Smoke-free: Clearing the Air in Public Housing

8 June 2016

Interagency Committee on

Clean Indoor Air Quality (CIAQ)

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Massachusetts General Hospital, Harvard Medical School, Boston, MA

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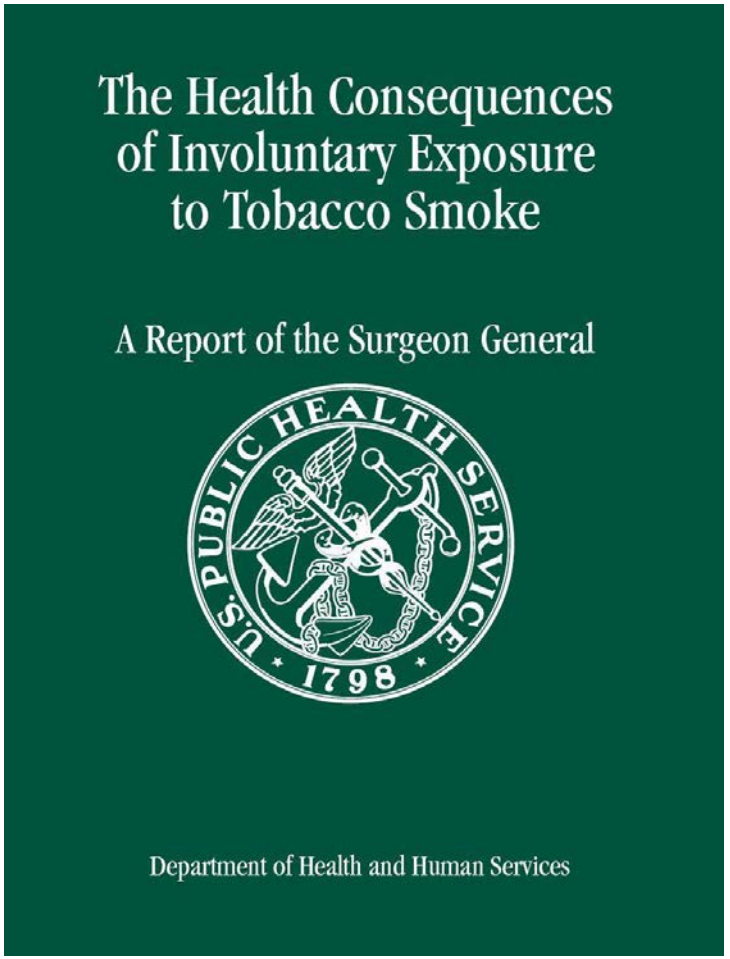
Background

- Secondhand smoke (SHS) adversely affects health
  - Asthma trigger, CVD, stroke, lung cancer
- Surgeon General: No safe level of exposure
- SHS exposure is more common/higher in multiunit housing (MUH) than detached housing, esp. among low-income residents



HUD Calls for Smoke-free PHAs

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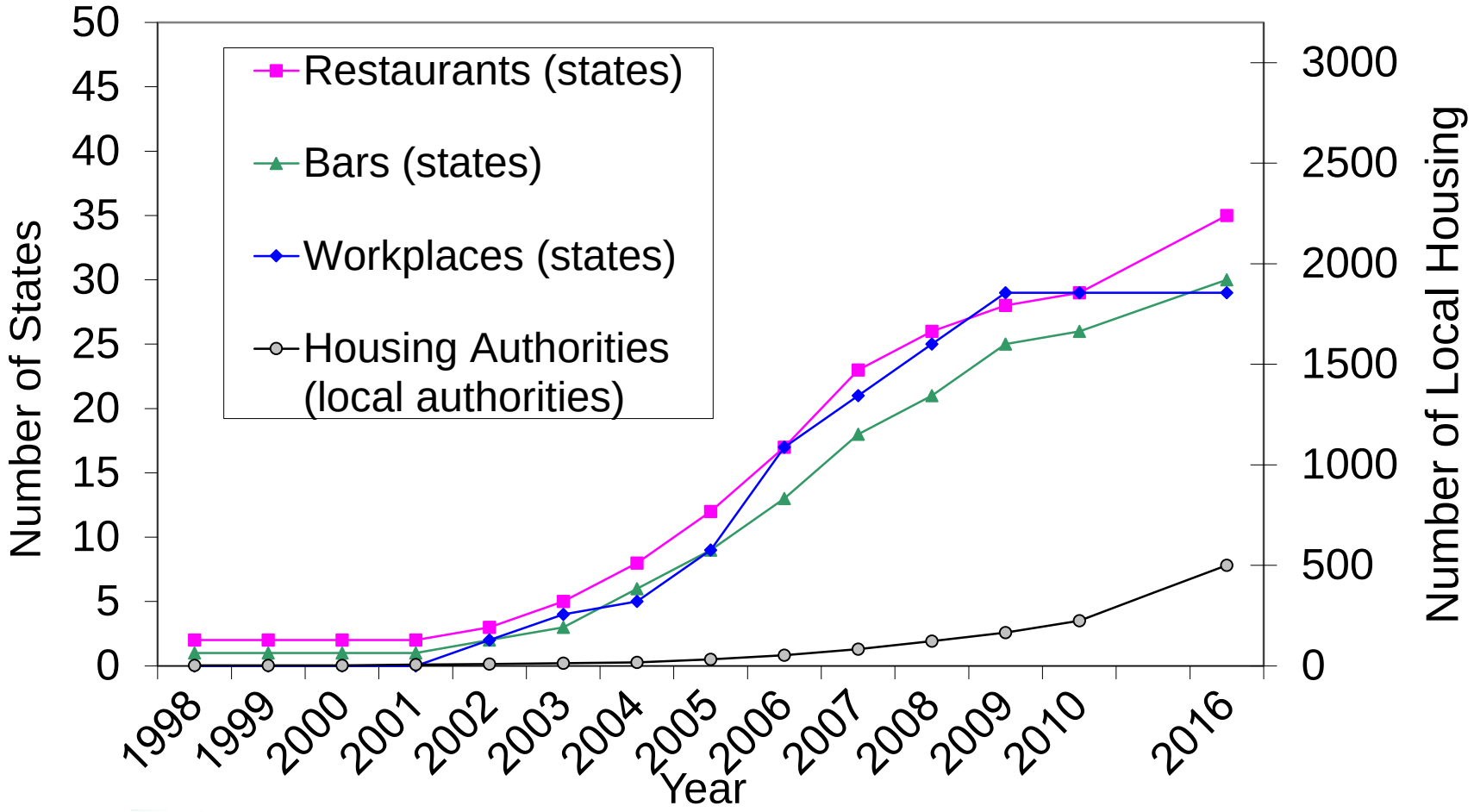
Smoke-free policies through 2016



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Boston Herald, January 2010


BOSTON Herald
www.bostonherald.com
SUNDAY EDITION JANUARY 31, 2010
STILL ONLY $2

GAGA FOR GRAMMYS
OUR CRITIC'S PICKS FOR TONIGHT'S AWARDS EXTRAVAGANZA, P. 35

STAFF PHOTO BY MARK GARFINKEL

COLD SHOULDER
The mannequins aren't nearly as well prepared for the frigid weather as the pedestrians on Boylston Street yesterday. Luckily, today is expected to be in the balmy upper 20s.

MAYOR KICKS ASH

Menino vows to ban smoking in public housing projects, P. 2-3

- Policy initially planned for 2014 implementation

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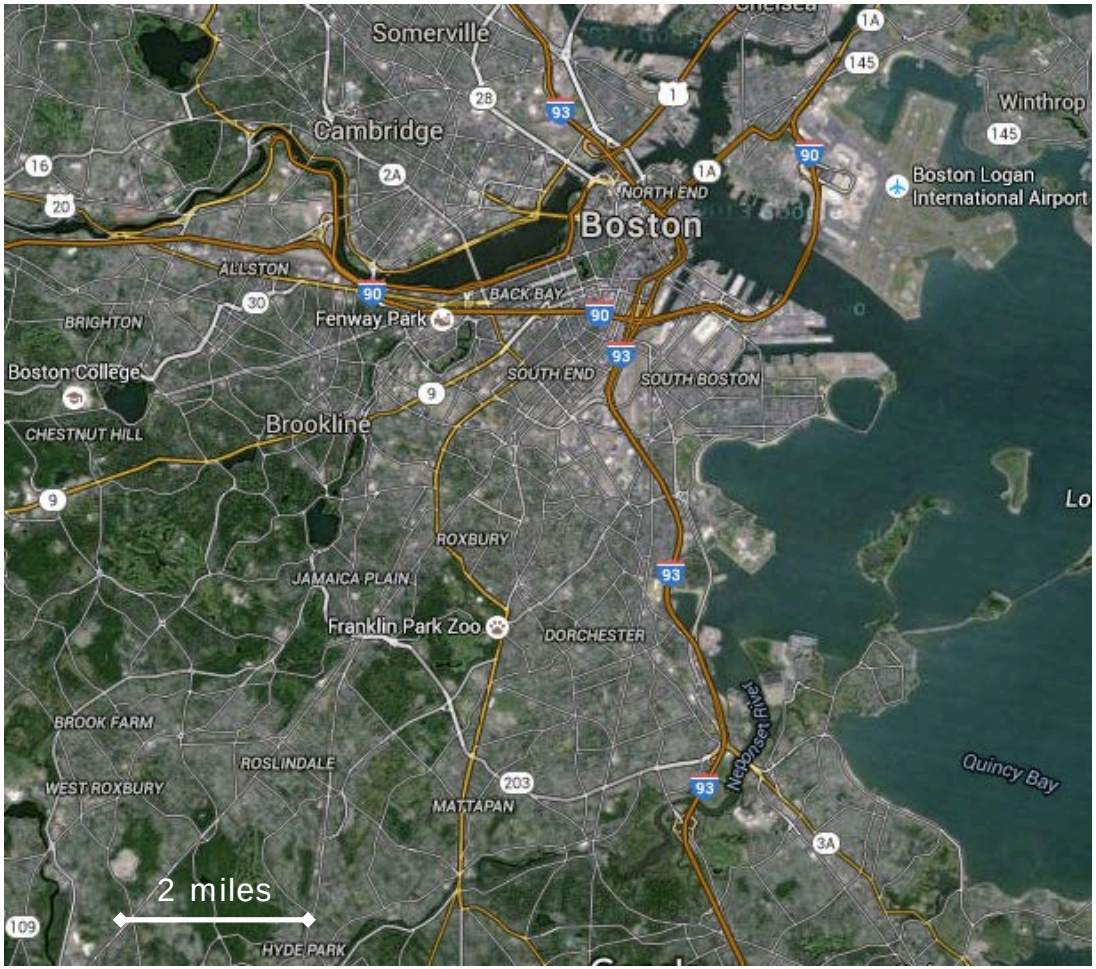
Outline

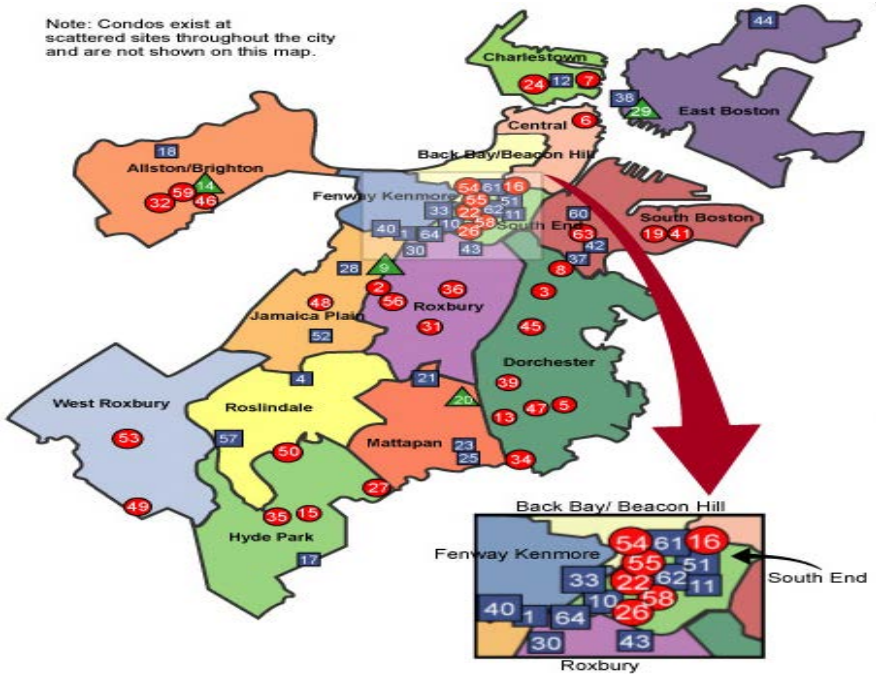
- Boston as a Smoke-free PHA lab
  - Pilot research studies
  - The FreshAir Study
  - Follow-ons
- Lessons learned
- Questions left unanswered

Boston


Somerville
Cambridge
Boston
NORTH END
Boston Logan International Airport
Winthrop
ALLSTON
BACK BAY
BRIGHTON
Fenway Park
Boston College
SOUTH END
SOUTH BOSTON
CHESTNUT HILL
Brookline
ROXBURY
JAMAICA PLAIN
Franklin Park Zoo
DORCHESTER
BROOK FARM
ROSLINDALE
WEST ROXBURY
MATTAPAN
Neponset River
Quincy Bay
HYDE PARK
2 miles

About the BHA

- Houses ~10% of city residents
  - >22,000 in BHA-owned buildings
- ~11,000 units
- 64 developments
  - 37 elderly/disabled
    - 25% of residents
  - 27 for families
    - 75% of residents



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About BHA residents

- Race/Ethnicity
  - 16% white
  - 32% black
  - 42% Hispanic
  - 10% Asian
- Language
  - 44% English
  - 28% Spanish
  - 5% Mandarin/Cantonese
  - Many other languages

About BHA residents

- Age
  - 34% 0-17yo
  - 47% 18-61yo
  - 20% 62+yo
- Smoking
  - 19%
  - (vs. 14% statewide, 20% nationally)

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The Boston Housing Authority

- A few units in BHA went smoke-free voluntarily in fall 2009

- BHA established a smoke-free housing "working group"
- Jan. 2010, mayor announces smoke-free for 2014
  - Largest PHA in U.S at the time to do so
  - Implemented September 30, 2012

BHA's New Smoke-free Policy

- No smoking *anywhere* in BHA buildings (including apartments) or within specified distance of building
  - Applies to residents, visitors, employees
- Violation of policy is a lease violation that could result in fines up to $250 and ultimately eviction
- Not a ban on smok*ers*, just a ban on smok*ing*.

Implementation

- Meetings to inform residents
  - Offer smoking cessation treatment
- Notify/train building managers

- Establish development-specific rules
  - Dedicated smoking areas?
  - No-smoking perimeters around buildings?
- Establish signage on properties
- Remind each household of policy at lease renewal
- Enforcement?

Why the policy might *not* reduce SHS exposure

- Non-compliance/ poor enforcement
- New sources of exposure as locations where smoking is permitted shift
  - E.g., non-smoker walks past smokers outside the building before entering
  - Smoke enters units through windows if smokers are too close to the building

Pilot Studies

- 1) Cotinine testing of BHA residents
  - *Levy et al., AJPM, 2013*
- 2) Environmental monitoring of tobacco smoke in public spaces on BHA properties
  - *Arku et al., Indoor Air*, 2015
- 3) Comparison of BHA indoor air quality in smoking-allowed vs. smoke-free units
  - *Russo et al., NTR*, 2014

Pilot #1 – Cotinine Assessment

- Winter 2011 (pre-policy), 2 BHA locations
- 61 volunteer subjects
- Non-smokers
- Adults and children
- $15 for participation
- Measured
  - Saliva cotinine (a nicotine metabolite)
  - Self-reported exposure

Pilot #1 – Results (1)

- 88% of residents had detectable cotinine (0.15ng/mL LLD)
  - Nationally (NHANES: 0.015ng/mL LLD)
    - 40% adults (all housing)
    - 36% children in detached homes
    - 56% children in MUH
- Geometric mean cotinine = 0.52ng/mL
  - Nationally (NHANES)
    - 0.05ng/mL adults
    - 0.10ng/mL children

Pilot #1 – Results (2) – Survey

Outcome variables		%	Cotinine (ng/mL)	p
Q1. Household smokers	No	82	0.42	0.03
	Yes	18	1.57	
Q2. Smoking rule	Smoking not allowed	70	0.40	0.006
	Smoking allowed sometimes/somew here	30	1.07	
Q3. Perceived development smoking prevalence	Half or fewer residents	54	0.62	0.33
	More than half of residents	46	0.44	
Q4. Smell tobacco smoke within home [non-smoking homes]	No	34	0.63	0.06
	Yes	66	0.36	
Q5. Smell tobacco smoke in hallways	Never/ rarely/ sometimes	40	0.86	0.03
	Usually/ always	60	0.39	

Levy et al., *AJPM*, 2013

Pilot #2 – Environ. Monitoring

Study Aim:

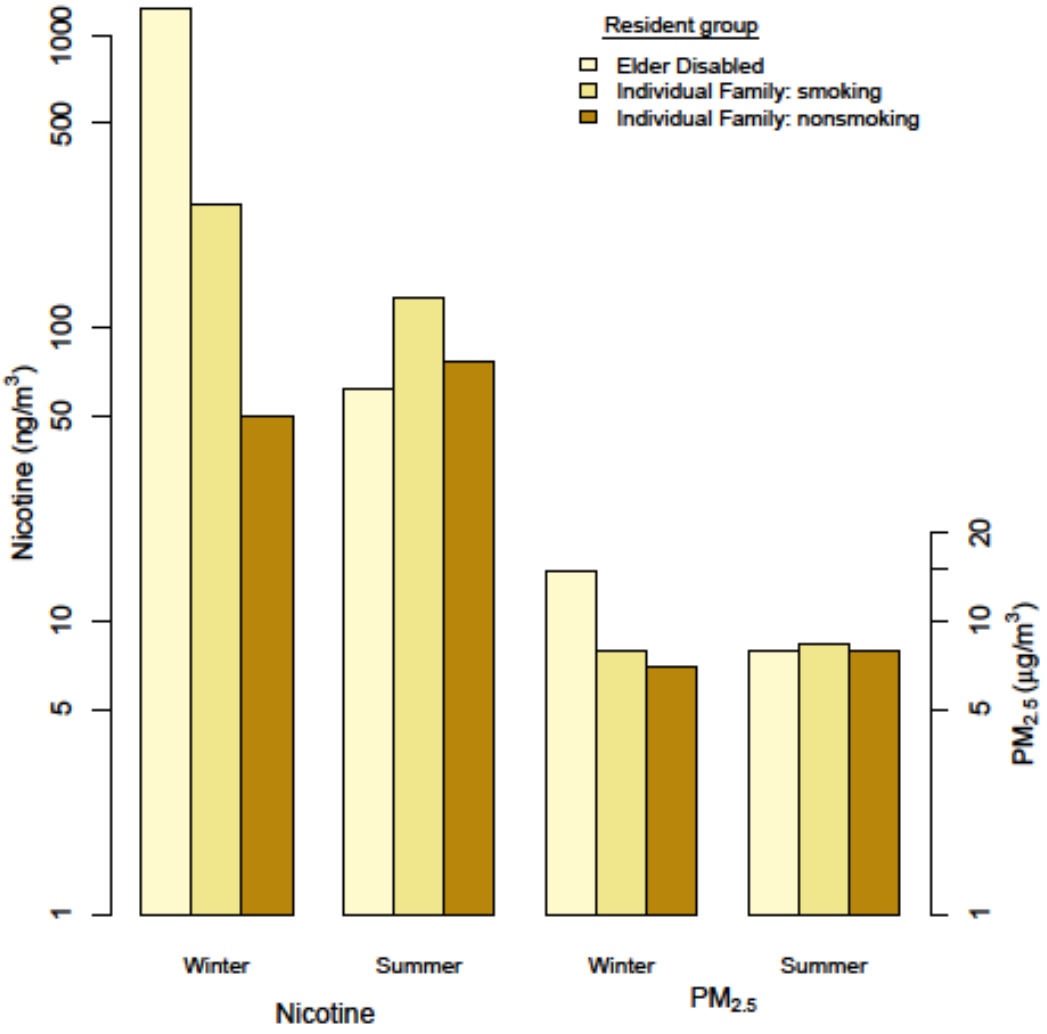
- Compare levels of tobacco smoke pollution (TSP) in common areas of **6** BHA properties ***prior*** to the policy roll-out
  - Across building types
    - Family vs. elderly/disabled
  - Across smoking policies
    - Smoking allowed vs. not
  - Across season
    - Winter vs. summer

Pilot #2 – Measures

- Measure over 7 days each period

- Airborne nicotine
  - Passive, needs 3-7 days exposure for environments without active smoking
  - Tobacco-specific

- PM 2.5
  - Active real-time monitoring
  - Also gravimetric measurement
  - Not tobacco-specific



Arku et al., *Indoor Air*, 2015

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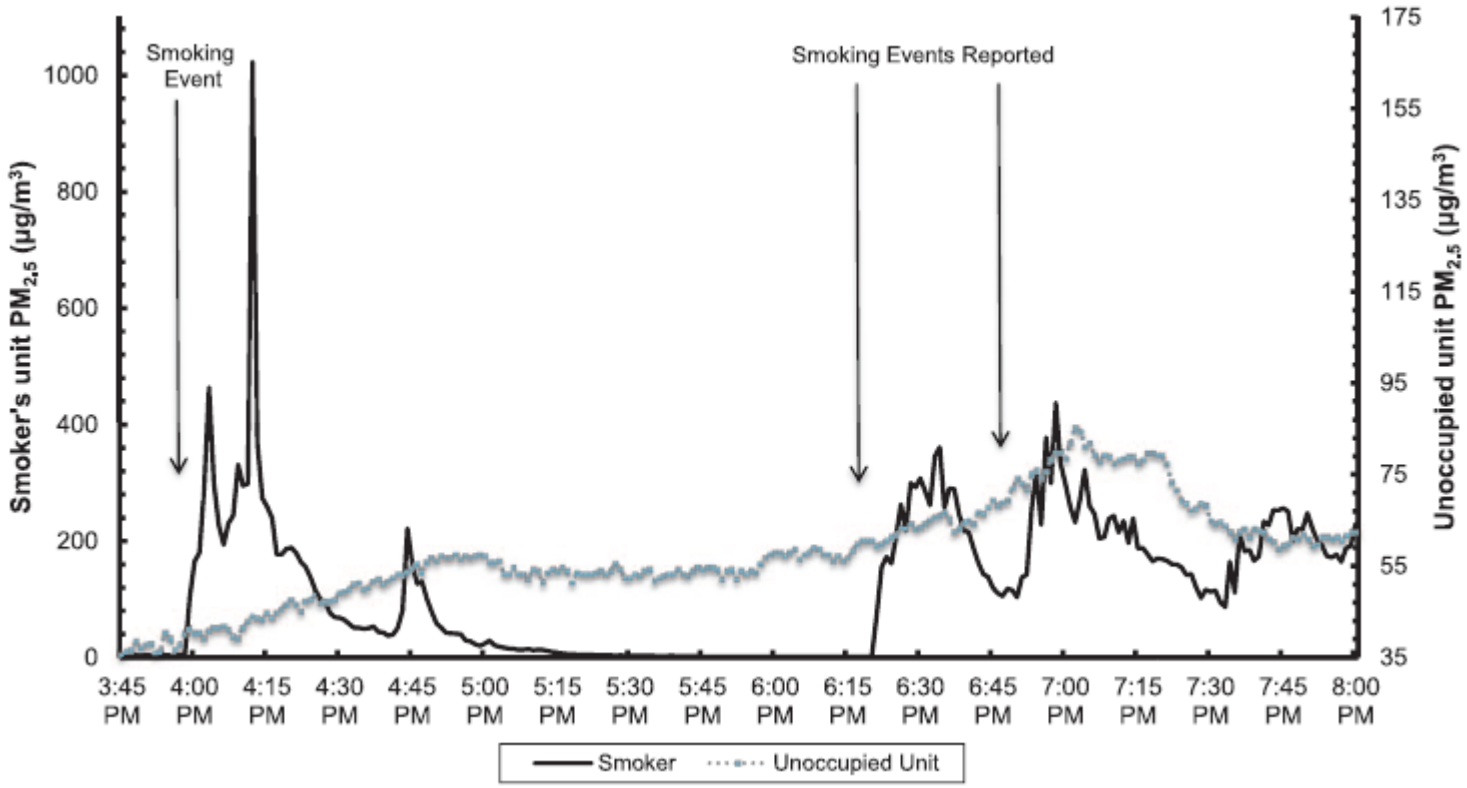
Pilot #3 – BPHC Study

- BHA residents, 15 households with smokers, 17 households with no smokers in 5 housing developments
  - Some developments smoke-free pre-policy, others transitioned during measurement
- Measured air nicotine, $PM_{2.5}$, self-report
  - In-unit and hallway measurement

Pilot #3 – Results (1)
Smoking vs. Smoke-free

- PM 2.5 lower in smoke-free sites
  - Households with smokers
    - 14.3 (smoking-allowed) vs. 7.0 (smoke-free) ug/m^3
  - Households with no smokers
    - 5.1 (smoking-allowed) vs. 4.0 (smoke-free) ug/m^3
  - Differences significant at $p<0.001$

Pilot #3 Results (2)
$PM_{2.5}$ in adjacent apartments



Russo et al., *NTR*, 2014

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Fresh Air
Aire Fresco

A 3-year R01 to study the BHA's smoke-free policy

NIH/NHLBI
R01-HL112212

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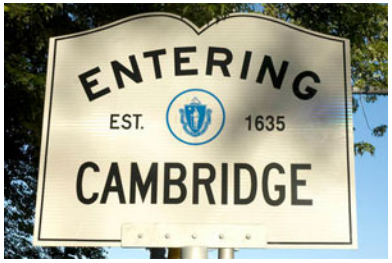
Study Design



Summer/Fall 2012

Summer/Fall 2013

Survey  Saliva Cotinine  Air Nicotine  Air PM 2.5 

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Aims

- Aim 1. Does smoke-free policy reduce SHS exposure/TSP?
  - Saliva cotinine, in-unit airborne nicotine, self-report
- Aim 2. Investigate TSP sources in BHA/CHA before and after policy
  - Common space $PM_{2.5,}$ airborne nicotine, survey data
- Aim 3. Explore resident knowledge, attitudes, beliefs, & behaviors regarding SHS/TSP and the smoke-free policy

Inclusion Criteria

- Residents of family developments
- Who speak English or Spanish
- Households where no one smokes
  - Also, excludes those with other use of nicotine
- Enrolled 192 eligible households in BHA, 95 households in CHA
  - 80%(157 BHA, 72 CHA) reached at f/u

Exposure measure details

- Self-report 
  - Survey items inquiring about locations, circumstances, duration of SHS exposure
- Nicotine monitor 
  - Deployed at interview, retrieved after ≥7 days
  - Also checklist of smoking, air conditioning, window use
- Saliva cotinine 
  - Collected at interview – 0.02ng/ml LLD

Fresh Air
Aire Fresco

Results

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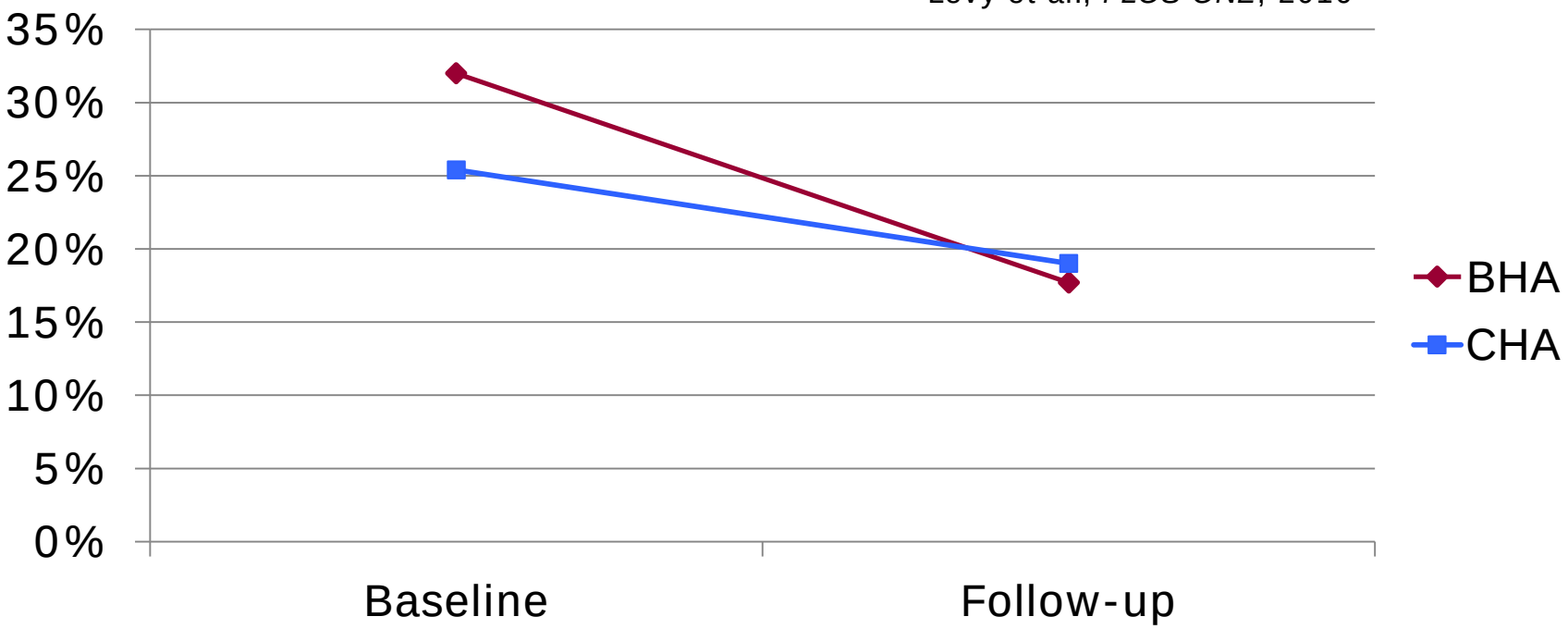
% Residents who smell smoke in their apartments (7d)

Fresh Air
Aire Fresco

Levy et al., *PLOS ONE*, 2016



	BL	FU	Dif	Dif-in-Dif	P-value
BHA	32	18	-14	-8	0.34
CHA	25	19	-6		

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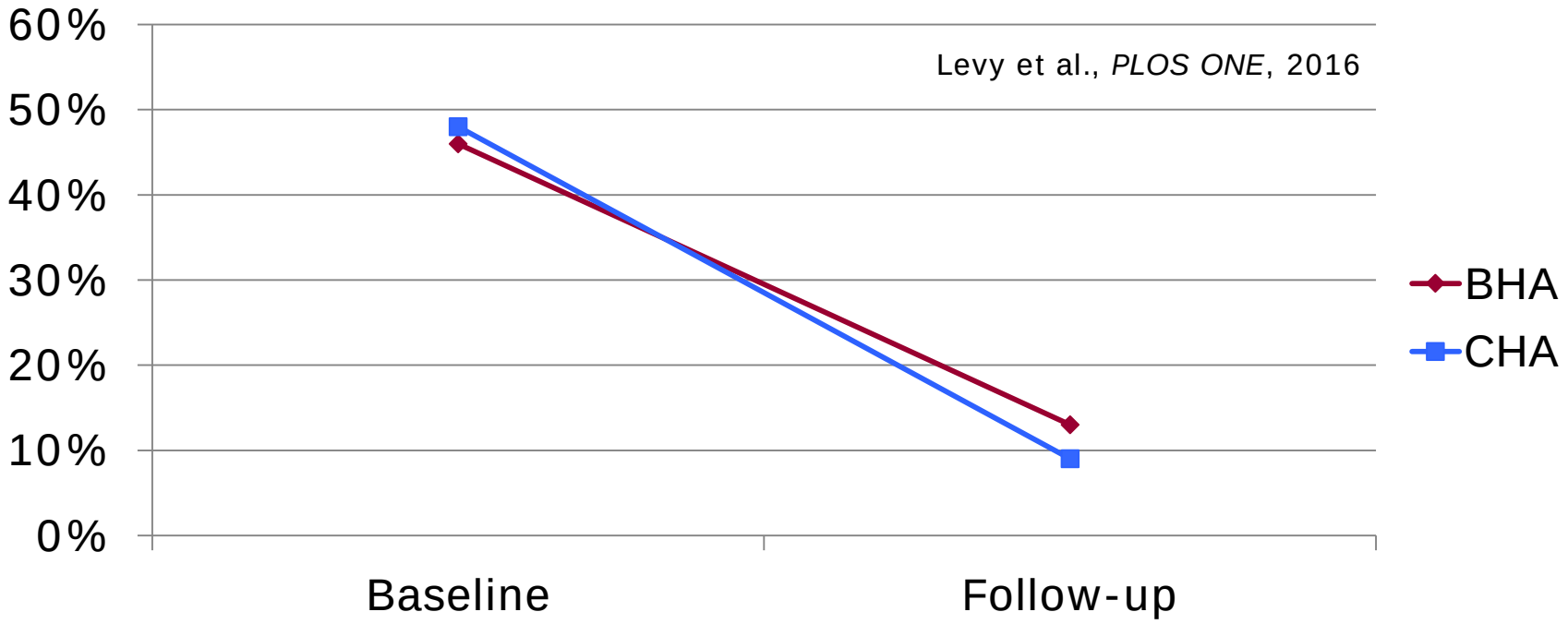
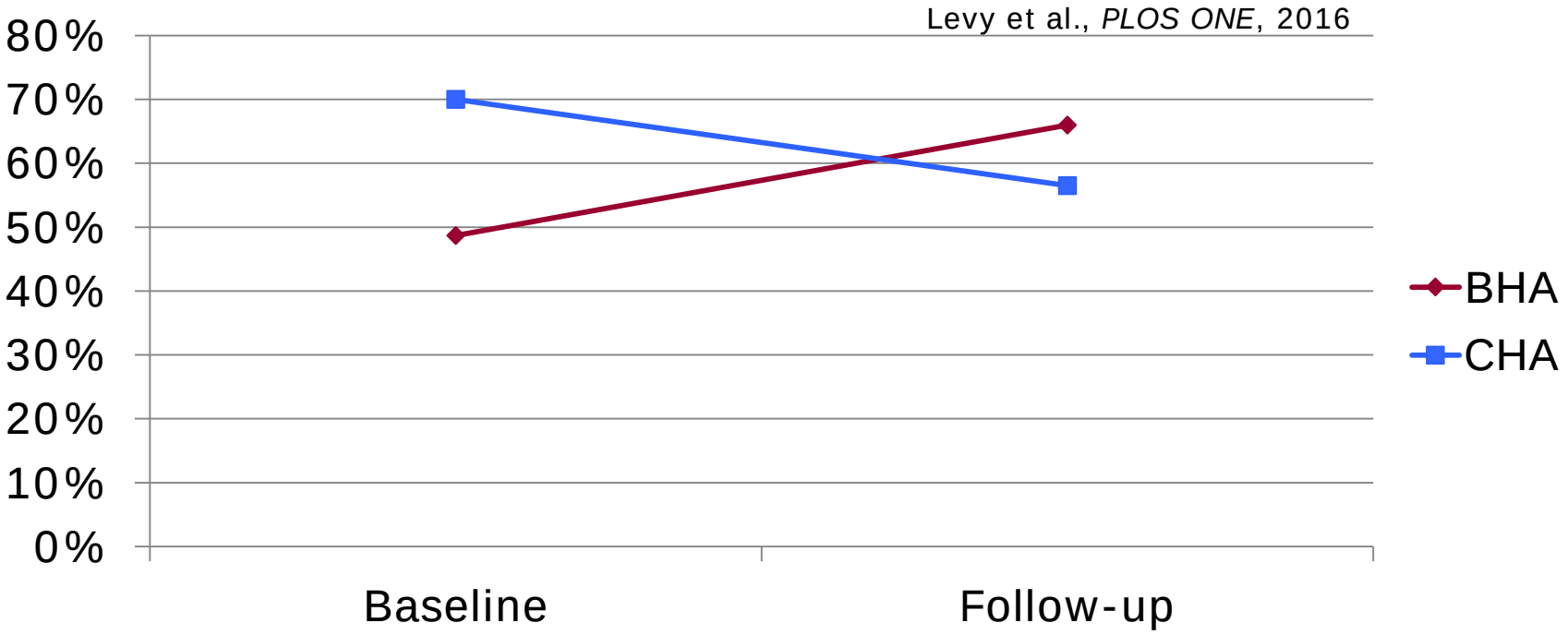
Apartment Nicotine - % detectable



	BL	FU	Dif	Dif-in-Dif	P-value
BHA	46	13	-33	6	0.40
CHA	48	9	-39		

Residents' Cotinine - % detectable



	BL	FU	Dif	Dif-in-Dif	P-value
BHA	49	66	17	30	0.002
CHA	70	57	-13		

% Residents smell smoke outside doorways of their buildings (7d)

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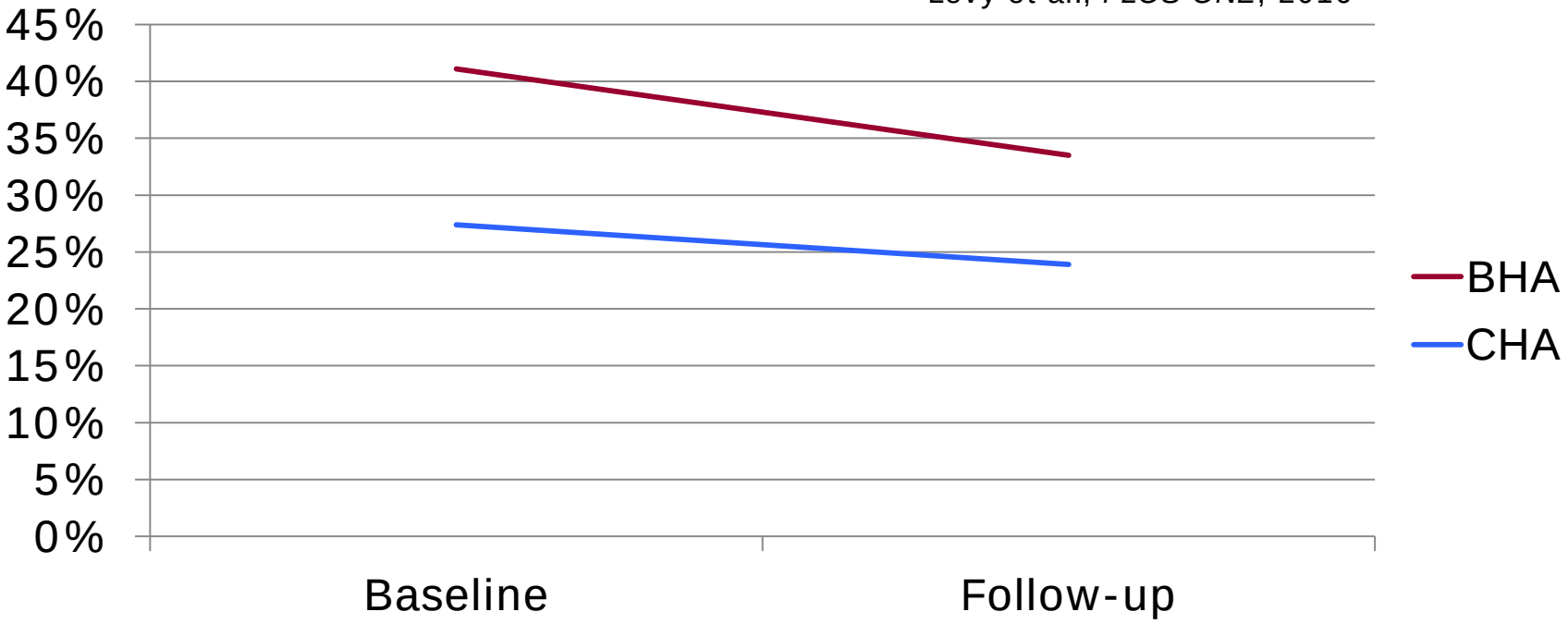
Aire Fresco

Levy et al., *PLOS ONE*, 2016



	BL	FU	Dif	Dif-in-Dif	P-value
BHA	41	34	-7	-4	0.52
CHA	27	24	-3		

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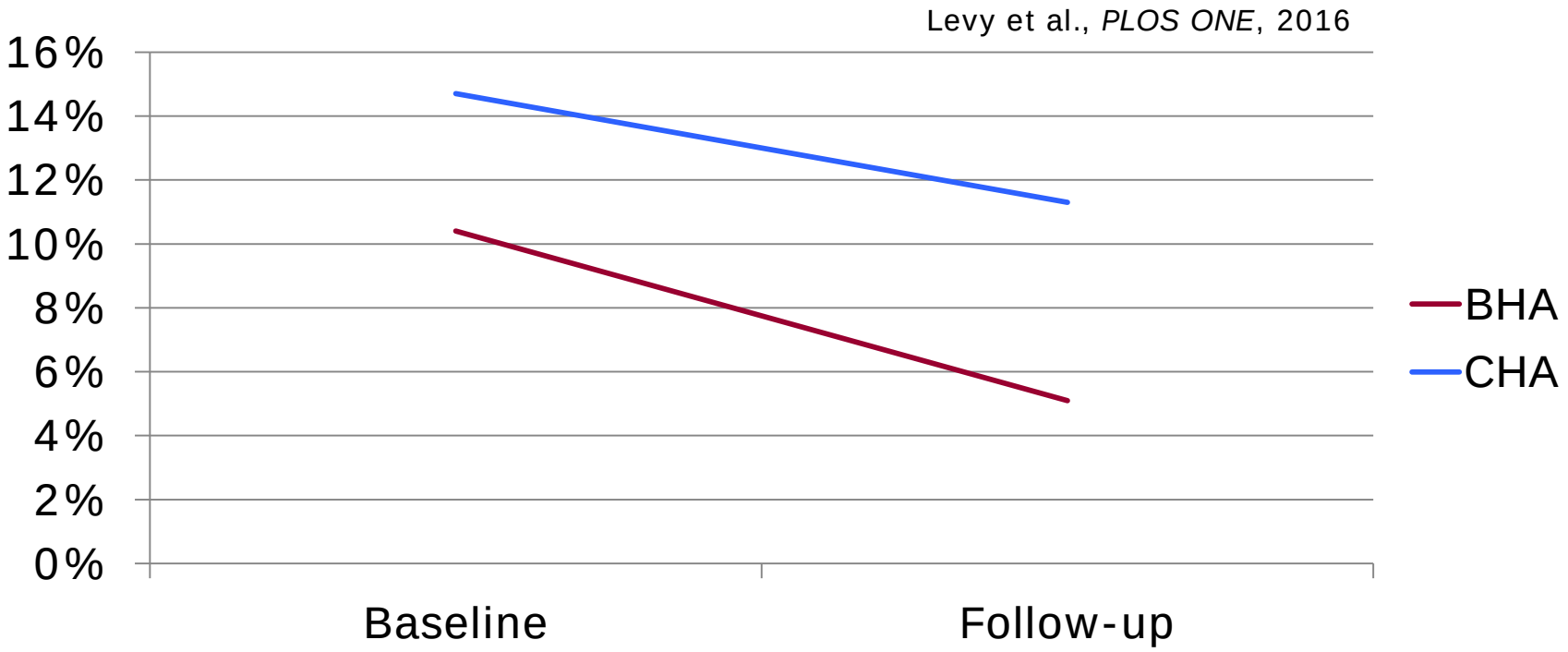
% Residents smell smoke at work (7d)

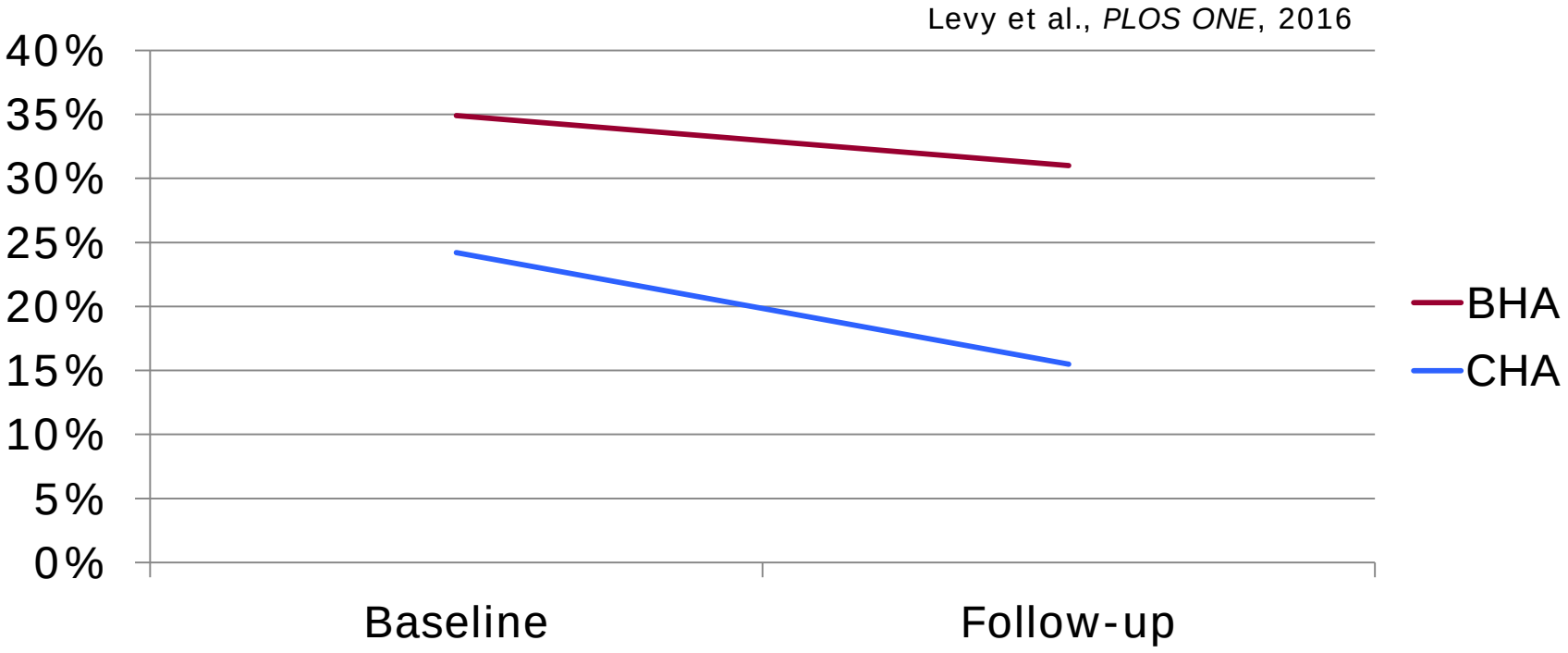


	BL	FU	Dif	Dif-in-Dif	P-value
BHA	10	5	-5	-1	0.48
CHA	15	11	-4		

% Residents smell smoke in public areas of their buildings (7d)

Fresh Air
Aire Fresco

Levy et al., *PLOS ONE*, 2016



	BL	FU	Dif	Dif-in-Dif	P-value
BHA	35	31	-4	4	0.54
CHA	24	16	-8		

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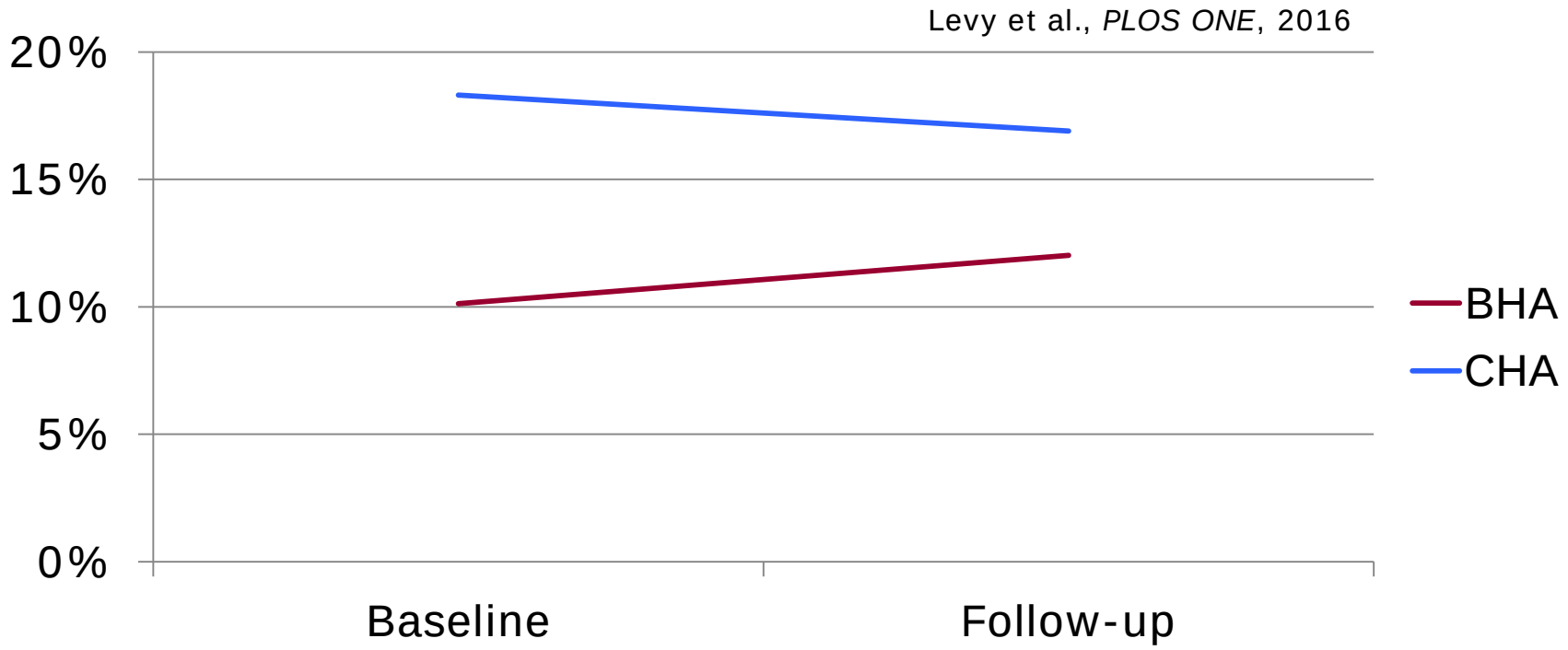
% Residents smell smoke at non-BHA friend's home (7d)

Fresh Air
AireFresco



	BL	FU	Dif	Dif-in-Dif	P-value
BHA	10	12	2	2	0.41
CHA	17	17	0		

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Common area air quality

- 10 BHA (family & elderly/disabled) and 6 CHA buildings, Jan 2012-October 2013 (FreshAir + pilot data)
- 7-day measurement; PM continuous, nicotine multiple monitors
- Adjusted for season and within-site clustering

Parameter	$PM_{2.5}$ ($\mu g/m^3$) Mean	Nicotine (ng/m^3) Log(mean)	Nicotine (ng/m^3) 90^{th} pctile
Intercept	-2.81	2.95	283
Smoking Ban	2.92	1.17	176
Boston	2.78	0.98	261
Boston*Ban	-4.05 (p=0.09)	-0.85 (p=0.08)	-191 (p=0.13)
Background PM	1.51	--	--

MacNaughton et al., *Sci. Total. Env.*, 2016

Resident experience

- FreshAir survey (family housing, non-smokers, BHA only, post-policy only)
  - 91% Aware of the policy
  - 87% Satisfied with roll-out
  - Believe policy is fair
  - Support stiff penalties short of eviction
  - 51%: people rarely follow smoke-free rule
  - Low satisfaction with enforcement associated with low housing satisfaction

Rokicki et al., *Nicotine & Tobacco Research*, 2016

Qualitative Follow-up

- 1-on-1 semi-structured interviews (PI: Inez Adams, PhD)
  - English only
- Opportunistic sampling in elderly/disabled housing
- 30 smokers, 30 non-smokers
- Direct observation

Courtesy of Inez Adams, PhD

Interview findings

- Improvements
  - Residents reported smelling smoke less in common areas
  - Common areas cleaner, free of cigarette butts
- But…
  - 23 of 30 smokers admitted to smoking in their units as much *or more* than before policy
  - Smokers resent policy
  - Non-smokers not concerned about SHS
    - Are empathetic about smokers' health, inconvenience

Courtesy of Inez Adams, PhD

Summary – SHS Exposure

- Cross-sectional studies:
  - Smoke-free policy associated with reduced SHS levels
- FreshAir studies:
  - Apartment SHS reduced — policy-related?
  - Common area SHS reduced
  - Resident SHS *increased*
    - Not due to identified exposure in BHA
    - Low levels + regression to the mean?
    - Small change in public area exposure that was not noticed by residents?

Summary – Resident experience

- Non-smokers
  - Like the policy
  - Think enforcement is lacking
- Smokers
  - Don't like the policy
  - Many don't comply with the policy
- BHA
  - Implementation is always evolving/improving
    - Now email and phone hotline for complaints

Unanswered questions

- What will happen to smoking rates in PHAs?
- What will happen in elderly/disabled housing?
- What effects on children's exposure?
- What effects on thirdhand smoke?
- What effect on health?

Challenges ahead

- Supporting smokers
  - Smoking cessation services
  - Safe places to smoke
- Enforcement/Compliance
  - HUD budget impact:
    - "Cost (recurring) -- Enforcement -- not quantified"
  - Personnel limitations
  - Technology?

Study Team

- MGH
  - Doug Levy (PI)
  - Jonathan Winickoff
  - Nancy Rigotti
- HSPH (Environmental Sciences)
  - Gary Adamkiewicz
  - Jack Spengler
- Committee for Boston Public Housing
  - Mae Bennett-Fripp
- New England Research Institutes (NERI)
  - Andre Araujo
  - Shona Fang
  - Anne Stoddard
- Boston Housing Authority
  - Kate Bennett, John Kane
- Cambridge Housing Authority
  - Gloria Leipzig, James Comer, Sam Cohen

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- Harvard School of Public Health

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Thanks!

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