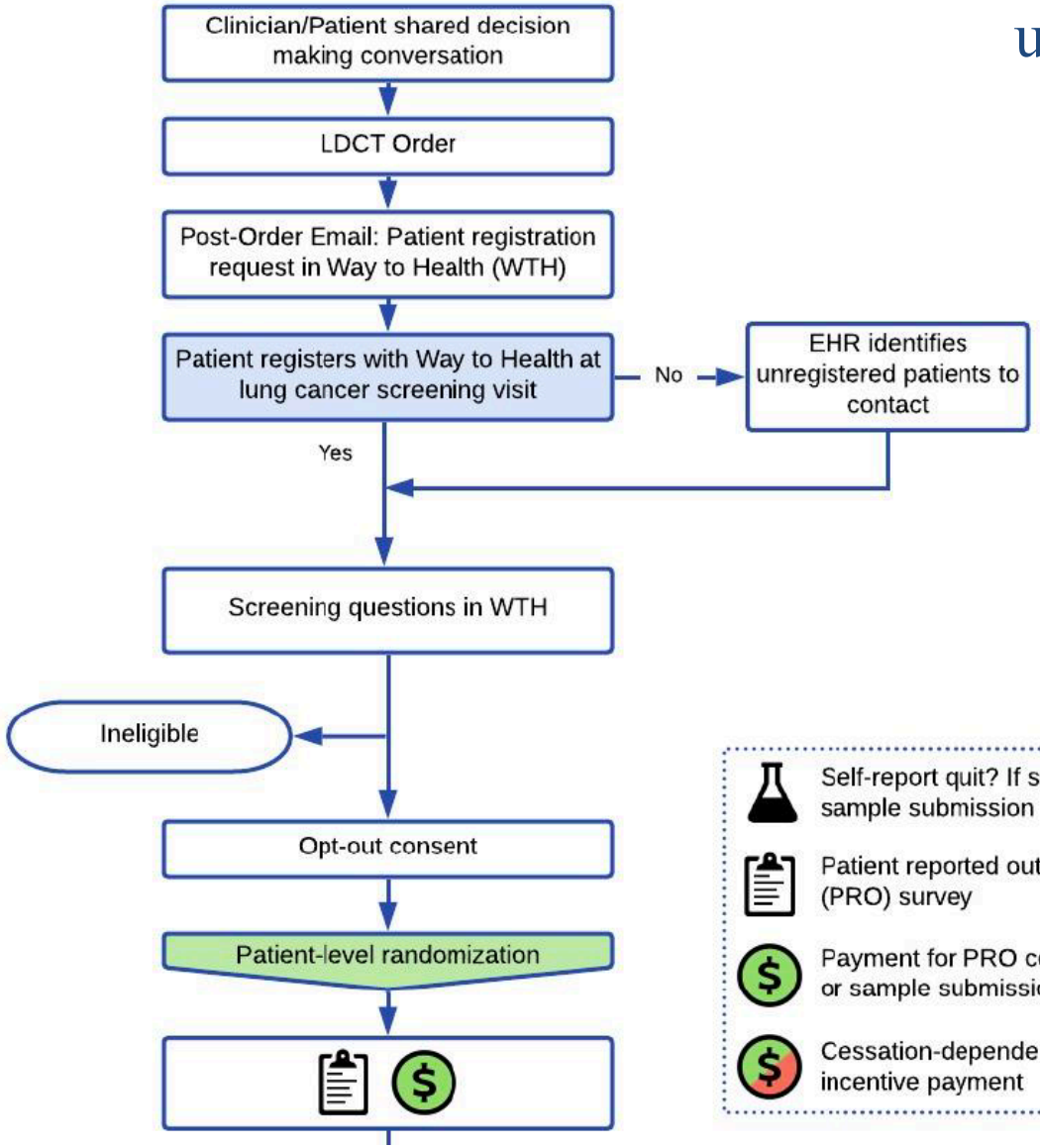
Simplified Patient Flow

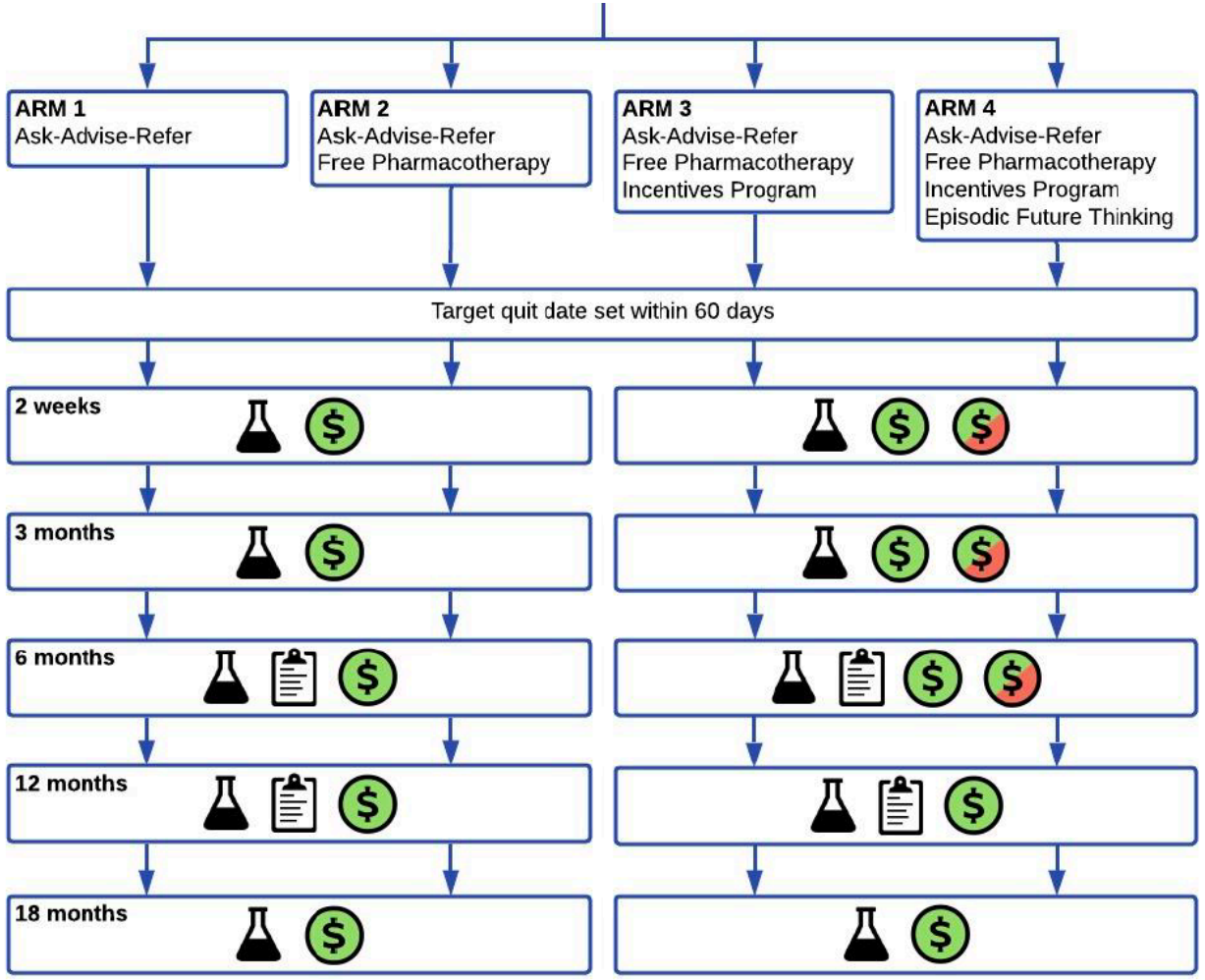


Penn
University of Pennsylvania

CHIBE

Target sample size: 3,200 underserved smokers undergoing lung cancer screening

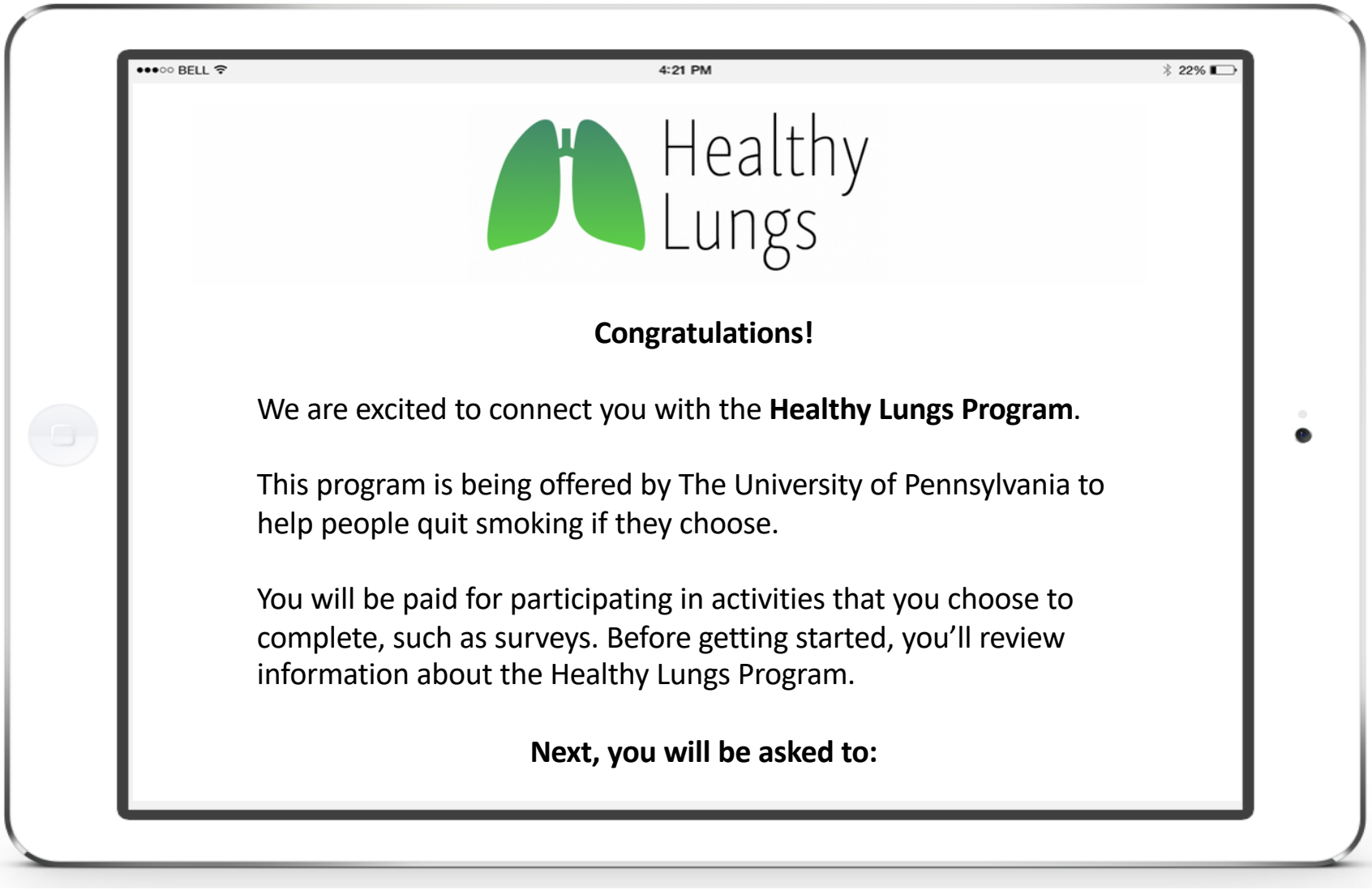




Penn
University of Pennsylvania

CHIBE

Patient Enrollment via iPad



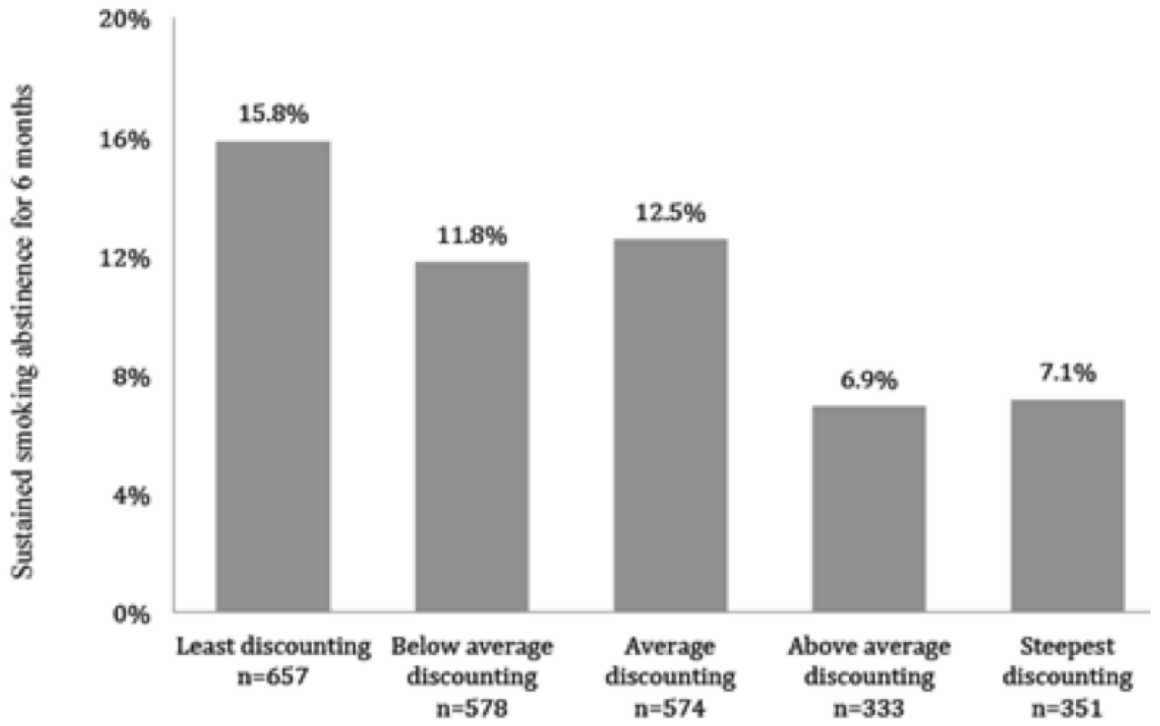
Penn
University of Pennsylvania

CHIBE

Heterogeneity in the Effects of Reward- and Deposit-based Financial Incentives on Smoking Cessation

Scott D. Halpern[1,2,3,4], Benjamin French[2,3], Dylan S. Small[2,5], Kathryn Saulsgiver[2,3], Michael O. Harhay[3], Janet Audrain-McGovern[2,6], George Loewenstein[2,7], David A. Asch[1,2,4,8,9,10], and Kevin G. Volpp[1,2,4,8,9,10]

Steep temporal discounting reduces incentive effectiveness

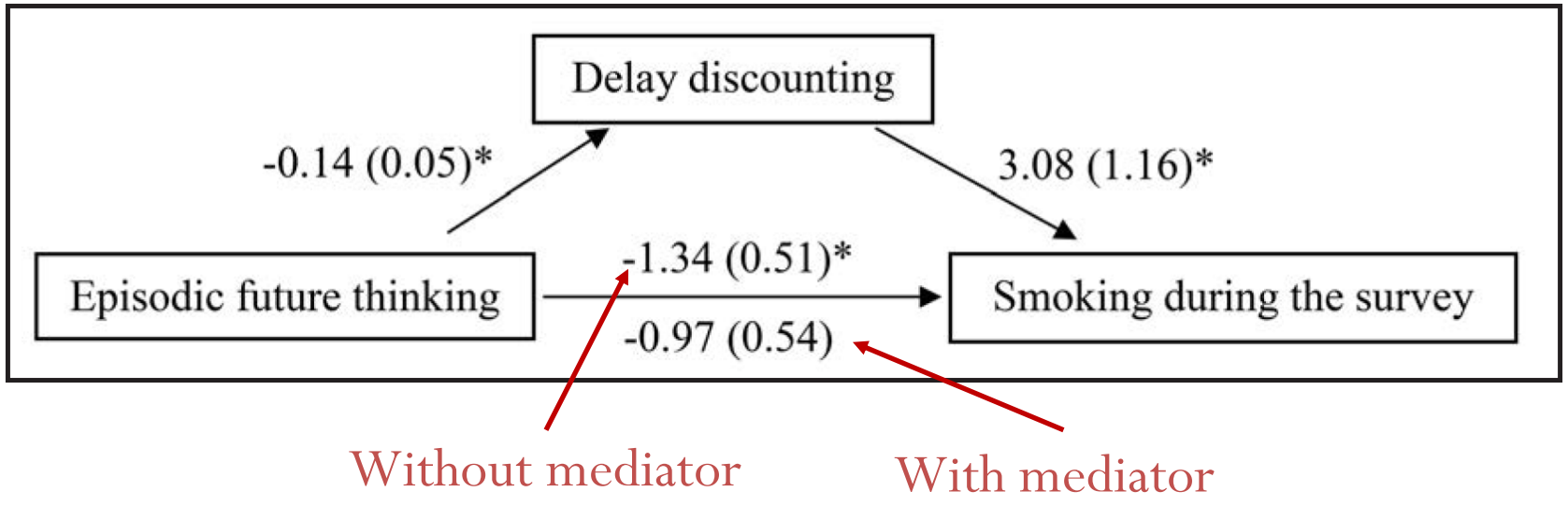


Am J Respir Crit Care Med Vol 194, Iss 8, pp 981-988 Oct 15, 2016

Episodic Future Thinking Involving the Nonsmoking Self Can Induce Lower Discounting and Cigarette Consumption

WEN-BIN CHIOU, PH.D.,[a,*] & WEN-HSIUNG WU, PH.D.[b]

Delay discounting partially mediates relation between EFT and smoking



J Stud. Alcohol Drugs 78, 106-112, 2017

Proposed precision variables and effect modifiers

Precision variables

Age

Education

Test for effect modification

Gender

Race

Ethnicity

Income
(as a % of poverty line)

Rurality

Temporal discounting score

Nicotine dependence score

Number of prior lung cancer screenings

Results of lung cancer screening

Use of smartphone with mobile data cancer screening

Financial well-being score

Insurance type

Presence of chronic smoking-related illness

Presence of mental health diagnosis

Lung cancer risk (Tammemagi score)

Penn
University of Pennsylvania

CHIBE

Discussion