



Maternal Health Incentives for Smoking Cessation

Yukiko Washio, Ph.D.

Christiana Care OBGYN/University of Delaware



Disclosure

Nothing to disclose



Risk Factors in Female Non-communicable Diseases (WHO, 2011)





Risk Factors in Female Non-communicable Diseases (WHO, 2011)

- Tobacco use**
- Harmful drinking**
- Nutrition/breastfeeding**
- Physical activity/obesity**



Risk Factors in Female Non-communicable Diseases (WHO, 2011)

- Tobacco use
- Harmful drinking
- Nutrition/breastfeeding
- Physical activity/obesity



Prenatal Smoking

- ❑ **14% pregnant women smoke cigarettes (SAMHSA, 2015)**
- ❑ **2 out of 5 children exposed to second hand smoke (CDC, 2015)**
- ❑ **Increases the risks of:**
 - ❖ **Miscarriage, low birth weight, preterm delivery, and NICU admission (Bailey et al., 2012)**
 - ❖ **Adverse infant outcomes including SIDS (Treyster & Gitterman, 2011)**



Substance Use during Pregnancy

- ❑ **~30% of prenatal substance use among socioeconomically disadvantaged women** (Beatty et al., 2012)
- ❑ **Up to 80% of substance-using women able to abstain from at least one substance during pregnancy** (Forray et al., 2014)
- ❑ **Cigarette smoking, as the most common substance used, with the poorest short and long-term cessation rates** (Forray et al., 2014)

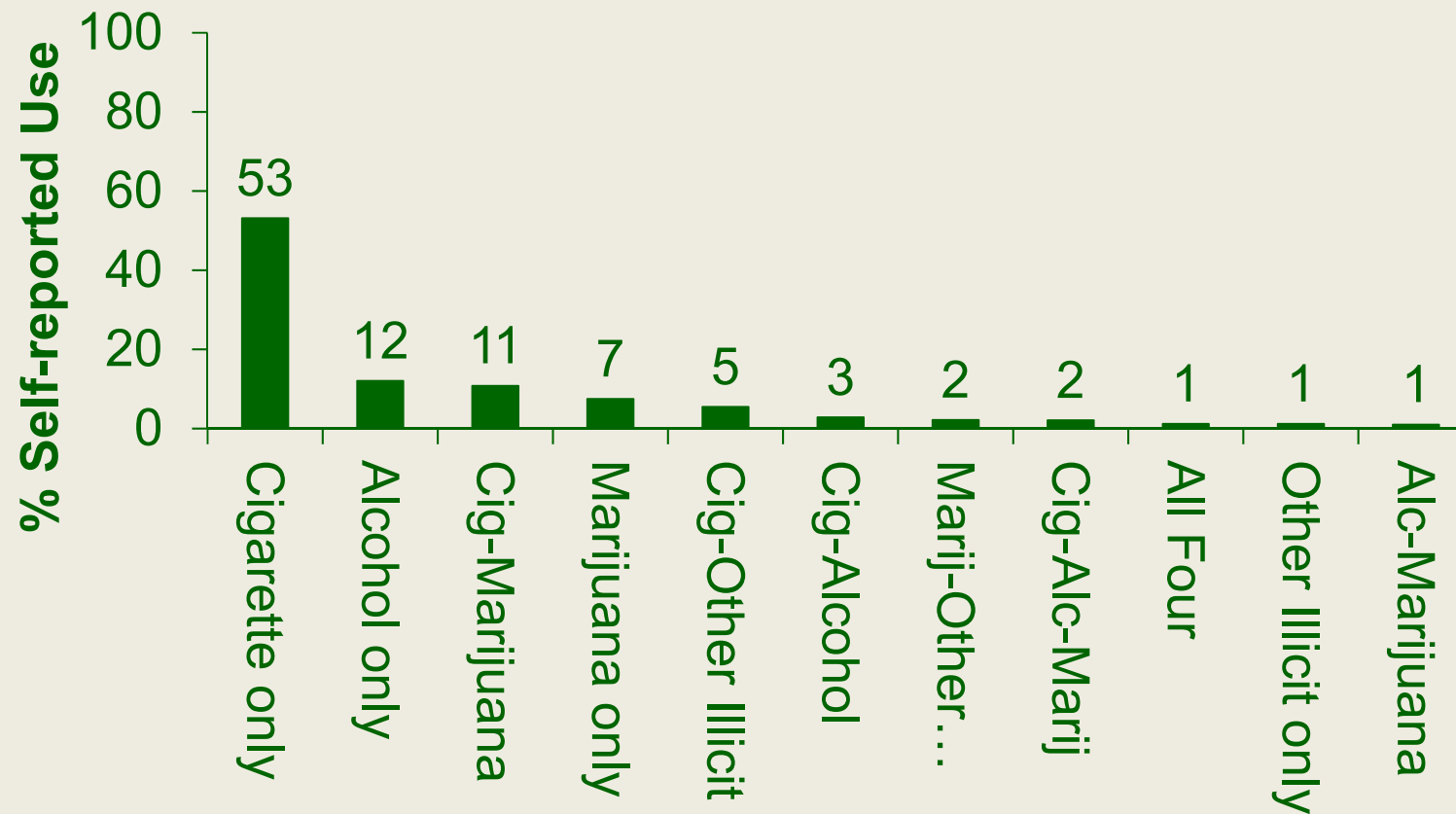


Prenatal Substance Use (N = 11494; 2014-2015)

Self-reported Tobacco	12%
Self-reported Marijuana	4%
Self-reported Alcohol	3%
Self-reported Other Drugs	2%
Self-reported Cocaine	<1%

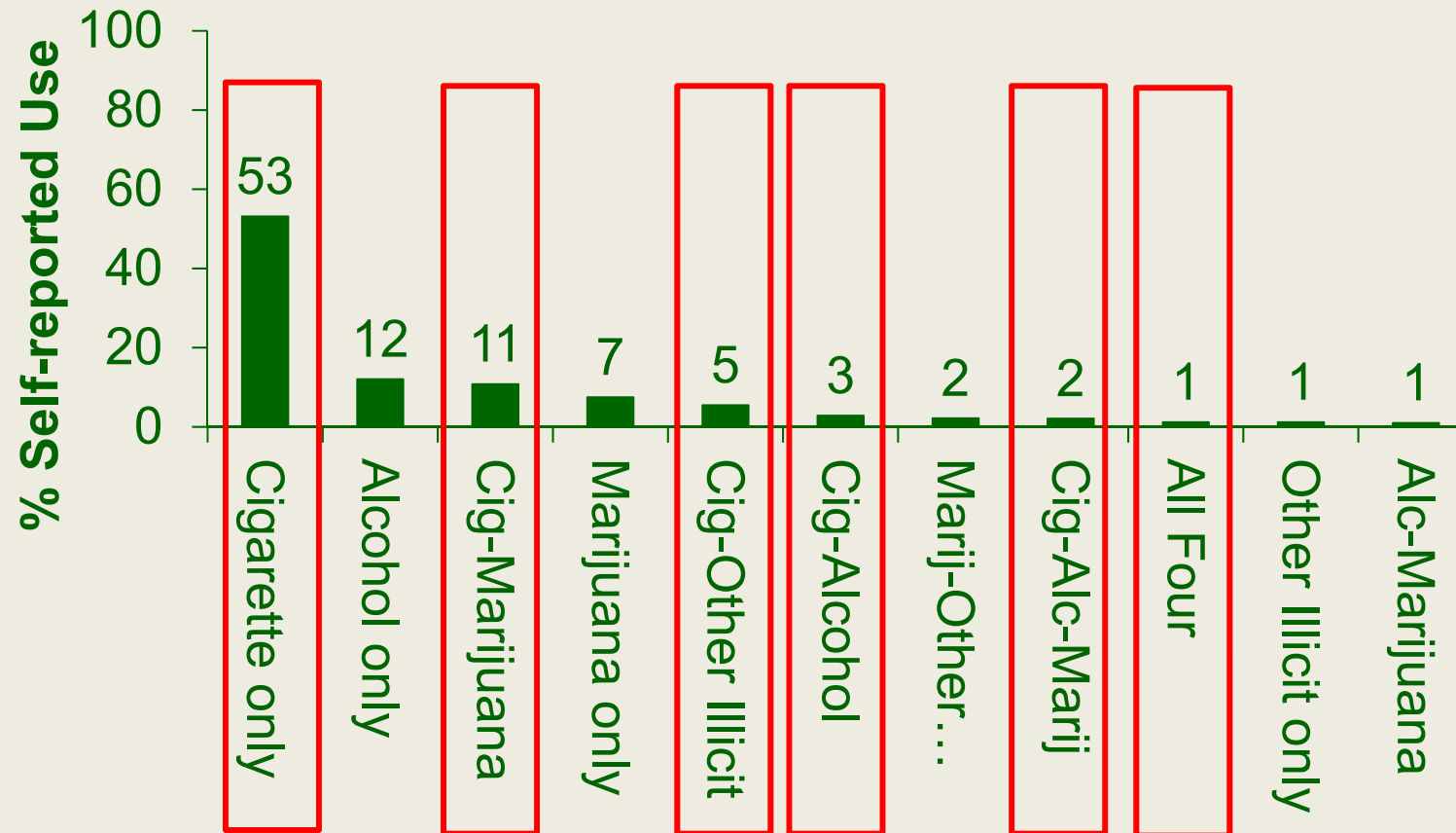


Combination Use Profile (n = 1,206)





Combination Use Profile (n = 1,206)





Self-reported Substance Use on Neonatal Outcomes

Variable		Preterm Birth		Low Birthweight		NICU Admission	
		AOR	95%CI	AOR	95%CI	AOR	95%CI
Cigarette smoking	(No as ref)						
	Yes	1.83***	[1.46,2.30]	2.23***	[1.77,2.80]	1.33**	[1.08,1.64]
	No response	4.16*	[1.27,14.71]	3.5*	[1.04,12.61]	2.91	[0.92,9.83]
Alcohol	(No as ref)						
	Yes	0.62	[0.36,1.00]	0.86	[0.53,1.34]	0.93	[0.63,1.35]
	No response	0.75	[0.21,2.41]	0.49	[0.13,1.70]	0.60	[0.18,1.88]
Marijuana	(No as ref)						
	Yes	1.25	[0.87,1.77]	1.05	[0.72,1.49]	1.19	[0.86,1.64]
	No response	0.30	[0.08,1.08]	0.53	[0.14,1.87]	1.06	[0.32,3.31]
Other illicit drug	(No as ref)						
	Yes	2.48***	[1.56,3.89]	2.88***	[1.81,4.49]	3.09***	[2.03,4.67]
	No response	2.18	[0.64,6.66]	2.13	[0.61,6.71]	0.70	[0.19,2.19]

*: p-value<0.05; **: p-value<0.01; ***: p-value<0.001





Prenatal Smoking & Drinking

□ Synergetic adverse effects of smoking and drinking during pregnancy (Odendaal et al., 2008; MMWR, 2016)

- ❖ Birth weight, pre-term delivery
- ❖ Fetal alcohol spectrum disorders (FASDs)
- ❖ Smaller head circumference
- ❖ Maybe worse effect than other illicit drugs (e.g., Jones et al., 2013; Slotkin, 1998)

□ Pregnant smokers at risk for prenatal drinking (Cannon et al., 2012)

- ❖ 11% pregnant women reported prenatal alcohol use (NSDUH, 2013)



Characteristics of Pregnant Women at Risk for Problem Drinking

J Immigrant Minority Health
DOI 10.1007/s10903-015-0238-5



ORIGINAL PAPER

Characteristics of Low-income Racial/Ethnic Minority Pregnant Women Screening Positive for Alcohol Risk

Yukiko Washio¹ · Amy A. Mericle² · Heather Cassey³ · Angela M. Daubert³ ·
Kimberly C. Kirby¹



Alcohol Risk at Philly WIC (N = 225)

	Bivariate		Multivariate	
	OR	p	AOR	p
Demographics				
Age (M, SD)	1.0	0.996		
Race/Ethnicity		0.305		
White/Caucasian (reference category)	---			
Black/African American	3.4			
Hispanic	4.6			
Other	1.7			
Educational Attainment		0.097		
Non-degreed (reference category)	---			
GED/Highschool	0.7			
Post-secondary	0.1			
Still in highschool	0.5			
Weeks Pregant (M, SD)	1.0	0.160		
Currently Homeless/Temporarily Housed	1.2	0.618		
History of Homelessness	2.4	0.004	1.5	0.255
Currently Living w/Someone who Drinks	1.1	0.848		
Current Smoker	4.3	<0.001	3.0	0.010
Currently Living w/Someone who Smokes	1.3	0.466		
History of Marijuana or Other Drug Use	4.1	<0.001	3.2	0.001



Nicotine & Tobacco Research, Volume 12, Number 5 (May 2010) 483–488

Original Investigation

Effects of cigarette smoking cessation on breastfeeding duration

Tara M. Higgins, B.A.,¹ Stephen T. Higgins, Ph.D.,^{1,2} Sarah H. Heil, Ph.D.,^{1,2} Gary J. Badger, M.S.,³ Joan M. Skelly, M.S.,³ Ira M. Bernstein, M.D.,⁴ Laura J. Solomon, Ph.D.,⁵ Yukiko Washio, Ph.D.,¹ & Adrien M. Preston, B.A.¹

¹ Department of Psychiatry, University of Vermont, Burlington, VT

² Department of Psychology, University of Vermont, Burlington, VT

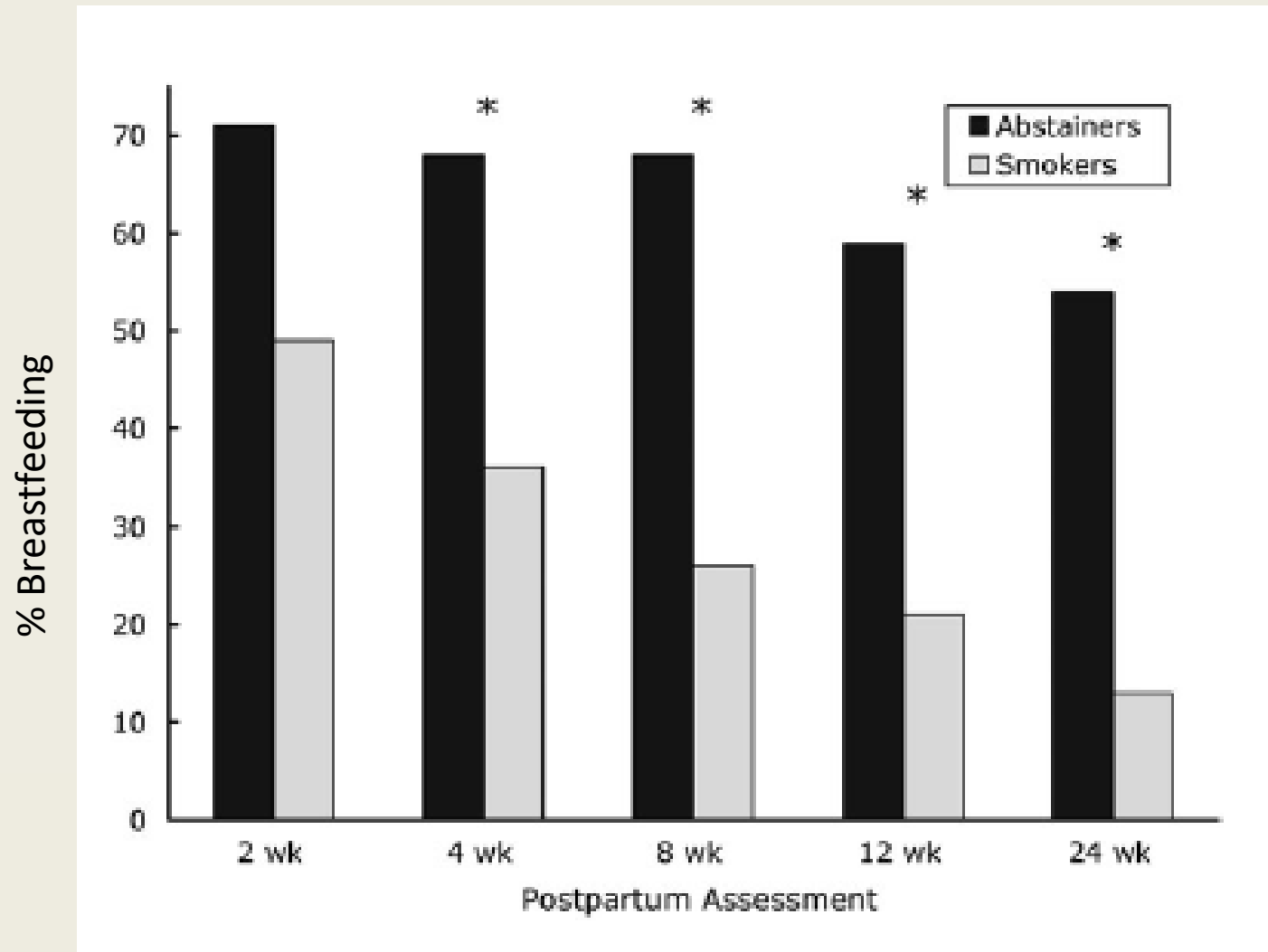
³ Department of Medical Biostatistics, University of Vermont, Burlington, VT

⁴ Department of Obstetrics and Gynecology, University of Vermont, Burlington, VT

⁵ Department of Family Practice, University of Vermont, Burlington, VT

Corresponding Author: Stephen T. Higgins, Ph.D., University of Vermont, UHC Campus, Rm 3100B 3rd Fl, Old Hall, 1 South Prospect St., Burlington, VT 05401, USA. Telephone: 802-656-9614; Fax: 802-656-9628; E-mail: stephen.higgins@uvm.edu

Received August 17, 2009; accepted February 10, 2010





Treatment Approaches

- Pharmacological approach
- Psychosocial approach



Treatment Approaches

Pharmacological approach

- ❖ Substitution therapy
- ❖ Bupropion
- ❖ Exogenous progesterone

Psychosocial approach



Treatment Approaches

Pharmacological approach

Psychosocial approach

- ❖ Cognitive behavioral therapy
- ❖ Brief intervention
- ❖ Counseling
- ❖ Motivational interviewing
- ❖ Contingency management/Conditional cash transfer – Health Incentive use
- ❖ Peer support



High Impulsivity among Smokers (Bickel et al., 1999)

Impulsive

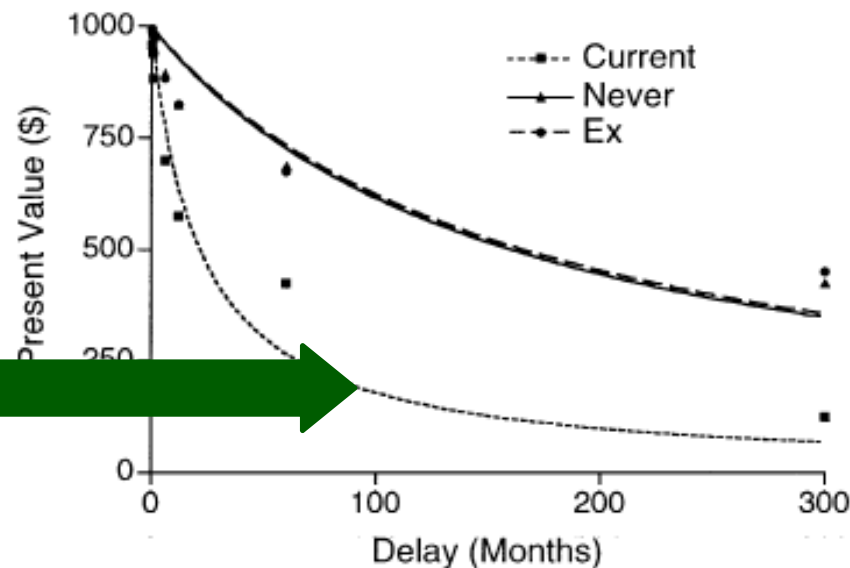


Fig. 1 Temporal discounting functions for money for current smokers (*squares*) never-smokers (*triangles*) and ex-smokers (*circles*). Points show median indifference points for money as a function of delay. Lines show the best-fitting discounting functions generated by the hyperbolic decay model (see text)

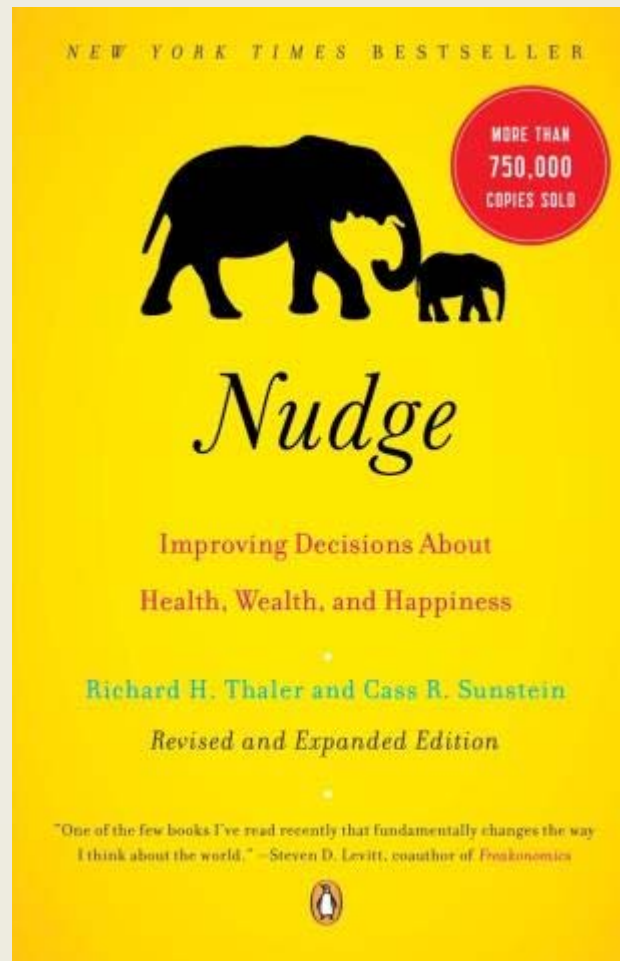


Delaware Health Sciences Alliance

HEALTHCARE EDUCATION, RESEARCH & SERVICES

◆ CHRISTIANA CARE HEALTH SYSTEM ◆ NEMOURS ◆ THOMAS JEFFERSON UNIVERSITY ◆ UNIVERSITY OF DELAWARE

www.delawarehsa.org



UNIVERSITY OF
DELAWARE

 CHRISTIANA CARE
HEALTH SYSTEM



Increase Focus on Target Behavior by Increasing Saliency

Psychol Rep. 2017 Jan 1:33294117720937. doi: 10.1177/0033294117720937. [Epub ahead of print]

Incentive Use for Improving Maternal Health: Perspective From Behavioral Science.

Washio Y¹.

 Author information

Abstract

Incentive use to improve maternal health behavior has been controversial, and guidelines to effectively design and implement such an intervention have been published. This commentary briefly describes a perspective from behavioral science for the existing guideline on the development of an incentive-based intervention to change maternal health behaviors. It is recommended to emphasize the saliency of incentives as an important variable to maintain the intervention effect while addressing barriers to feasibility and sustainability.

KEYWORDS: Maternal health; health behavior change; health incentives; saliency of incentives



Health Incentives for Pregnant Populations

- **Smoking cessation** (Higgins et al., 2012)
 - ❖ Smoking abstinence (Lumley et al., 2009)
 - ❖ Fetal growth, birth weight, % low birth weight (Higgins et al., 2012)
 - ❖ Breastfeeding duration (Higgins et al., 2010)
- **Cocaine abstinence** (Schottenfeld et al., 2011)



Incentive Use for Pregnant Smokers

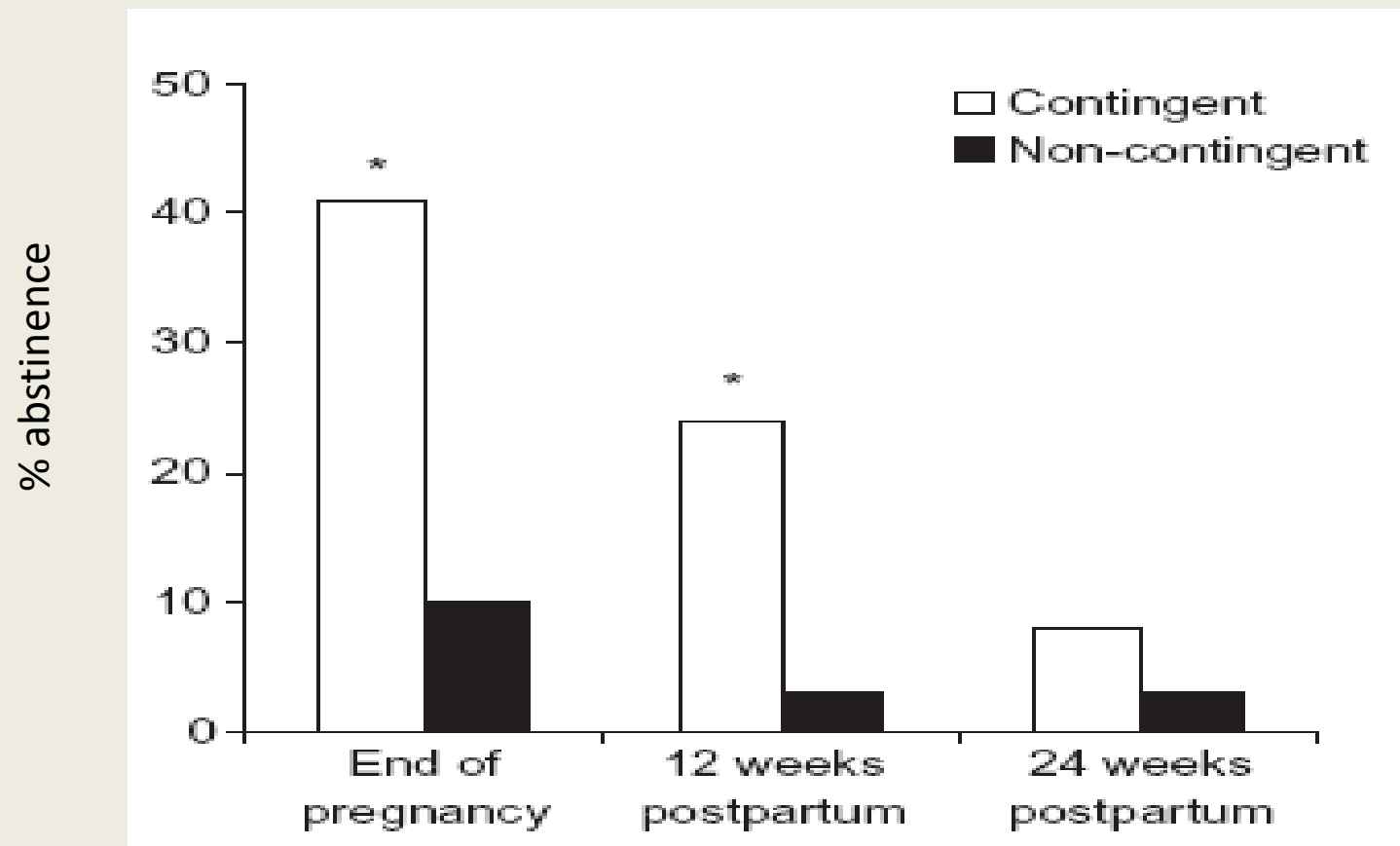
□ Vermont clinical trials for pregnant smokers

(Higgins, Washio, et al., 2012)

- ❖ Incentives on attendance only vs. smoking abstinence (i.e., cotinine)
- ❖ Escalating incentive amount (\$6.25+\$1.25; max:\$1,000; average:\$500)
- ❖ Incentives contingent on carbon monoxide levels in breath samples (<6ppm) in the first week
- ❖ Incentives contingent on cotinine levels in urine samples (<80ng/ml)

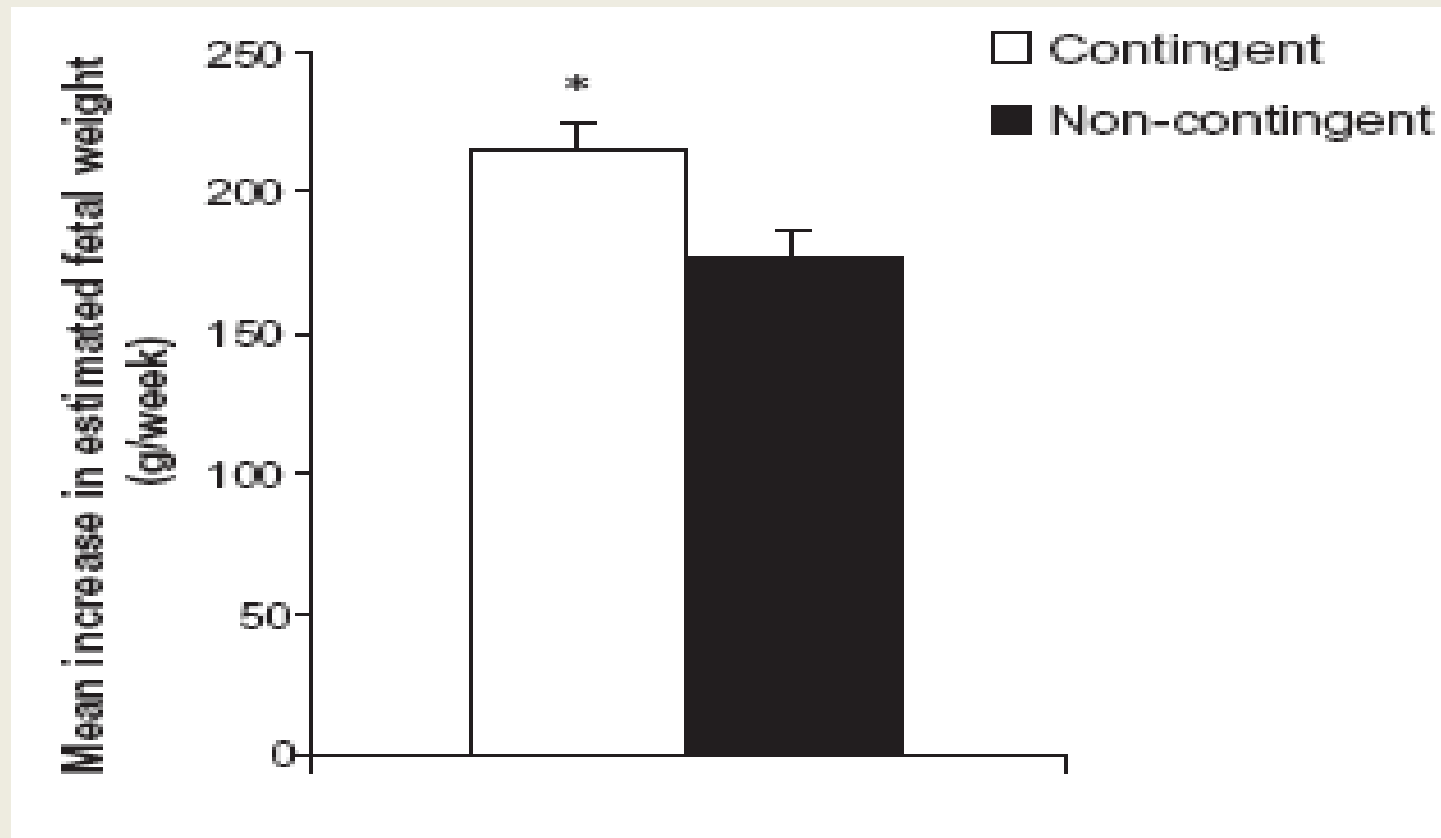


Incentive Effects on Smoking Abstinence (Heil et al., 2008; N = 73)



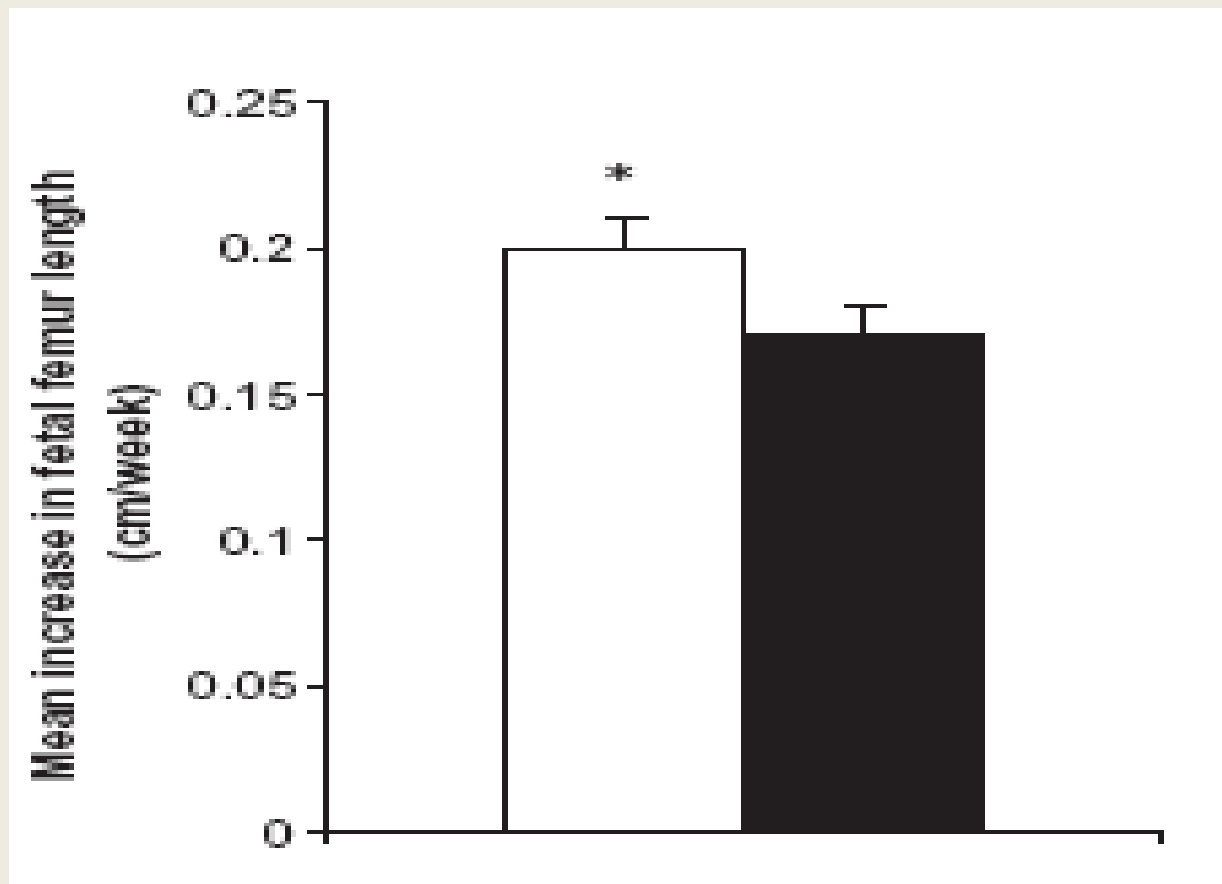


Incentive Effects on Fetal Weight (Heil et al., 2008)



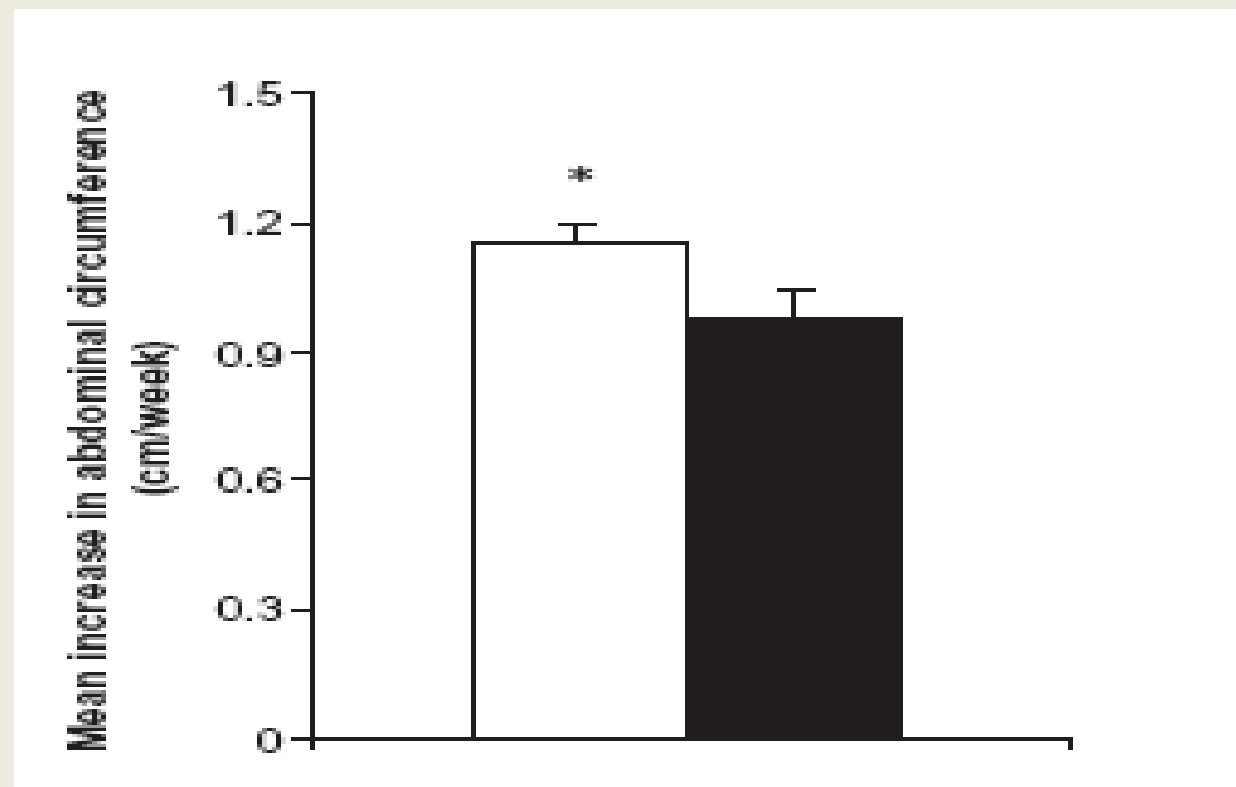


Incentive Effects on Fetal Femur Length (Heil et al., 2008)



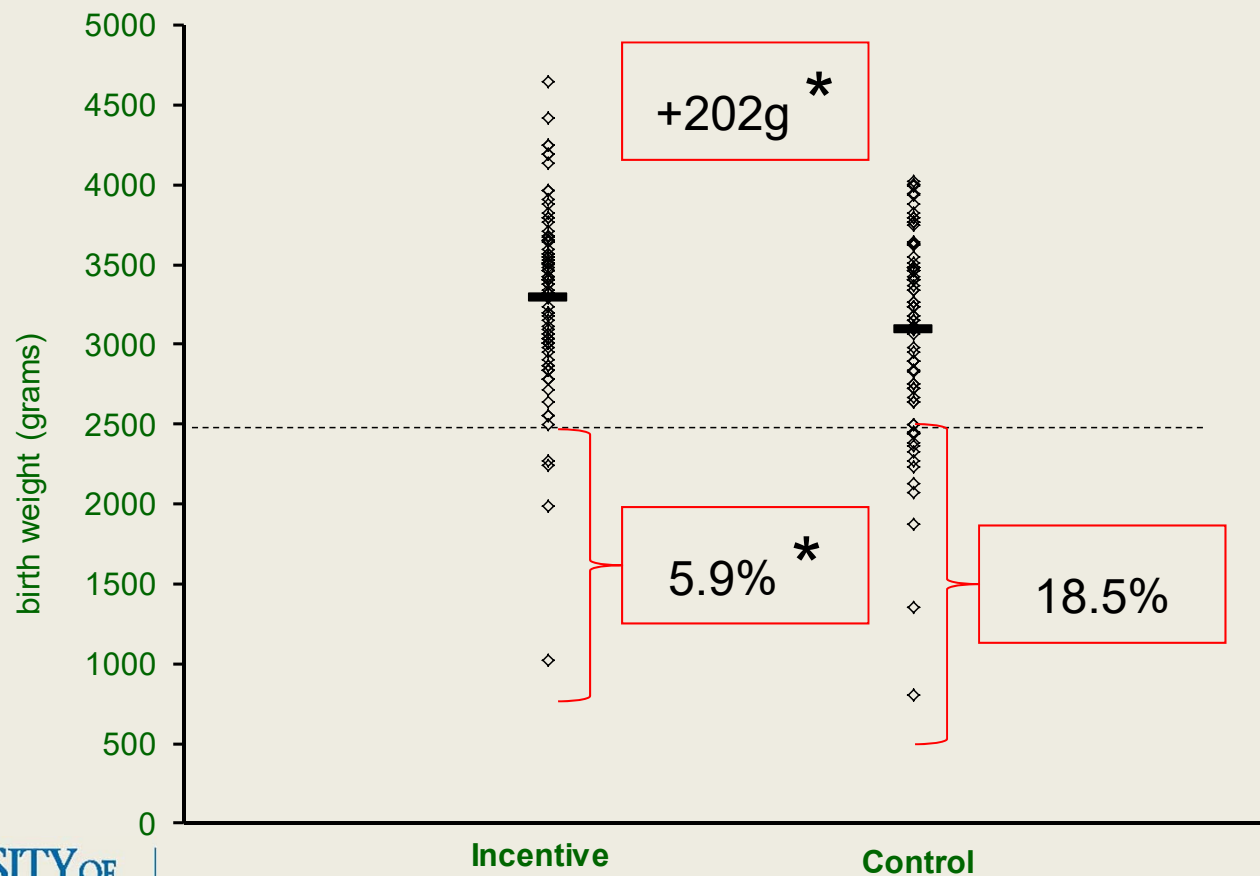


Incentive Effects on Abdominal Circumference (Heil et al., 2008)





Incentive Effects on Birth Weight (Higgins et al., 2010a; N = 166)





Incentive Effects on Birth Weight (Higgins et al., 2010a; N = 166)

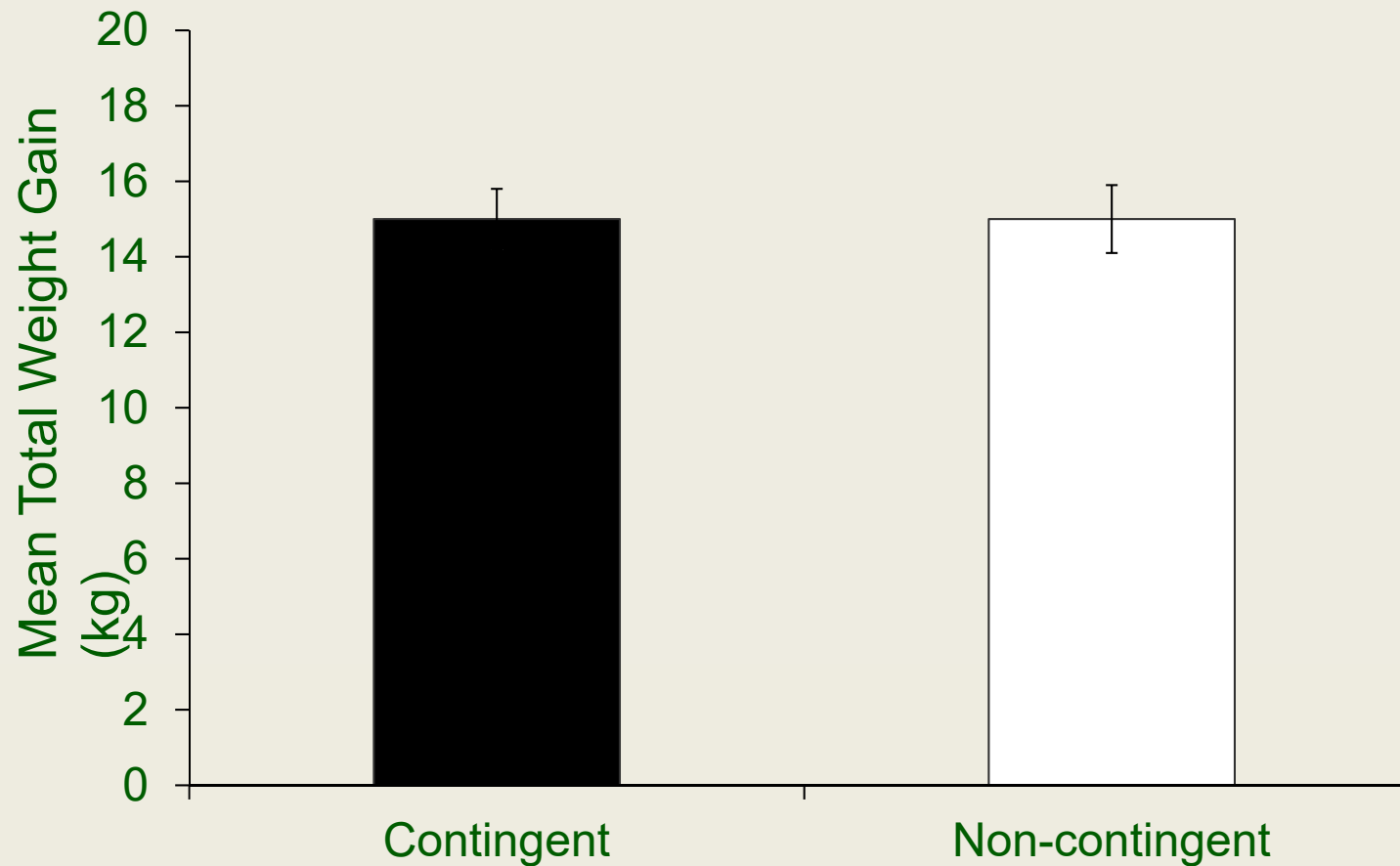
Table 2 Infant outcomes at delivery.

Measure	Contingent (n = 85)	Non-contingent (n = 81)	P-values
Birth weight (g)	3295.6 ± 63.8	3093.6 ± 67.0	0.03
% Low birth weight	5.9	18.5	0.02
Gestational age (weeks)	39.1 ± 0.2	38.5 ± 0.3	0.06
% Preterm births	5.9	13.6	0.09
% NICU admissions	4.7	13.8	0.06

Values represent mean ± standard error, unless specified otherwise. NICU: neonatal intensive care unit.

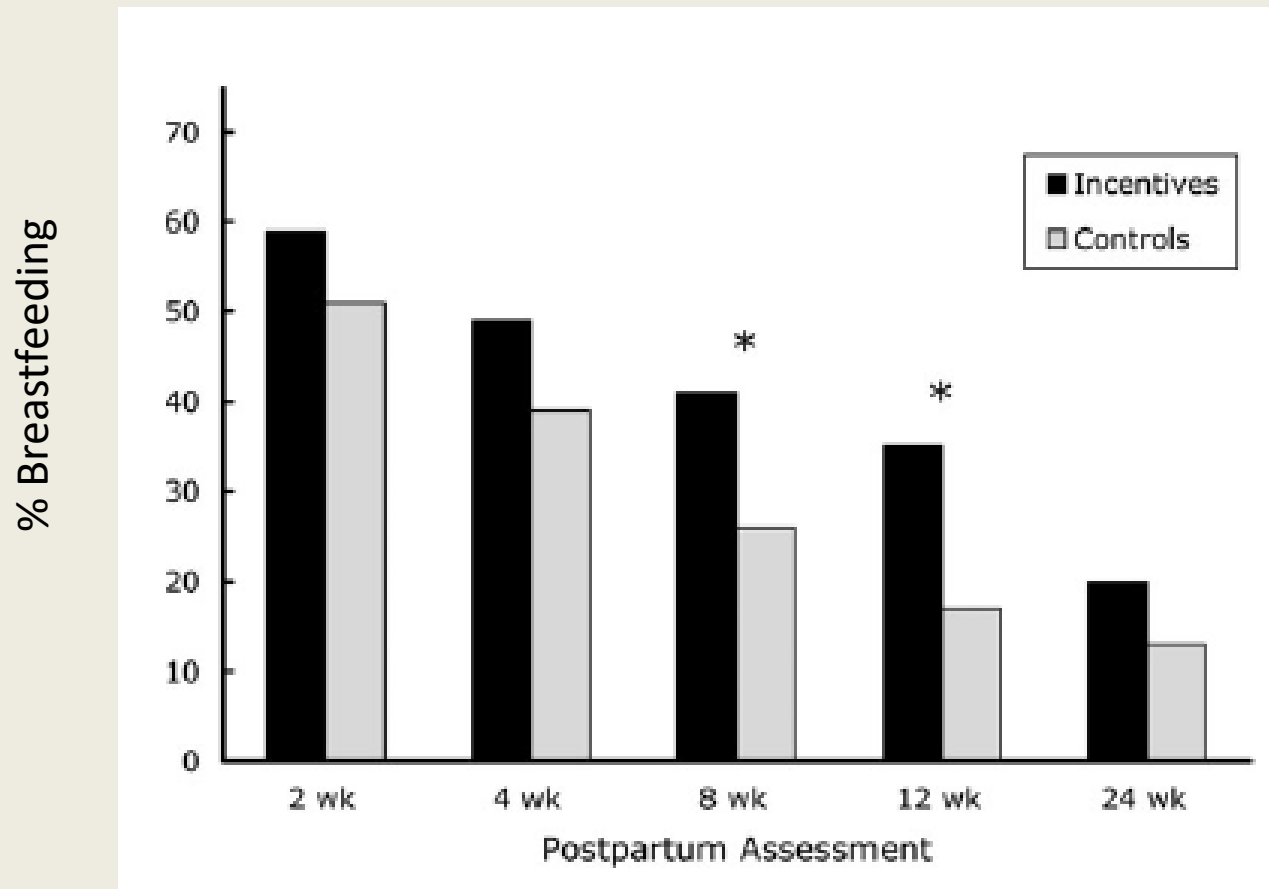


Incentive Side Effects on Maternal Weight Gain (Washio et al., 2011; N = 154)





Incentive Effects on Breastfeeding (Higgins et al., 2010b; N = 158)





Compensating Mothers' Hard Work

The Lancet Commissions

Women and Health: the key for sustainable development



Ana Langer, Afaf Meleis, Felicia M Knaul, Rifat Atun, Meltem Aran, Héctor Arreola-Ornelas, Zulfiqar A Bhutta, Agnes Binagwaho, Ruth Bonita, Jacquelyn M Caglia, Mariam Claxson, Justine Davies, France A Donnay, Jewel M Gausman, Caroline Glickman, Annie D Kearns, Tamil Kendall, Rafael Lozano, Naomi Sebari, Gita Sen, Srirom Sindhu, Miriam Temin, Julio Frenk

Executive summary

Girls' and women's health is in transition and, although some aspects of it have improved substantially in the past few decades, there are still important unmet needs. Population ageing and transformations in the social

life-course approach to show the breadth of women's health beyond the reproductive role. We estimate the financial value of the paid and unpaid health-care-related duties that women undertake in health systems and in their homes and communities, which are a hidden

Lancet 2015; 386: 1165-210

Published Online:

June 5, 2015

[http://dx.doi.org/10.1016/S0140-6736\(15\)00497-4](http://dx.doi.org/10.1016/S0140-6736(15)00497-4)

ISSN 0140-6736(15)00497-4

See [Editorial page 1110](#)



Future of Pregnant Smoker Incentive

- Cost-effectiveness** (Boyd et al., 2016)
- Combined pharmacological and behavioral approach** (NCI R01: PI Kranzler)
- Implementation in healthcare system**



Important Aspects in Implementation

Stakeholders on incentive and mobile tech

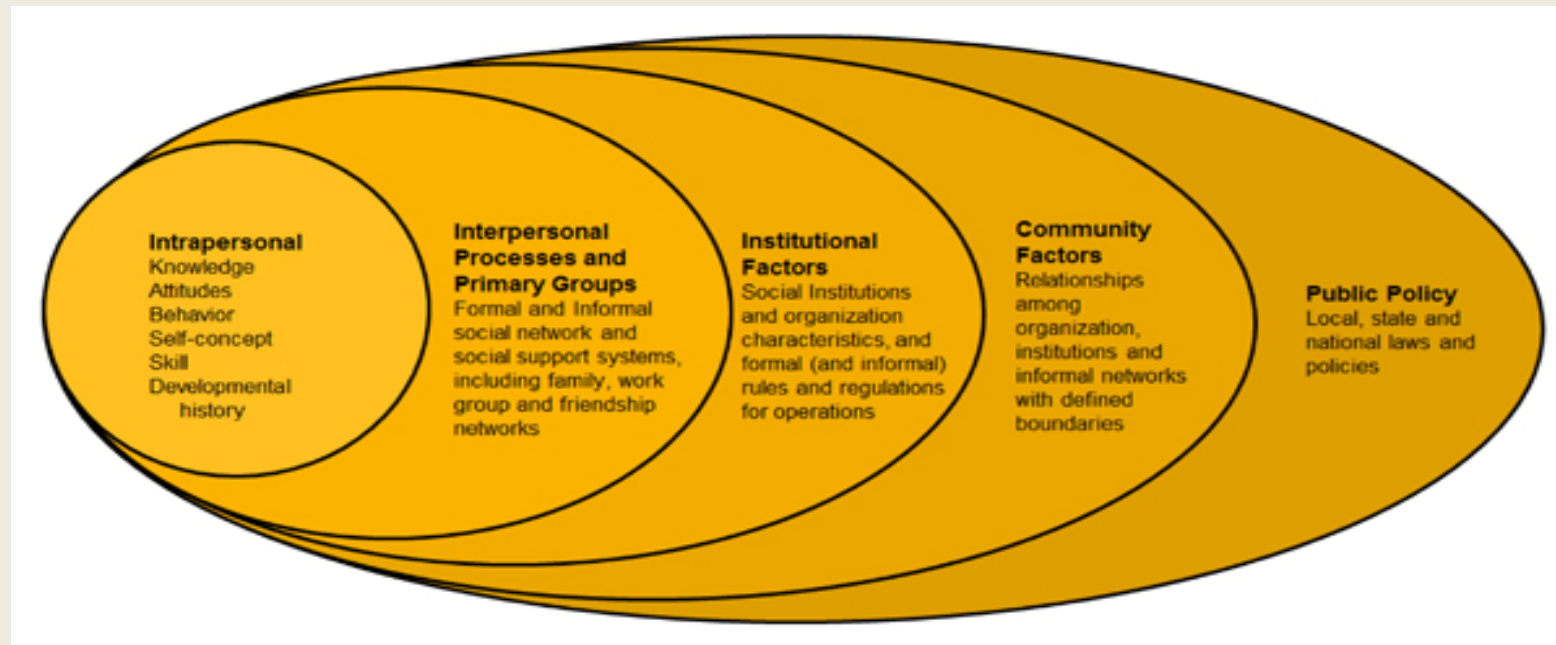
- ❖ Healthcare providers/leaders
- ❖ Health insurance companies
- ❖ Community advisory boards/Task force

Use of existing infrastructure

- ❖ Prenatal care visits in Outpatient setting
- ❖ Home visitation programs
- ❖ Social services



Socio Ecological Model





Implementation of pregnant smoking incentive at Christiana Care

- ❑ Adjunct to each prenatal care visit
- ❑ 5 minutes
- ❑ Collection of breath and urine samples
 - ❖ By medical assistants
 - ❖ NicAlert for urine testing
 - ❖ Carbon monoxide breathalyzer for breath samples



Implementation of pregnant smoking incentive at Christiana Care

\$10 for sample provision

Additional \$\$ for

❖ Reduction in breath CO levels

❖ Abstinence of cotinine in urine samples

Escalating amounts of incentives by \$5

❖ Continuous reduction in breath sample CO levels

❖ Stayed low in breath CO between 0 and 2

❖ Abstinence of cotinine in urine samples



Program Development Grant

- Incentive group (n = 14) vs
Sample provision only group (n = 17)
- No significant differences in
sociodemographic characteristics and
smoking history



Program Development Grant

	Control (n=17)	Incentive (n=14)	P values
Maternal age	29.00(1.31)	28.71(0.98)	0.91
Married/Partnered (%)	52.94	42.86	0.58
Employed (%)	35.29	21.43	0.46
Ethnicity (%)	5.88	14.29	0.58
Race (%)			1
 White	23.53	28.57	
 Black	52.94	57.14	
 Others	23.53	85.71	
Education (# yrs)	12.47(0.39)	12.64(0.51)	0.92
# Gravida	3.88(0.73)	4.64(0.91)	0.4
# Parity	1.65(0.45)	2.07(0.37)	0.2



Program Development Grant

	Control (n=17)	Incentive (n=14)	P values
# Cigs per Day Past 30 Days	8.88(1.67)	10.14(1.60)	0.47
Age Started Smoking	16.06(1.03)	14.93(1.25)	0.26
# Yrs Smoking	11.94(1.26)	13.00(1.33)	0.51
# Cigs per Day Bfr Preg	17.82(2.06)	18.00(1.72)	0.84
# Quit Attempt Bfr Preg	1.71(0.63)	1.71(0.77)	0.9
# Cigs per Day Sinc Preg	6.94(1.54)	10.00(1.64)	0.12
# Quit Attempt Sinc Preg	2.12(0.74)	1.50(1.05)	0.38
Fagerstrom Score	6.35(0.37)	6.79(0.58)	0.7

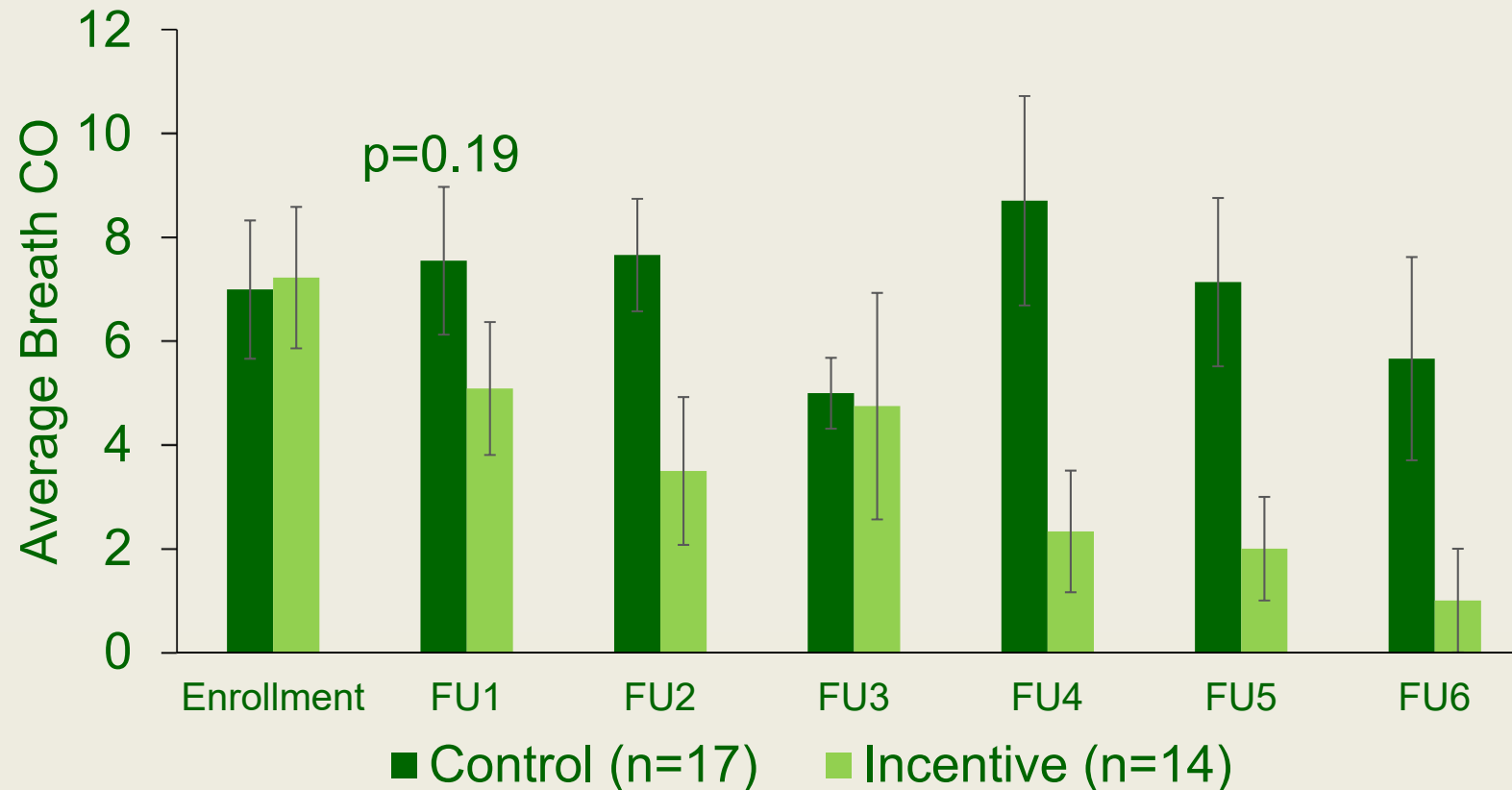


Program Development Grant

- Generally reduced CO levels at all follow-ups in Incentive group compared to Sample provision only**
- Significant average CO level in Incentive ($p = 0.01$) compared to Sample provision only**
- Improved birth outcomes in Incentive compared to Sample provision only**

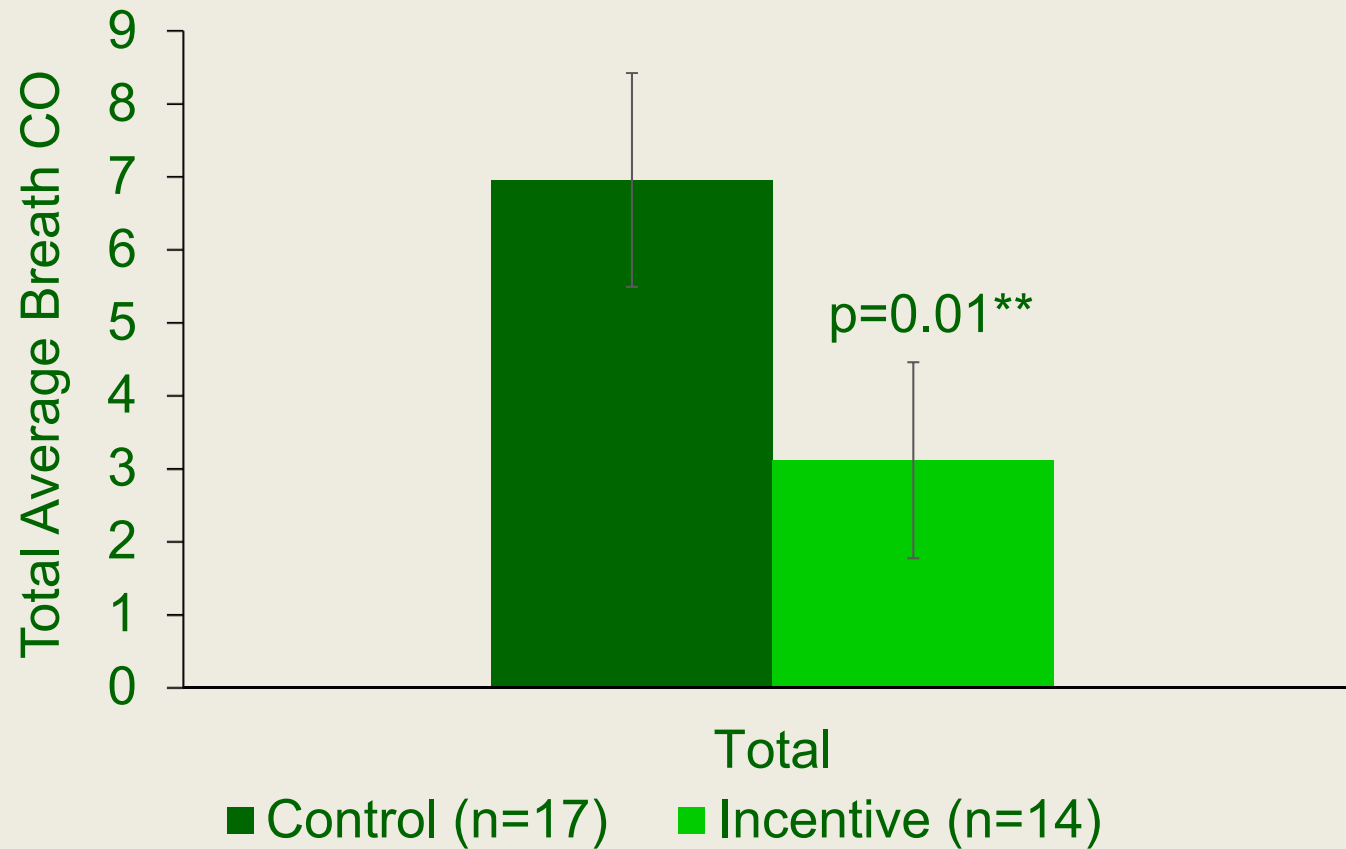


Program Development Grant





Program Development Grant





Program Development Grant

	Control (n=10)	Incentive (n=7)	P values
Gestational weeks at birth	37.47(0.78)	38.36(0.38)	1
Birth Weight (g)	2768(161.83)	2957.86(162.99)	0.47
Head Circumference (cm)	32.8(0.53)	33(0.73)	0.88
Apgar score 1 min	7.3(0.72)	7.86(0.34)	0.76
Apgar score 5 min	8.7(0.21)	9(0)	0.26
Size for gestational age (%)	29(5.91)	32.37(8.51)	0.66
NICU Admission (%)	17.65	6.67	0.7
If Yes, how many days?	33.33(22.83)	7(0)	0.5
C-Section (%)	11.76	13.33	0.79



Program Development Grant

- High risk pregnant smokers due to ongoing NCI bupropion trial
- Contingent incentives on smoking reduction for contingency experience
- Clear instruction on incentive contingencies



Program Development Grant

□ Compared to Vermont trials

- ❖ Dedicated space for clinical trials
- ❖ Active outreach for follow-ups
- ❖ Frequent monitoring schedules
- ❖ Inclusion of low level pregnant smokers
- ❖ Caucasian dominant population



Program Development Grant

□ Effectiveness trial in England by Tappins

- ❖ Reinforcement on CO level <10ppm
- ❖ 4-week, 12-week, and 34-38 ges weeks
- ❖ >600 participants
- ❖ Significant increase in cessation rates (22.5% vs. 8.6%) in Incentive compared to Control
- ❖ Slightly higher birth weight in Incentive



Awareness on Prenatal Drinking and FASD

□ American Association of Pediatrics

AAP Says No Amount of Alcohol Should be Considered Safe During Pregnancy

10/19/2015

A new clinical report from the American Academy of Pediatrics (AAP) identifies prenatal exposure to alcohol as the leading preventable cause of birth defects and intellectual and neurodevelopmental disabilities in children. The report, "Fetal Alcohol Spectrum Disorders," in the November 2015 issue of Pediatrics (published online Oct. 19) stresses that no amount of alcohol should be considered safe to drink during any trimester of pregnancy.



Awareness on Prenatal Drinking and FASD

□ CDC VitalSigns

The screenshot shows the CDC VitalSigns website. At the top left is the CDC logo with the text "Centers for Disease Control and Prevention" and "CDC 24/7: Saving Lives, Protecting People™". To the right is a search bar with the word "SEARCH" and a magnifying glass icon. Below the search bar is a "CDC A-Z INDEX" dropdown menu. The main content area has a dark blue header with the text "Vital Signs". Below this is a sidebar with a list of categories: "Vital Signs", "Current issue" (with a plus sign), "Topics Covered" (with a minus sign), "Alcohol" (with a minus sign), "Alcohol and Pregnancy" (bolded), "Cancer", "Cardiovascular Diseases", "Food Safety", and "Healthcare-associated Infections". The main content area shows the breadcrumb "Vital Signs > Topics Covered > Alcohol" and the title "Alcohol and Pregnancy". Below the title is the question "Why take the risk?" and social media icons for Facebook, Twitter, and a plus sign. There is also a "Language:" dropdown menu set to "English". On the right side, there is a section titled "On this Page" with a list of links: "Overview", "Problem", "Infographic", "What Can Be Done", and "Issue Details". The "Overview" link is highlighted.



Awareness on Prenatal Drinking and FASD

□ Washington Post

Parents.com / Pregnancy & Birth / Everything Pregnancy / What Life as a 43-Year-Old With FASD Is Like

What Life as a 43-Year-Old With FASD Is Like

A mom who drank alcohol throughout her pregnancy shares what her grown daughter's life is like today.

By Melissa Willets

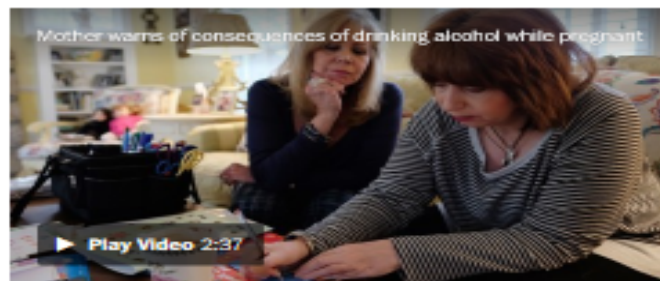
4.7K
SHARES



Comments (1)

We recently reported on a study that found as many as [428 conditions are associated with FASD](#), or Fetal Alcohol Spectrum Disorders. As if expectant women need any more reasons to put down that wine glass, now a mom named Kathy Mitchell is opening up about [what happens to a child when you drink during pregnancy](#), as she did.

Mitchell's daughter Karli is no longer a child; she's 43-years-old, but according to *The Washington Post*, she has the developmental capabilities of a first-grader. Karli collects stickers and dolls, and wears Hello Kitty pajamas, much like my own 7-year-old does. She needs help to navigate everyday situations, like crossing a street, or recognizing danger, or even remembering to brush her teeth; again, much like my own daughter, who is in second grade.





Incentivized Alcohol Monitoring

Community-Initiated Pilot Program “My Baby’s Breath” to Reduce Prenatal Alcohol Use

► *Yukiko Washio, PhD; Julie Frederick, DBA, MBA,
BSN, RN; Anne Archibald, CMA, MBA;
Nathan Bertram BA, PHR; Jody Allen Crowe, MEd*

Introduction

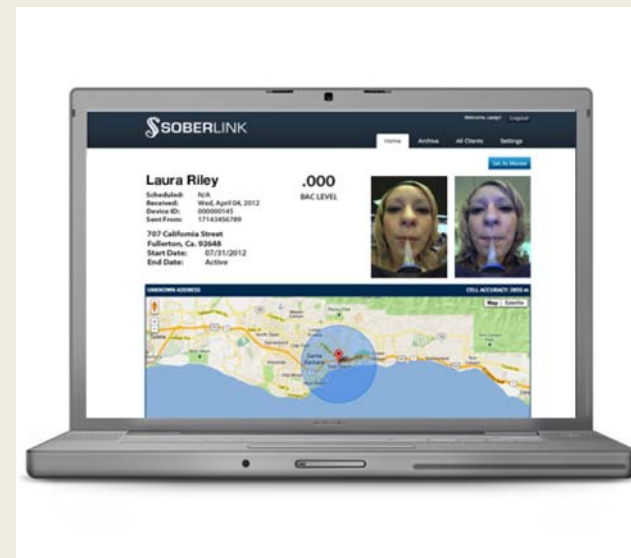
Prenatal exposure to alcohol can cause a broad range of adverse developmental effects including birth defects and intellectual neurodevelopmental disabilities, called fetal alcohol spectrum disorders (FASD).¹ FASD can be manifested in various ways including congenital neurologic, cognitive, behavioral, and (at the extreme) morphological aspects among neonates that are directly traceable to maternal alcohol use during pregnancy. FASD is one of the leading causes of physical



Incentivized Alcohol Monitoring

□ Potential tool to reinforce alcohol abstinence among pregnant women

- ❖ Real-time monitoring allows flexible monitoring schedule and an immediate assistance
- ❖ Allows immediate reinforcement or immediate assistance in case of alcohol-positive samples





Incentivized Alcohol Monitoring

□ Minnesota Healthy Brains for Children

❖ 4 pregnant women reported to DHS for prenatal drinking in Crow Wing County, MN

Participant	# days monitored	# tests scheduled	# tests submitted later than 1hr	# tests missed completely	# tests showing alcohol-positive	\$ earned
1	134	268	108	12	0	\$595.00
2	118	354	10	2	0	\$530.00
3	56	112	23	7	0	\$60.00
4	31	62	23	9	0	\$60.00



Hate for Incentive Use (Stakeholder Issues)

A Sad State of Affairs

► *Peter V. Rocca, MD*

As a result of a collaborative work between Harvard University and the National Bureau of Economic Affairs, Roland G. Fryer, Jr. published an article entitled “Financial Incentives and Student Achievement: Evidence from Randomized Trials.” The paper summarized the results of a two year experiment (2007-2009) in which approximately 27,000 public school students in Chicago, Dallas, and New York City. “three prototypically

a “more relaxed employee” who, in turn, is more productive for the company.

In this issue of the DMJ, Washio and colleagues (*Community-Initiated Pilot Program “My Baby’s Breath” to Reduce Prenatal Alcohol Use*) describe a financial incentive program in which pregnant women “at risk for continued drinkingincluding..... underage drinking, arrest from driving under the influence, or treatment history of

Since when did we become a nation which pays its people to do what we think they are supposed to do?

As a physician, I applaud the use of resources for the purpose of medical education. Our patients should know



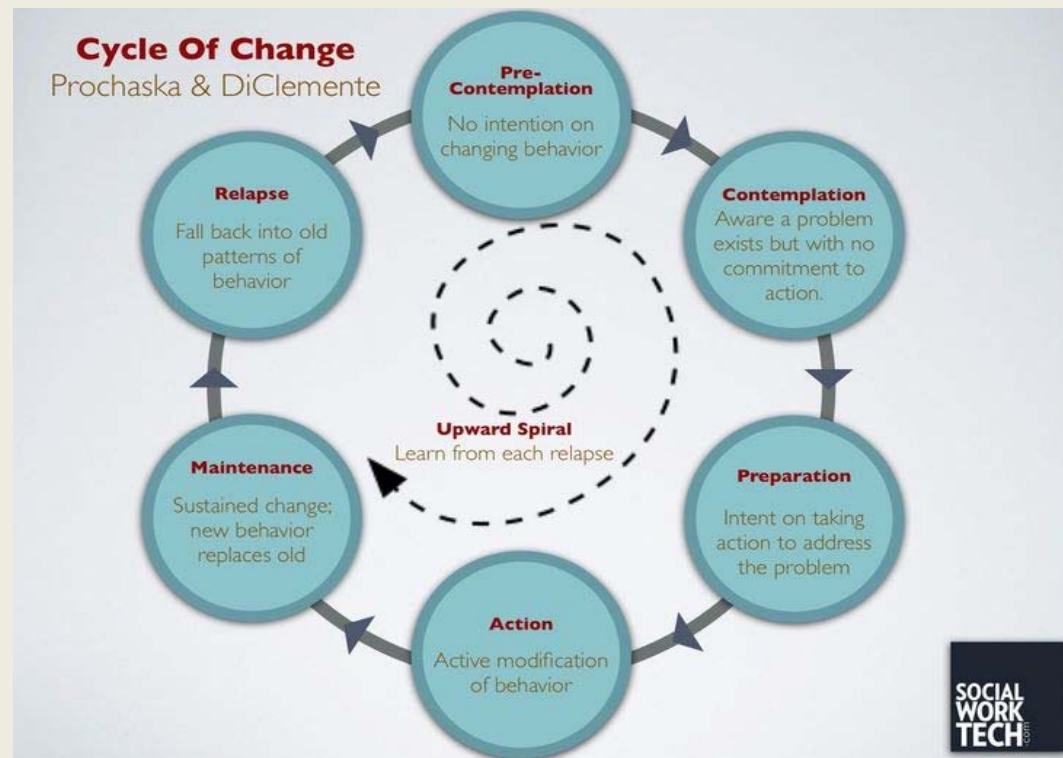
Who Gets Financial Benefits? (Infrastructural Issues)

- ❑ Breastfeeding/Prenatal Smoking → Insurance/Healthcare system**
 - ❖ Medical cost comparisons with and without incentives
 - ❖ Insurance reimbursement
 - ❖ Hospital-based fundraising

- ❑ Fetal Alcohol Spectrum Disorder Prevention → Community services/School/Criminal justice system**
 - ❖ State-funded social services (w/ criminal justice)
 - ❖ Public/private treatment and health services
 - ❖ ACA: Insurance reimbursement on alcohol monitoring



Transtheoretical Model for FASD Prevention





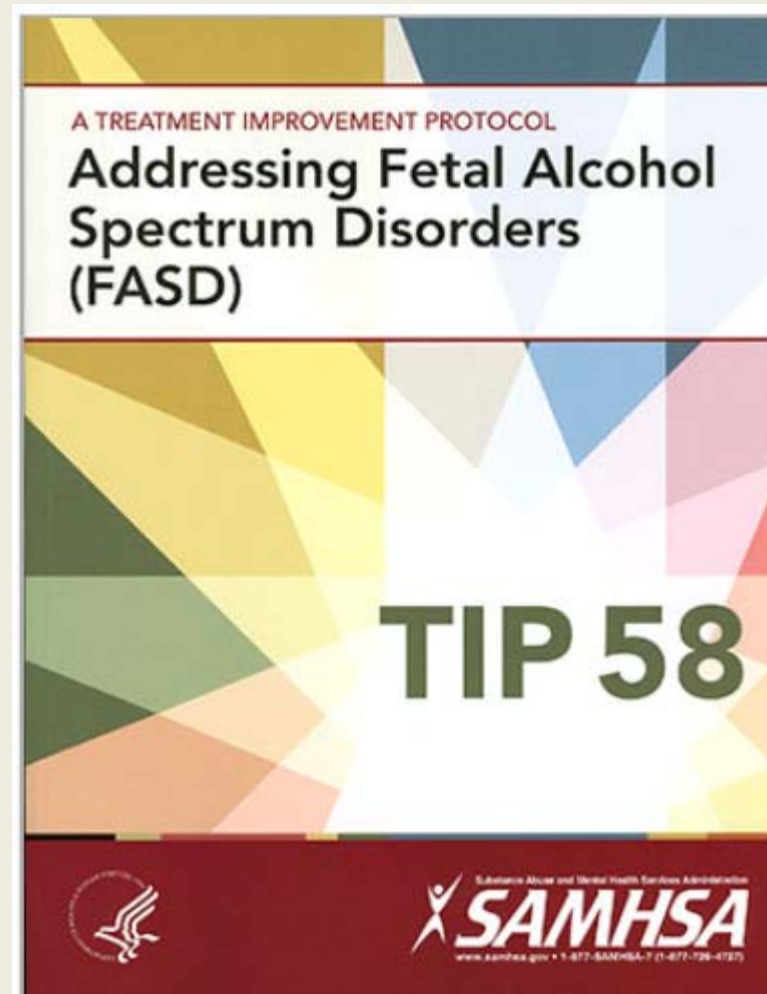
Indicated FASD Prevention

- Collaboration with South Africa**
- Canada FASD Research Network**
 - ❖ Nancy Poole, Ph.D
- Parent-Child Assistance Program (Dr. Grant at University of Washington)**
- Collaboration with Christiana Care/DE**



Future Development

□ SAMHSA





Delaware Health Sciences Alliance

HEALTHCARE EDUCATION, RESEARCH & SERVICES

◆ CHRISTIANA CARE HEALTH SYSTEM ◆ NEMOURS ◆ THOMAS JEFFERSON UNIVERSITY ◆ UNIVERSITY OF DELAWARE

www.delawarehsa.org

Any Questions/Comments?

