Adoption, Health Impact and Cost of Smoke-Free Multi-Unit Housing Policies

New

Supporting Statement

Part B – Collection of Information Employing Statistical Methods

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Robin Soler, Ph.D.
Contracting Officer Representative (COR)
Division of Community Health
Centers for Disease Control and Prevention (CDC)
4770 Buford Hwy, N.E. MS F-81
Atlanta GA 30341
Telephone: (770) 488-5103
E-mail: RSoler@cdc.gov

TABLE OF CONTENTS

LIST OF ATTACHMENTS

REFERENCES

PART B. COLLECTION OF INFORMATION EMPLOYING STATISTICAL METHODS

B.1 Respondent Universe and Sampling Methods

B.1. A. LOS ANGELES COUNTY
The LA County data collection will employ statistical methods for sampling, weighting, and analysis and the procedures are detailed below.

Respondent Universe for Los Angeles County
SHS exposure in MUH is a critical public health concern in LA County, especially among African-American and Latino residents (29). Preliminary estimates from the 2007 Los Angeles County Health Survey (LACHS) indicate that these subgroups are disproportionately exposed to SHS. Specifically, among those living in MUH, the prevalence of SHS exposure was higher among African-Americans and Latinos than among Asian/Pacific Islanders and whites (29). African-Americans and Latinos are also more likely than Asian Pacific Islanders and whites to rent versus own their home (29). These data led to the decision to focus the LA County component of the Smoke-Free MUH Policy Study on MUH renters; hence condominium and townhome residents are excluded from the sample.

Another consideration in defining the target population was whether to sample MUH residents who are smokers, nonsmokers, or both (and by extension, limit data collection primarily to units where smoking is or is not permitted). Published literature indicates that the impact of local tobacco control policies is greater among households with nonsmokers than smokers (21, 22). Therefore, for a fixed sample size, statistical power is enhanced by limiting the sample to primarily nonsmokers (an exception is being made to allow smokers who do not smoke in the unit or attached patio and balcony). The decision to focus primarily on nonsmokers is also consistent with the overarching goal of the study, which is to assess the health, social, and cost impact of smoke-free MUH policies on involuntary SHS exposure.

Description of Sampling Frame for Los Angeles County
The study team has begun to compile a comprehensive database identifying multi-unit residential properties (two or more housing units) in LA County using federal, county, and city data sources. This database will be refined in the next two months. Data were obtained primarily from the Los Angeles County Office of the Assessor, the LACDPH's Environmental Health Program, the U.S. Department of Housing and Urban Development, the Housing Authority of the County of Los Angeles, and locally subsidized housing programs. In addition to identifying multi-unit residential properties, the LA County database includes the following information: site address; property owner's name and mailing address; property manager's or other agent of the owner's name and contact information (if applicable); property information including year built, number of buildings (if applicable), number of units per building, a legal description of the property; reappraisal year, and type of rental property (i.e., market-rate rental units or subsidized housing units).

Data from the Office of the Assessor provides the most comprehensive data regarding MUH properties. State law mandates that all property is subject to taxation based on the assessed value of the property, unless otherwise exempted. The Office of the Assessor maintains assessment records of properties in the County of Los Angeles and is responsible for locating all taxable properties and identifying ownership, establishing a taxable value for all properties, completing an assessment roll showing the assessed values of all properties, and applying all legal exemptions. LACDPH, through significant in-kind staff contributions, obtained preliminary data from the Department's Environmental Health (EH) Program to supplement data obtained from the Office of the Assessor. This enabled the study team to prepare the preliminary sampling design in the next section of this document.

To collect comprehensive information on subsidized housing, the study team, working with other LACDPH staff, obtained LA County data from the U.S. Department of Housing and Urban Development (HUD), the Housing Authority of the County of Los Angeles (HACoLA), and individual cities. HUD administers federal aid to local housing authorities to manage housing for residents through two main types of subsidized housing programs: public housing and housing choice vouchers (Section 8). These forms of rental assistance allow eligible low-income families, the elderly, and persons with disabilities to find affordable housing that is available in all sizes and types. The listing from HUD provides the property's address; the name and contact information of the property management company that oversees individual properties; and whether the residential units are reserved for low-income families, the elderly, or disabled. The listing from HACoLA includes the name and location of the public housing site; the number of units reserved for the elderly or for families; and the type of public housing programs available (e.g., public housing and Section 8 housing choice voucher program). Data obtained from each of the intervention and control cities include the name and address of these properties as well as the type of subsidized housing program available for residents.

Rationale for Selection of Intervention and Control Cities in Los Angeles County
A quasi-experimental baseline and follow-up control group design will be used to study the health, social, and cost impact of adoption and implementation of local ordinances that require MUH policies to reduce exposure to SHS in LA County. A sample of 500 MUH residents and 130 MUH Operators will be selected from intervention cities with local smoke-freeMUH ordinances and a comparable sample of 500 MUH residents and 130 MUH operators will be selected from control cities without local smoke free MUH ordinances. This initial selection of cities, described below, is subject to change, depending on the individual city's progress in adopting regulatory smoke-free MUH policies. The size of the samples will not change even if other cities are ultimately selected.

1) Intervention Cities Selection criteria
We plan to select up to twelve cities in LA County with active MUH policy campaigns and at least 20% of residents living in rental units for this study because they will most likely adopt an MUH policy during the course of the study. The initial selection of cities, described below, is subject to change, depending on the individual city's progress in adopting local smoke-free MUH ordinances in 2012 and 2013. The size of the samples will not change even if other cities are ultimately selected. At this time, we expect the intervention cities to include Sierra Madre, Lawndale, Culver City, Artesia, San Fernando, San Gabriel, Carson, Huntington Park, South

Pasadena, Compton, Pasadena, Cerritos, and Baldwin Park. See Table 1 for a list of the intervention cities and their campaign status. Special emphasis was also placed on selecting intervention cities with ethnically diverse populations and substantial health disparities.

Table 1. Intervention Cities

Intervention city name	MUH policy campaign status*	Expected policy adoption date
Culver City	In phase 4 - Try to identify champion, build coalition, public comments	2014
Lawndale	In phase 2 – Recruit coalition	2014
Sierra Madre	In phase 4 - Look for champion	2014
San Fernando	In phase 4 – Implement the campaign	2014
San Gabriel	In phase 2 – Recruit coalition, conduct presentation	2014
Carson	In phase 3 - Outreach	2014
Artesia	In phase 3 – Build coalition, conduct public comments in Jun	2014
Hawthorne	In phase 1 - Educate the public on MUH	2014
El Monte	Not started	
Baldwin Park	In phase 4 – Implement the campaign	Oct 2011 (in effect on Dec 2014)
Compton	In phase 5 – Policy implementation	Oct 2011 (in effect on Jan 2013)
Huntington Park	In phase 5 – Policy implementation	Feb 2012 (in effect on Jul 2013)
South Pasadena	In phase 5 – Policy implementation	Aug 2010 (in effect on Jan 2013)
Pasadena	In phase 5 – Policy implementation	Jul 2011 (in effect on Jul 2013)

*MUH Policy Campaign Status is based on a Policy Adoption and Implementation Model that separates the policy adoption and implementation process into five phases: community assessment (phase 1), policy campaign strategy (phase 2), coalition building (phase 3), implementation of policy campaign and adoption of the policy (phase 4), and policy implementation and enforcement (phase 5).

2) Comparison (Control) Cities Selection Criteria
We plan to select up to twelve cities in LA County as control cities for this study. In contrast to the intervention cities, control cities must not have an active smoke-free MUH policy campaign or an existing local smoke-free MUH ordinance. Control cities were identified and paired with an intervention city based on comparable characteristics and prioritized according to the following factors: previous policy adoption (e.g., treatment and control cities previously adopted smoke-free parks policies); percent of housing units occupied by renters; and median household income (see Table 2 for intervention and **control** city characteristics). The final decision about intervention and control cities will be made in 2014. The proposed comparison cities may include: Lomita, Lynwood, Monrovia, Alhambra, LaPuente, Monterey Park, Gardena, Maywood, El Segundo, South Gate, Torrance, Covina, and La Canada Flintridge.

City	Tobacco Policies*	Agency	Percent of Housing Units Occupied by Renters	Median house-hold income	Hispanic Pop[n]	White Pop[n]	Black Pop[n]	Asian Pop[n]	Total Pop[n]	City size (sq. mile)
					Table 2. Intervention and Control City Characteristics					
Sierra Madre	TRL, Dining	Day One	38.2%	82,675	14.9%	72.3%	1.7%	7.5%	10,917	2.96
Lomita	TRL, Parks		53.7%	62,464	32.8%	43.4%	4.8%	14.1%	20,256	1.92
Lawndale	TRL	SAFE	65.6%	48,357	61.0%	16.2%	9.3%	9.6%	32,769	1.97
Lynwood	TRL, Parks		53.5%	43,654	86.6%	2.2%	9.7%	0.6%	69,772	4.84
Culver City	TRL, Parks, Dining	FAME	45.7%	72,199	23.2%	48.0%	9.2%	14.5%	38,883	5.14
Monrovia	Parks		50.5%	65,477	38.4%	41.1%	6.4%	10.9%	36,590	13.75
Artesia	TRL	PCore	44.4%	50,777	35.8%	21.3%	3.3%	36.9%	16,522	1.62
Alhambra	Parks		59.2%	51,527	34.4%	10.0%	1.3%	52.5%	83,089	7.63
San Fernando	TRL, Parks	SAFE	45.5%	49,716	92.5%	5.3%	0.6%	0.8%	23,645	2.37
La Puente	Parks		39.8%	61,108	85.1%	4.6%	1.1%	8.2%	39,816	3.47
San Gabriel	TRL, Parks	Day One	50.8%	55,326	25.7%	11.4%	0.8%	60.4%	39,718	4.13
Monterey Park	TRL, Parks		44.6%	52,159	26.9%	5.0%	0.3%	66.3%	60,269	7.74
Cerritos	TRL, Parks	PCore	18.1%	86,597	12.0%	16.6%	6.7%	61.5%	49,041	8.86
La Canada-FLT	TRL		10.6%	150,357	6.3%	64.7%	0.5%	25.6%	20,246	8.65
Carson	TRL, OA	FAME	23.2%	68,425	38.6%	7.7%	23.3%	25.2%	91,714	18.94
Gardena	TRL, Parks		52.1%	46,837	37.7%	9.3%	23.9%	25.8%	58,829	5.86
Huntington Park	Park, OA	CMT	73.0%	36,561	97.1%	1.6%	0.6%	0.4%	58,114	3.01
Maywood	Parks		69.8%	37,974	97.4%	1.8%	0.2%	0.2%	27,395	1.18

South Pasadena	OA	SAFE	54.3%	80,412	18.6%	54.3%	3.0%	31.1%	25,619	3.41
El Segundo	TRL, Beaches		57.2%	87,630	15.7%	59.1%	1.9%	8.6%	16,654	5.44
Compton	TRL, OA	CMT	44.8%	43,728	65.0%	0.8%	32.1%	0.2%	96,455	10.1
South Gate	Parks		54.2%	42,556	94.8%	3.4%	0.6%	0.7%	94,396	7.35
Pasadena	TRL, OA, Parks	PDPH	54.5%	65.422	33.7%	38.8%	10.7%	14.3%	138,101	23.11
Torrance	Parks, Beaches		42.7%	74,163	16.1%	42.3%	2.7%	34.5%	146,493	20.55
Baldwin Park	TRL, OA, Parks	SAFE	39.8%	50,732	80.1%	4.3%	0.9%	13.9%	75,390	6.78
Covina	Parks		41.6%	68,904	52.4%	29.9%	3.8%	11.5%	47,796	7.03

I = Intervention
C=Control

* Dining refers to smoke-free outdoor dining policies; TRL refers to tobacco retailer licensing policies;
  Parks/Beaches refers to smoke-free park(s)/beaches policies, OA refers to smoke-free outdoor comprehensive policies.

Description of Sampling Design for Los Angeles County

Respondent Universe
The respondent universe for the proposed study will include both operators of MUH complexes as well as occupants of eligible units within these MUH complexes; 130 MUH operators and 500 MUH residents will be selected from housing complexes in each study condition (intervention and control cities). To be eligible for the study, an individual unit within a MUH complex must (a) be occupied and (b) not allow anyone to smoke in the unit during the data collection period. For the purposes of this initial study plan, cities in LA County with and without adopted smoke-free MUH policies were purposively selected for the study to represent a diverse range of study conditions. One-to-one matching (i.e., one intervention city will be matched to one control city) is used to increase equivalency of the intervention and control cities. The primary city-level matching variables include previous policy adoption (e.g., treatment and control cities previously adopted smoke-free parks policies); percent of housing units occupied by renters; and median household income. Secondary matching variables include city-level race/ethnicity; population size and city size; and number and type of MUH complexes. Table 3 provides counts of MUH complexes and is intended to illustrate the rough orders of magnitude of the size of the populations to be covered in the study.

Sampling Design
Within each of the selected cities, a multistage cluster probability sampling design will be used to randomly select MUH complexes and units within complexes. The target sample sizes are proportional to the number of MUH units in a city under a particular study condition. Such an allocation is approximately optimal for estimating outcomes that are aggregated across all cities within a study condition. The sample sizes for each city are generally too small to provide reliable city-specific estimates. The goal will be to obtain completed interviews with 130 MUH operators per study condition (corresponding to a total sample size of 260 MUH complexes).

For each of the selected cities, the sampling frame of MUH complexes will be constructed as follows. At stage 1, the primary stratification of MUH complexes will be by size of MUH defined in terms of the number of units in the complex. Stratification by size of MUH will used because it has been found to be associated with SHS exposure. For example, the 2007 Los Angeles County Health Survey (a random digit-dial telephone survey of approximately 1,000 randomly selected households) found that a significantly higher proportion of households in MUH complexes with 16 units or more (12.0%) were exposed to SHS in comparison to households in MUH complexes with 15 units or less (4.4%) (30) The use of a MUH complex unit size stratification variable that is highly correlated with SHS exposure can be effective in reducing sample variance as well as ensuring better representativeness of the sample. Moreover, stratification by size will be important in developing an efficient sample allocation because there is variability at the city level in the distribution of MUH complexes by size (e.g., see Table 3). While the definition of the size classes to be used for stratification remains to be determined, we expect that specifying three or four sizes (with a separate stratum for very small MUHs) will be sufficient to ensure a more nearly optimum allocation of the sample MUH complexes to strata.

To the extent feasible, variables such as market-based vs. subsidized housing may be used to sort MUHs prior to sampling to induce additional implicit stratification.

After stratification of the MUH complexes into appropriate size classes, a probability proportional to size (PPS) sample of complexes will be selected from each of the proposed intervention and proposed control cities to reach the targeted sample size (before considering nonresponse rate—see below) of 130 complexes per study condition. For example, assuming that 75% of MUH operators will agree to participate in the study, a total of 173 MUH complexes per condition would have to be sampled. The operators of the selected MUH complexes will be contacted for interview and asked to provide detailed listings of the non-vacant units in their complex for subsequent sampling purposes (see Section B.2, Procedures for Data Collection).

At stage 2 of sampling, a specified number of units will be selected from the lists of non-vacant units provided by the MUH operator. We expect that the number of units to be sampled per complex will vary from 2 to 8 depending on the size of the complex. The goal will be to obtain completed interviews resident surveys in 500 MUH units per study condition (1,000 total MUH units). In order to obtain these numbers, a much larger sample size must be selected to compensate for losses due to smoker status (households that allow smoking are ineligible for the study) as well as survey nonresponse (refusal, unavailable during field period, etc.). Thus, for example, assuming that 25% of units allow smoking and 80% of the remaining units agree to participate in the study, a total of 833 units per study condition must initially be selected for the sample.

After selection of the units, the adult in each household with the most recent birthday will be selected for enrollment in the study (**pages 4-6 of Attachment 8A** and study eligibility criteria in Section B.2, Procedures for Data Collection). After enrollment of the adult resident participant, we will then ask if there are children under 18 in the home and if the adult with the most recent birthday is their parent or caregiver. If they are not the parent or caregiver, the adult is interviewed for the household but is not asked to respond to the questions related to the children; he/she is then asked for the saliva sample (**Attachments 10A and 10A-1**). Next, we ask to speak with the parent/guardian to respond to the questions that pertain to the children (**Attachment 8A-3**). The child over age two with the most recent birthday is asked for the saliva sample (**Attachments 10A-1** assent and **8A-3** consent procedures will be rigorously followed). Alternatively, if the adult is the parent or caregiver, he/she is asked the entire questionnaire (including the child-related questions); asked to give saliva sample; and the child over age two with the most recent birthday is also asked for the saliva sample (**Attachments 8A-1 and 8A-3**).

Among the MUH complexes agreeing to participate in the study and meeting the eligibility criteria, a random sample will be selected for the airborne particle monitoring assessment (see B.2 Airborne Particle Monitoring for details). One hundred complexes in the intervention and control study conditions (200 total) will be selected for participation in the airborne particle monitoring assessment.

Table 3. Estimates of the number of MUH complexes and housing-related statistics by   city and condition

Type*	City	No. MUH Units	Percentage of Duplexes	Percentage of Triplexes	Percentage of Fourplexes	Percentage of 5 units of more
I1	Sierra Madre	198	25.76%	17.17%	13.13%	43.94%
I2	Lawndale	730	46.16%	18.77%	13.70%	21.37%
I3	Culver City	1,174	41.91%	15.42%	23.51%	19.17%
I4	Artesia	155	12.90%	25.16%	30.97%	30.97%
I5	Cerritos	22	0%	0%	81.82%	18.18%
I6	San Fernando	296	33.11%	22.30%	18.92%	25.68%
I7	San Gabriel	762	17.19%	15.55%	14.44%	48.82%
I8	Carson	348	41.09%	21.26%	11.21%	26.44%
I9	Baldwin Park	303	16.83%	12.87%	16.17%	54.13%
I10	Huntington Park	1,761	15.45%	27.14%	19.36%	38.05%
I11	South Pasadena	771	29.31%	11.15%	17.64%	41.89%
I12	Compton	1,624	37.68%	18.60%	22.23%	24.49%
I13	Pasadena	2,890	19.72%	19.45%	17.02%	43.81%
	All intervention sites	9,053	29,60%	18,06%	18.41%	33.92%
C1	Lomita	429	25.64%	26.34%	15.62%	32.40%
C2	Lynwood	1,123	21.91%	22.53%	23.33%	32.24%
C3	Monrovia	894	36.24%	19.13%	15.66%	28.97%
C4	Alhambra	2,634	23.73%	24.53%	15.41%	36.33%
C5	La Canada FLT	37	16.22%	21.62%	18.92%	43.24%
C6	La Puente	233	18.03%	7.30%	27.90%	46.78%
C7	Monterey Park	894	25.91%	22.56%	16.06%	35.47%
C8	Gardena	1,640	15.82%	18.63%	28.97%	36.58%
C9	Covina	547	9.14%	13.89%	17.37%	59.60
C10	Maywood	759	11.46%	39.26%	20.55%	28.72%
C11	El Segundo	538	11.90%	13.38%	19.52%	55.20%
C12	South Gate	2,080	18.51%	30.77%	22.60%	28.13%
C13	Torrance	1,563	18.94%	12.86%	26.55%	41.65%
	All control sites	10,595	20.57%	23.93%	19.75%	35.76%
	Grand total	19,648	24.73%	21.22%	19.13%	34.91%

*Prefix indicates type (I = intervention; C = control). Suffix indicates matched pairs. Data obtained from Los Angeles County Office of the Assessor.

Statistical Power
As noted in Part A, data related to these factors are presently limited; therefore, the findings from this study have the potential to inform and improve process and outcomes of smoke-free MUH strategies in other states and localities.

The LA County component of this study will sample 130 MUH operators and 500 residents in each study condition, for a total of 260 MUH operators and 1,000 residents each studied at two time intervals approximately nine months apart. One hundred airborne particle monitoring assessments in MUH complexes will also be conducted per study condition, for a total of 200 assessments at two time intervals.

The calculation of statistical power requires estimating the probability of correctly rejecting a null hypothesis (i.e., no changes in health or social impact, or costs of locally adopted smoke-free MUH ordinances in intervention cities relative to the control cities without locally adopted smoke-free MUH ordinances) that is false. Power is numerically defined as $1-\beta$, where β is the Type II error rate. Statistical power is also related implicitly to the Type I error rate (α), referred to as a "significance or alpha level" of a hypothesis test. Statistical power is typically computed during the sampling design phase of a study to ensure that there is sufficient power (i.e., 0.70 to 0.90) and the numerical quantities used in the calculations, such as the size of the intervention effect divided by the standard deviation for variables of interest (i.e., effect size), are taken from previous studies and/or published data from comparable studies.

The 2006 Surgeon General's report concludes, "The scientific evidence indicates that there is no risk-free level of exposure to secondhand smoke. Eliminating smoking in indoor spaces fully protects nonsmokers from exposure to secondhand smoke". The Surgeon General's report does not state what magnitude of health outcome improvements can be expected in the home environment within a specific time frame once SHS is reduced. Thus, any effect or change post-intervention is valuable. In addition, a comprehensive literature review did not identify a single published study focused on MUH residents or operators based on an experimental or quasi-experimental research design (i.e., pretest/posttest changes in health, social, or cost resulting from the implementation of locally adopted smoke-free MUH ordinances in intervention relative to control study condition). Therefore, the numerical quantities needed to directly calculate statistical power, effects and standard deviations, are not available. The literature review did reveal several "impact" studies among MUH residents of enclosed public places policies based on repeated cross-sectional designs, and one cross-sectional operator survey assessing perceived barriers and motivators of MUH policies as well as other MUH policy indicators. The magnitude of the effects of tobacco control policies from prior published studies are listed in **Attachment 3A.**

The values presented below can only be viewed as approximations for power. There are at least four major factors that will impact the true power that cannot be adjusted for at this time.

1. The computations assume independent samples are taken before and after treatment (change in the law). Since the same people will be surveyed there will be improvements due to the paired design. Unfortunately we don't have access to any data to show how much the improvement will be.
2. There is also a control sample in matched cities that has not been incorporated in the computations.
3. Not everyone who is surveyed before the law change will be available when we go back nine months later, so the actual sample sizes available for the comparisons will be smaller.
4. The implementation of the city ordinances are rolled out, not completely implemented in one day. As a result the differences we are likely to observe will not be a result of a full nine months of breathing cleaner air, let alone 12 months.

The first two of these will cause the actual power to increase, while the last two will cause it to decrease. Nevertheless, we believe that the above power computations are a good approximation of what we will be able to detect.

Power to detect differences in treatment conditions for salivary cotinine

We estimated power to detect changes in salivary cotinine among children and adult participants living in the MUH before and after an initiation of smoke-free policy prohibiting smoking in multi-unit housing complexes in LA County cities. Since no information on effect size for MUH smoke-free policies was available in the published literature, we used estimates for salivary cotinine reported in a cross-sectional survey conducted in January 2006 and repeated in January 2007 in Scotland for children living in a home where both parents were non-smokers (22) and for adults reported to be non-smokers (21). The policy passed in Scotland in March 2006 prohibited smoking in most enclosed public places. Table 4 shows the power calculations for the estimated changes in salivary cotinine.

Table 4. Power calculation to detect a difference in treatment conditions for cotinine levels in children and adults

	Group mean for pre-treatment for cotinine (ng/ml)	**Group mean for post-treatment for cotinine (ng/ml)**	**Change in the cotinine level (ng/ml) %**	**Sample size per treatment Actual size**	**80% power**	**Power**
Children	0.14 (0.13-0.16)	0.07 (0.06-0.08)	0.07 51%	250	168	0.92
Adults	0.35 (0.32-0.39)	0.18 (0.16-0.20)	0.17 49%	500	59	0.99

Although the estimated sample sizes to archive 80% power are 168 for children and 59 for adults, larger sample sizes were warranted because the sensitivity of cotinine test in the Scotland study (.10 ng/ml) is higher than the current study (.15 ng/ml).

Power estimation to detect a difference between pre- and post-treatment levels of PM$_{2.5}$

The $PM_{2.5}$ measurements used in the power calculations were taken from a study of SHS transfer in MUH (16). We used the median levels measured over 3-day period during the evening when exposure to a SHS is the highest (from 4:00 p.m. to 11:59 p.m.) as a reference for the pre-treatment exposure. As a post-treatment goal for $PM_{2.5}$, we used levels reported during the night time (from midnight to 7:59a.m.) when the exposure to SHS is the lowest. Table 7 shows the estimates for power calculations for the estimated changes in $PM_{2.5}$ level for the non-smoking MUHs for two different sample sizes (100 and 38 households). Assuming that the size of the effect doesn't change, and then we will need to have 38 units to measure a difference in the SHS exposure in non-smoking units with a power of 80%.

Table 5. Power calculation to detect a difference in pre- and post- treatment levels of $PM_{2.5}$ in non-smoking units

	Group median for pre-treatment $PM_{2.5}$	**Group median for post-treatment for $PM_{2.5}$**	**Change in the $PM_{2.5}$ level**	**Sample size per treatment** **Actual 80%power size (p) size**
Non-smoking MUH	10.2	7.0	3.2 32%	100(0.99) 38(0.8)

Data Analysis Plan for Los Angeles County Data

Upon completion of data collection, we will conduct a comprehensive statistical analysis to explore the following three key research questions of this study:

1. What is the impact of a required smoke-free MUH policy on MUH residents, including both adults and children?

2. What is the social impact of a required smoke-free MUH policy on MUH adult residents and operators?

3. What is the cost of a required smoke-free MUH policy?

Prior to selecting appropriate statistical testing methods, the assumptions for each test will be examined. For example, for parametric tests (e.g., two sample t-test, linear regression test), the Kolmogorov-Smirnov Test will be used to determine whether the study sample came from a normally distributed population. The Levene test will be used to examine the assumption of equal variances. Data transformation (e.g., log transformation) may be used for any non-normal data. If the normal distribution assumption is still not met after data transformation, a nonparametric statistic may be used. The comprehensive statistical analysis plan for this study includes the following aspects:

1) *Examine the Phase 1 baseline characteristics of respondents to the resident and operator surveys and selected apartment complexes by intervention condition.*

First, <u>univariate analysis</u> will be used to examine the frequency and distribution of baseline characteristics of respondents to the MUH Resident and Operator surveys as well as characteristics of the surveyed MUH apartment complexes in both intervention and control cities.

For MUH adult residents, frequencies, weighted percentages, and standard deviations will be calculated for age, gender, race/ethnicity, education, household income, health insurance status, general health status, method of air/ventilation in their apartment unit, SHS exposure from sources outside the apartment complex, length of stay in the current apartment complex, and smoking status variables.

For MUH child residents, frequencies, weighted percentages, and standard deviations will be estimated for age, race/ethnicity, and health status variables.

For MUH operator respondents, frequencies, weighted percentages, and standard deviations will be calculated for age, gender, race/ethnicity, education, whether he/she lives in the apartment complex, frequency of visiting the apartment and smoking status variables.

For surveyed MUH apartment complexes, descriptive measures such as frequencies, weighted percentages, means, and standard deviations will be calculated for variables such as total number of rental units in the apartment complex, type of apartment complex, year built, and average monthly rent for a one-bedroom, one-bath unit.

Second, <u>bivariate analysis</u> will be conducted to examine the differences in distribution of the above baseline characteristic variables between intervention and control cities for adult MUH residents, child residents, operators, and selected apartment complexes, respectively. For continuous variables with a normal distribution, a two-sample t-test may be used to examine the difference between intervention and control cities. For ordinal or interval variables, Wilcoxon-Mann Whitney test may be used. For categorical variables, Chi-square test or Fisher's exact test may be used.

Third, <u>stratified analyses</u> (e.g., three-way cross-tabulations using confounder or control variable) will be used to examine selected individual- and MUH complex-level characteristics, and differences in distribution of the baseline characteristic variables between intervention and control cities. For example, a stratification variable with two strata will be created based on the size of selected MUH apartment complexes [15 units or less versus 16 units or more] and used as a control in analyses examining differences in distribution of the baseline characteristic variables between intervention and control cities.

2) *Estimate the weighted prevalence, incidence, and mean or median of relevant key outcome variables by intervention condition and timing of survey.*

First, <u>univariate analysis</u> will be used to calculate the frequencies, weighted percentages, mean or median numbers, and crude incidences of key outcome variables at baseline and follow-up for intervention and control groups separately:

For MUH adult residents, key outcome variables include: self-reported SHS exposure in the apartment complex; cotinine presence in saliva; cigarette consumption; health status; quitting intention; quitting attempts; and knowledge, attitudes, and beliefs regarding SHS exposure.

For MUH child residents, key outcome variables include: parent/guardian-reported SHS exposure in the apartment complex; health status; and cotinine presence in saliva.

For MUH operator respondents, key outcome variables include self-reported barriers and factors that promote the adoption, implementation and enforcement of the smoke-free MUH policy; knowledge, attitudes, and beliefs regarding smoke-free MUH policies; reported frequency of receiving SHS-related complaints; reported amount of staff time used to resolve secondhand smoke-related complaints.

For a subset of selected MUH apartment units, PM2.5 level will be monitored during a seven-day period. The average seven-day PM2.5 particle counts and its 95% confidence interval will be estimated for intervention and control cities at baseline and follow-up separately.

Second, bivariate analysis will be used to examine the differences in distribution of each of the above key outcome variable between follow-up and baseline for intervention and control cities, respectively, in the total sample. For continuous variables that follow a normal distribution, paired t-test may be used to examine the changes in study variables between follow-up and baseline surveys for intervention and control groups separately. For ordinal or interval variables, Wilcoxon signed ranks test may be used. For categorical variables, McNemar test may be used. Confidence intervals and P-values will be reported for each test.

Third, stratified analysis will also be used to examine selected individual- and MUH complex-level characteristics, and differences in distribution of key outcome variables between follow-up and baseline surveys for intervention and control cities, respectively.

3) Evaluate the implementation of citywide smoke-free MUH policy.

To determine whether the citywide smoke-free MUH ordinance is implemented as planned in each sampled MUH apartment complex in the intervention cities, we will examine smoking policies in sampled MUH apartment complexes in intervention cities at follow-up and compare findings to the requirements of the city law. A new variable indicating the level of implementation may be created and used as index of intervention condition.

4) Examine the independent effect of the implementation of a citywide smoke-free MUH policy on key outcome variables.

First, the direction and magnitude of changes in each key outcome variable will be illustrated by graphs for both intervention and control cities. Such graphs may help visualize the potential treatment effect and characterize potential selection biases and maturation patterns.

Second, multilevel multivariable regression models will be used to examine the independent effect of implementing the citywide smoke-free MUH policy on key outcome variables accounting for variances at city-, apartment complex-, and individual-level as well as clustering and stratification. Baseline values of each key outcome or covariate variable will also be adjusted

in corresponding multilevel multivariable regression models. For binary outcome variables (e.g., positive saliva cotinine), multilevel multivariable logistic regression models may be used to adjust for the effect of city-level covariates (e.g., city size, population count, median household income, race/ethnicity, current smoke-free policies, percent of renter-occupied housing), apartment complex-level covariates (e.g., voluntary smoke-free policies, apartment type), and individual-level covariates (e.g., demographics, socioeconomic status, health status, SHS exposure from sources outside the apartment, smoking behaviors). For variables with count values, multilevel multivariable Poisson regression models may be used. For continuous variables (e.g., PM2.5 level, cigarette consumption, total number of days lost to work), multilevel multivariable linear regression models may be used (see Table 3).

Third, for each regression model, statistical interactions between intervention condition and potential effect modifiers (e.g., gender, type of MUH apartment complex) will be tested. If the interaction terms are statistically significant, the association between the intervention condition and the specific outcome variable examined should be reported separately for each level of the effect modifier.

The purpose of collecting cost estimates is to provide documented cost data directly associated with impact data that CDC can potentially use to model the cost-effectiveness of MUH policies. The LA County data would provide a unique combination of pre-intervention baseline and post-intervention longitudinal data on costs and environmental impact data, to inform the development of a cost-effectiveness model that addresses the following specific questions:

1. Do MUH apartment unit operators report incremental smoking-related costs associated with unit turnover (e.g., cleaning, repainting, etc.), other cleaning costs, insurance, fire damage, other repairs and maintenance, and/or administrative and other costs, and can these incremental costs be quantified for a specified time period?

2. Do MUH operators report quantifiable costs associated with implementing a smoke-free MUH policy to protect residents from the ill effects of exposure to SHS in their housing units, including putting up no-smoking signs, notifying tenants of the new policy (letters, notices, phone calls, posters), revising the current lease to include the smoke-free provision, offering staff education, training, and outreach (e.g., educating tenants, dealing with smoking violations), providing cessation information and referrals to tenants who smoke, legal costs related to policy implementation and enforcement, designating a smoking area for tenants on the property (e.g., purchase of ashtrays, receptacles, benches), and other one-time and/or ongoing costs?

The MUH Operator Survey will be the primary data source used to estimate operator costs for implementing MUH policies and incremental operator costs associated with not implementing such policies, addressing questions 1 and 2 above. These MUH Operator Survey results will be examined by subcategories for number of units in complex, average monthly rent, number of residents in unit, and other variables that could be confounders for costs related to smoke-free MUH policies.

Although the primary purpose of cost data collection is to develop a more comprehensive basis for estimating costs of implementation in the future, covariate data collected on residents' self-

reported lost work and school days can be compared to national estimates of lost work days and school days (32). Statistical analysis will examine whether these results show a significant difference in smoking-related illness prevalence and related environmental measurements associated with MUH policies to protect residents from the ill effects of exposure to SHS in their housing units, after controlling for potential confounders.

B.1.B MINNESOTA, MAINE, AND FLORIDA
The second and more limited component of the study will focus on MUH in Maine, Minnesota, and Florida, states that have already adopted and broadly implemented MUH policies to protect residents from the ill effects of exposure to SHS in their housing units either as a response to local regulations or voluntarily. Minnesota, Maine, and Florida have been added to the policy component of this research in order to expand the generalizability of conclusions made regarding adoption and implementation of smoke-free policies in MUH. Results from studies in these three geographic areas, along with results from cities in LA County, can more readily be interpreted at a national population level than could results from LA County alone. With an overall objective of national applicability, and in order to complement the one already established study site (LA County), these three specific states were chosen with the following rationale:

1. All three states have adopted state-level regulatory policies in restaurants, work places, and public spaces.

2. All three states have an active base of smoke-free advocates and researchers.

3. Minnesota and Maine have given priority to the adoption and implementation of smoke-free housing policies. Both states maintain state-level registries of smoke-free units, and both have legislative power to regulate smoke-free policies in MUH at the state or local level.

4. Florida is prohibited from adopting local smoke-free MUH ordinances by state preemption of this authority. Thus, local smoke-free MUH policies in Florida are currently on a voluntary level at the discretion of the property owner/management. In addition, the City of Orlando is currently attempting to overturn this state preemption, which will help us better understand the challenges faced to local ordinance action on smoking.

Respondent Universe and Sampling Design
The Minnesota, Maine, and Florida data collection will involve convenience samples in selected cities. The final cities or counties selected will be determined in 2014. However, as Table 6 illustrates, the cities proposed in Minnesota, Maine, and Florida are not atypical of residents of MUH complexes nationally.

TABLE 6. State and City Comparisons for Proposed Focus Group Locations

Indicator	Florida	Maine	Minnesota	United States
Total Population	**18,801,310**	**1,328,361**	**5,303,925**	**308,745,538**
% Female	51.1%	51.1%	50.4%	**50.8%**
Age (% of total population)				
< 20 years	23.9%	23.3%	26.9%	**26.9%**
20 - 39 years	25.0%	22.9%	26.4%	**27.8%**
40 - 59 years	27.7%	31.1%	28.6%	**27.8%**
60 - 79 years	18.5%	18.1%	14.3%	**14.8%**
> 80 years	4.9%	4.5%	3.9%	**3.7%**
Race/Ethnicity (% of total population)				
White	75.0%	95.2%	85.3%	**72.4%**
Black or African American	16.0%	1.2%	5.2%	**12.6%**
Asian	2.4%	1.0%	4.0%	**4.8%**
Two or More Races	2.5%	1.6%	2.4%	**2.9%**
Hispanic or Latino	22.5%	1.3%	4.7%	**16.3%**
Economic Data*				
Median household income	$44,409	$45,815	$55,459	**$50,046**
% of individuals below poverty level	16.5%	12.9%	11.6%	**15.3%**
Unemployment rate, August 2011	10.7%	7.6%	7.2%	**9.1%**
Educational Data (% of total population 25 years or older)*				
Did not graduate high school	14.5%	9.7%	8.2%	**14.4%**

High school diploma	51.1%	54.5%	50.0%	**49.8%**
College degree or higher	34.4%	35.8%	41.8%	**35.7%**
Households by Type (% of total population)				
With individuals < 18 years	29.8%	27.8%	31.6%	**33.4%**
With individuals > 65 years	31.4%	27.1%	22.8%	**24.9%**
Housing Occupancy				
% Owner-occupied units	67.4%	71.3%	73.0%	**65.1%**
% Renter-occupied units	32.6%	28.7%	27.0%	**34.9%**
% Vacant rental units	13.2%	8.9%	7.8%	**8.2%**
% Receiving housing assistance**	2.1%	3.5%	3.0%	**3.1%**
Number of Public Housing Authority Units	193,782	26,971	92,358	**5,063,071**
Risk Factor Data***				
Never Smoker	53.0%	51.6%	59.2%	**56.0%**
Former Smoker	29.8%	30.2%	25.9%	**25.2%**
Current Smoker	17.2%	18.2%	14.9%	**17.2%**

Sources: 2010 Census FactFinder

* 2010 American Community Survey

**Calculated from 2008 HUD assistance data and 2010 total population

*** 2010 BRFSS

Indicator	Tallahassee, FL	Orlando, FL	Auburn, ME	Portland, ME	Waterville, ME	Minneapolis, MN	St. Paul, MN	United States

Total Population	**181,376**	**238,300**	**23,055**	**66,194**	**15,722**	**382,578**	**285,068**	**308,745,538**
% Female	52.9%	51.4%	51.7%	51.2%	53.2%	49.7%	51.1%	**50.8%**
Age (% of total population)								
< 20 years	25.9%	24.5%	24.7%	19.4%	24.0%	23.9%	29.0%	**26.9%**
20 - 39 years	42.9%	37.5%	25.4%	35.3%	29.2%	39.8%	33.4%	**27.8%**
40 - 59 years	19.0%	24.8%	28.9%	27.7%	24.8%	24.2%	24.4%	**27.8%**
60 - 79 years	9.7%	10.7%	15.4%	13.1%	15.0%	9.8%	10.4%	**14.8%**
> 80 years	2.4%	2.7%	5.6%	4.5%	6.8%	2.6%	2.9%	**3.7%**
Race/Ethnicity (% of total population)								
White	57.4%	57.6%	93.7%	85.0%	93.9%	63.8%	60.1%	**72.4%**
Black or African American	35.0%	28.1%	2.5%	7.1%	1.1%	18.6%	15.7%	**12.6%**
Asian	3.7%	3.8%	0.9%	3.5%	1.2%	5.6%	15.0%	**4.8%**
Two or More Races	2.3%	3.4%	2.1%	2.7%	2.4%	4.4%	4.2%	**2.9%**
Hispanic or Latino	6.3%	25.4%	1.5%	3.0%	2.4%	10.5%	9.6%	**16.3%**
Economic Data*								
Median household income	$35,911	$38,098	$39,818	$45,525	$31,633	$46,508	$44,057	**$50,046**
% of individuals below poverty level	34.4%	18.5%	14.7%	18.3%	24.3%	23.3%	24.2%	**15.3%**
Unemployment rate, August 2011	8.8%	10.2%	6.8%	5.4%	7.1%	7.1%	7.8%	**9.1%**
Educational Data (% of total population 25 years								

	Tallahassee	Orlando-Kissimmee	Lewiston-Auburn	Portland-South Portland-	Augusta-Waterville	Minneapolis-St. Paul-Bloomington		
or older)*								
Did not graduate high school	6.5%	11.8%	13.5%	7.4%	13.2%	10.8%	14.6%	**15.4%**
High school diploma or some college	36.9%	47.7%	52.0%	38.3%	56.2%	37.7%	43.8%	**57.1%**
College degree or higher	56.6%	40.6%	34.3%	54.3%	30.6%	51.6%	41.6%	**27.5%**
Households by Type (% of total population)								
With individuals < 18 years	23.5%	28.5%	29.1%	20.7%	24.8%	23.5%	30.4%	**33.4%**
With individuals > 65 years	15.0%	16.8%	26.0%	20.3%	28.5%	14.1%	17.4%	**24.9%**
Housing Occupancy								
Owner-occupied units	41.4%	39.5%	57.3%	42.7%	47.8%	49.2%	51.3%	**65.1%**
Renter-occupied units	58.6%	60.5%	42.7%	57.3%	52.2%	50.8%	48.7%	**34.9%**
% Vacant rental units	11.6%	14.0%	8.2%	5.6%	9.4%	7.1%	7.2%	**8.2%**
% Receiving housing assistance**	4.3%	4.4%	6.9%	9.6%	7.0%	3.5%	7.0%	**3.1%**
Number of Public Housing Authority Units	2,582	4,220	774	2,864	588	11,122	8,282	**5,063,071**
Risk Factor Data (MSA)*	Tallahassee	Orlando-Kissimmee	Lewiston-Auburn	Portland-South Portland-	Augusta-Waterville	Minneapolis-St. Paul-Bloomington		

				Biddeford				
Never Smoker	63.1%	60.0%	53.9%	52.8%	52.3%	59.6%		**56.0%**
Former Smoker	19.8%	24.1%	32.3%	30.0%	27.0%	25.2%		**25.2%**
Current Smoker	17.2%	15.9%	13.7%	17.2%	20.7%	15.2%		**17.2%**

Sources:

2010 Census FactFinder

* 2010 American Community Survey. NB: 2010 data are not yet available for Auburn and Waterville, ME. Data for these cities are from the 2005-2009 AC estimates

**Calculated from 2008 HUD assistance data and 2010 total population

*** 2010 BRFSS

Data Analysis Plan for Maine, Minnesota, and Florida

The MUH resident focus groups will occur in three different state/local contexts. We will examine the combined focus group data by state to identify common themes in policy development and implementation, as well as to examine more closely the differences between administrative and voluntary approaches to protecting residents from ill effects of exposure to SHS in their housing units (**Attachments 12A-1 and 12A-2** for resident focus group recruitment materials). Recruitment for focus groups will be based on four primary variables: smoking status, parental status, residing in market rate or subsidized housing, and type of policy that applies to the unit (smoke-free throughout the property v. smoking restricted to specific locations on the property). Focus groups will be heterogeneous based on these four variables, and each group will have participants residing in different MUH complexes (**Attachment 12A for resident telephone screening interview**).

Separate topic guides have been developed for focus groups; there are common questions across the two guides as well as questions that are unique to each. The Process-Oriented MUH Resident Focus Group Guide is provided as **Attachment 13B** and the Outcome-Oriented MUH Resident Focus Group Guide is provided as **Attachment 13C**.). Both groups will obtain general opinions of residential smoke-free policies. Focus groups will be tape-recorded and transcribed with individual participants labeled by ID number. Transcripts and some quantitative variables will be uploaded into NVivo qualitative data analysis software for review and analysis.

Quantitative data from the pre-focus group questionnaires include demographic, health, and community characteristic items (**Attachment 13A**). Quantitative data from the MUH operator surveys include information on property characteristics; SHS-related issues; existing smoking-related policies; knowledge, attitudes, beliefs, and intentions regarding smoke-free housing policies; policy-related costs; and demographics. Quantitative data will be stored and analyzed in an Excel database.

Secondary data collection will include document review from newspapers, policy and legislative records, and conversations with key informants in each regional location. Information from these sources will be used as background for developing policy models and understanding the context for primary data. Contextual data from secondary sources will be especially useful to identify larger systemic barriers that MUH operators and focus group participants were or were not able to overcome as they developed and implemented policies to protect residents from the ill effects of exposure to SHS in their housing units.

Review and analysis of the focus group transcripts will be guided by the principles of framework analysis. First, two trained coders from the study team will read all focus group transcripts to familiarize themselves with the data and identify preliminary themes.

A priori themes will be used as umbrella categories to develop subthemes relating to barriers, examples of ways to overcome barriers, and strategies for adoption or implementation. Data review of the transcripts and quantitative data from the pre-focus group questionnaires and MUH operator surveys will allow the coders to identify possible ways to organize the transcripts for

future analysis based on differences between participant groups and individual participants. Possible ways to organize the transcripts include:

1. Region;
2. Type of non-smoking policy:
    a. Voluntary or administrative; and
    b. Common areas or all areas.
3. Parent status;
4. Smoking status;
5. Housing complex;
6. Age;
7. Gender;
8. Race/Ethnicity;
9. Process or outcome focus group guide:
    a. Operator attitude toward policy; and
    b. Participant involvement in policy development.

Other ways to organize the transcripts may be identified during transcript review or during coding (using the *NVivo software*).

After initial document review, preliminary themes will be discussed with the larger research team to determine final themes and agree on a coding template, which will be entered into NVivo. The two coders will then independently analyze one transcript, compare results to assess inter-rater reliability for individual themes, and revise the coding template as necessary. The coders will use the final coding template to code all transcripts (including recoding the first "test" transcript). Coders will draft a "Phase 1 Summary" of common themes with representative quotes and the percentage of participants that mentioned a particular theme. The Phase 1 Summary will be organized using research questions as umbrella themes.

During the next phase of qualitative data analysis, coders will run crosstabs in NVivo using the organization criteria above to create comparison groups. Intergroup differences will be summarized and documented in a "Phase 2 Summary" using descriptive measures such as frequencies. The purpose of the Phase 2 Summary is to highlight differences between participant groups with implications for the research questions, for example, how local characteristics influence policy barriers and examples of how barriers were overcome. Quantitative data from the pre-focus group questionnaires and MUH operator interviews will be used to provide context for results from qualitative analyses. The number of MUH operators completing the interview is not large enough to conduct meaningful statistical analyses; however, these interviews will provide basic information on the policy context in each regional location and may clarify individual participants' experiences and responses.

B.2 Procedures for the Collection of Information

Attachment 3C provides a flow chart for collection and analysis of MUH Operator and Resident Surveys, cotinine and Indoor Air Quality samples, and focus groups. Weighting procedures for the LA County data are addressed in B.3 below. See **Attachment 3D** for the study logic model.

B.2.1 Operator and Resident Surveys Overview

MUH operators in the selected LA County intervention and comparison cities will first be screened for participation through a telephone screening interview. Operators will be interviewed twice, approximately nine months apart (described hereafter as Baseline and Post-Intervention data collection) in person by LA County –based Field Data Collectors hired and trained by the study team. The Post-Intervention version of the LA County MUH Operator survey will be a minimally modified version of the Phase 1 (Baseline) survey. Operators selected in Maine, Minnesota, and Florida will be interviewed using the same Baseline questionnaire and following the same procedures as in LA County.

A randomly selected group of **residents** from the LA County MUH complexes whose operators were interviewed in the intervention and comparison groups will be recruited to participate in the MUH Resident Survey, cotinine and IAQ monitoring. Respondents will first be screened in person by bilingual LA County–based Field Data Collectors hired and trained by the study team. Only residents who report that they do not smoke in their apartments or allow others to do so will be eligible for the study. After completing the consent process, the adult with the most recent birthday will be interviewed face-to-face about his/her attitudes, beliefs, smoking experiences, exposure to secondhand smoke, and knowledge of the apartment complex's policies to protect residents from the ill effects of exposure to SHS in their housing units. If there are children in the home, and the respondent is not the parent/guardian/foster parent/primary caregiver, the adult in the home that fulfills that role will be asked to complete a consent and to report on the smoking exposures of the children in the home. Demographic and other covariate data will also be collected for both groups. As with the MUH Operator Survey, Post-Intervention of the LA MUH Resident Survey will be a modification of the Baseline survey. A randomly selected adult and a randomly selected child will also be asked to provide a saliva sample to analyze for the presence of cotinine. A subset of the resident units in the intervention and comparison groups will be enrolled in a seven-day indoor air monitoring protocol to assess secondhand smoke exposure in the units.

The resident interviews, cotinine samples, and air monitoring will be repeated approximately nine months later. In the third year of the project, we will conduct a secondary analysis of de-identified self-reported resident health-related data in comparison to other available datasets in LA County to assess costs and benefits of the intervention. We will also conduct secondary analysis using de-identified MUH operator data on costs of implementation and compare it to other available cost data.

B.2.2 MUH Operator Surveys will be conducted in English (**Attachments 6A [Baseline] and 7A [Post-Intervention]**).

Who Collects the Data: In LA County, survey data will be collected by Solutions Field Data Collectors and Westat Field Data Collector Supervisor hired from LA County. Data entry, cleanup and weighting are done by Westat, which transmits data to LACDPH for analysis. In Maine, Florida, Minnesota survey data will be collected by Healthy Housing Solutions and Westat senior project team members; data to be analyzed by Healthy Housing Solutions.

Frequency: 1) LA County: Interviewed twice; 2) Maine, Minnesota, and Florida: interviewed one time.

Procedures: Based on lessons learned from the pilot study, we have concluded that large property management firms and public housing authorities will need to be contacted several months in advance to address their questions about the study and secure permission to interview operators of the selected MUH complexes (**Attachment 4A-1**). At the time data collection is approved to begin by OMB, operators will first be called by Field Data Collectors using a telephone script tested during the pilot (**Attachment 4A**). If not reached by phone, the Field Data Collector will attempt to visit the MUH complex and schedule the interview in person. Two attempts to schedule the interview will be made before another MUH unit is selected from the replacement pool. At the beginning of the scheduled interview, the MUH operator will be presented with an introduction to the study and an informed consent form to read, ask questions about, and sign (in-person) (**Attachment 6A-1**). The operator will be provided with a copy of the form.

If the MUH operator agrees to be interviewed, the Field Data Collector will administer the MUH Operator Baseline Survey (**Attachment 6A**). After the interview is complete, MUH operators will be asked for permission for the Field Data Collector to conduct the visual assessment of the exterior and entries to the units. Upon completion, the Field Data Collector will provide the operator with a $75 gift card incentive.

The operator will also be asked to provide lists of occupied units and copies of building policy or procedure documents related to the implementation of the policies to protect residents from the ill effects of exposure to SHS in their housing units. This is to provide proven examples of instances where these barriers were avoided, removed, or mitigated.

Finally, MUH Operators will be asked to accompany Field Data Collectors for a short visual assessment of the exterior and common areas of the buildings in each complex where operators are surveyed. Specifically, we assess presence of a designated exterior smoking area, proximity of the smoking area to windows and doors of the buildings, presence of cigarette butts or other smoking debris on the ground outside the entrance to the building, presence of receptacles for cigarette butts at the entry to the unit or in the designated smoking area, exterior and interior signs on smoking policies, smell of tobacco smoke in the hallways and other interior common spaces (e.g., entry foyer), and other housing conditions known to trigger or exacerbate respiratory conditions (such as proximity to highways, deterioration that can allow pests or moisture to enter the building, poor ventilation). This provides an independent verification of the presence of factors that may mask or confound the effects of smoke-free policies in the apartment complex.

Attachment 7A (Smoke-Free MUH Policy Study: Operator Survey – Post-Intervention) will be administered to the respondents who completed the Baseline survey nine months later. There will be no replacement of operators who drop out of the study. Operators will also be asked to provide lists of occupied units and copies of building policy or procedure documents related to the implementation of the policies to protect residents from the ill effects of exposure to SHS in their housing units. Finally, MUH Operators accompany Field Data Collectors for a short visual assessment of the exterior and common areas of the buildings in each complex where operators are surveyed.

B.2.3 The LA MUH Resident Surveys will be conducted in English and Spanish. (**Attachments 8A(e) and 9A(e)** provide the English translation; see **Attachments 8A(s) and 9A(s)** for the Spanish language versions).

Who Collects the Data: Collected by bi-lingual Solutions Field Data Collectors and Westat Field Data Collector Supervisor hired from LA County. Data entry, cleanup and weighting are done by Westat, which will transmit data to LACDPH for analysis.

Where/What: 1,000 resident surveys in LA County, administered twice (baseline and follow-up).

Frequency: LA County: Interviewed twice. We estimate this will take approximately 45 minutes for the adult component of the interview including the visual assessment of the living room and kitchen, and 15 minutes for the children's module.

Procedures: The Field Data Collectors will recruit selected MUH residents as described below (See description of resident selection procedures in Section B.1). Wearing a shirt that identifies the study as well as a photo ID badge, the Field Data Collector will go to each of the units listed on his/her assignment sheet. At each unit, he/she will introduce him/herself and indicate that he/she is a member of the study team. He/she will ask to speak with an adult household member. The Field Data Collector will determine whether the respondent prefers to speak in English or Spanish, explain the study and gain the householder's consent to be screened for eligibility. The Field Data Collector will administer the screening survey (**pages 4-5 in Attachment 8A**). Specifically, he/she will ask to speak with the adult household member with the most recent birthday. If that person is available, the Field Data Collector will ask to speak with him/her, determine language preference, explain the study, and gain cooperation to complete the MUH Resident Survey. If the selected householder is not available, the Field Data Collector will determine when he/she might be home and leave a resident recruitment flyer for his/her review. Based on that information, the Field Data Collector will either return at the appointed time or will collect a telephone number so that he/she can call and schedule an appointment. The Field Data Collector will also leave a card with contact information should the selected household member want to call and schedule an interview (**Attachment 8A-4** door hanger).

Field Data Collectors will make two attempts to screen a household before closing the case. They will also confirm with the MUH operator that the unit is occupied. For households where the sampled respondent is identified but not available, the Field Data Collector will make three attempts to complete the interview before closing the case.

Once the Field Data Collector has gained cooperation, he/she will have the respondent read the informed consent form, ask questions, and if willing to continue (**Attachment 8A-1**). The respondent will be provided with a copy of the signed form. If the respondent does not agree to be interviewed, the Field Data Collector will attempt to convert the refusal, following procedures identified in the training manual. After enrollment of the adult resident participant, the Field Data Collector will then ask if there are children under 18 in the home and if the adult with the most recent birthday is their parent or caregiver. If the adult respondent is not the parent or caregiver, he/she will only be interviewed for the household and asked for the adult saliva sample. Next, we will enroll the parent/guardian and ask that person to respond to the questions that pertain to the children (consent - **Attachment 8A-3; Attachment 8A Resident Survey - Baseline [Section G]**). If the adult respondent is the parent or caregiver, he/she will be asked the entire questionnaire (including the child-related questions) and to give the adult saliva sample (**Attachment 8A-1**).

If the respondent agrees to be interviewed, the Field Data Collector will administer the MUH Resident Survey and conduct a brief visual assessment inside the unit for confounders (i.e., presence of smokers in adjacent units, smell of smoke drifting into the unit from the exterior, etc.).

Attachment 9A (Smoke-Free MUH Policy Study: Resident Survey - Post-Intervention) will be administered to the respondents who completed the Baseline survey nine months later. There will be no replacement of residents who drop out of the study.

B.2.4 Saliva Cotinine Samples of LA County Residents. (**Attachment 10A** for protocol, **Attachment 8A-1** for adult consent and **Attachment 10A-1 for child assent**)

Who Collects the Data: Collected by bi-lingual Solutions Field Data Collectors and Westat Field Data Collector Supervisor hired from LA County, data analyzed by LACDPH.

Where/What: Up to 1,500 samples collected in LA County at the same time as the scheduled MUH Baseline Resident Surveys to reduce burden on respondents, and then nine months later. One adult respondent (randomly selected) per household will be asked to provide a sample (N=1,000); any household with children present at the time of the first resident interview will be asked to provide a child sample if the child is over age two (N=500).

Frequency: LA County: Samples collected twice. We estimate that saliva collection will take no more than 10 minutes per sample.

Procedures: The Field Data Collector will gather saliva samples from each respondent by instructing the respondent how to place a cotton swab under the tongue and hold it there for 1 -2 minutes. Salivary cotinine sampling will be used to measure SHS exposure for a minimum of 500 adults and approximately 250 children over age two each for the intervention and control conditions at Phase 1 (Baseline) and Phase 2 (Post-Intervention) data collection. Children over age two are selected as participants for saliva cotinine sampling in order to assure that they can comply with the saliva collection protocol. Children over the age of seven will be read the assent

and then asked to sign the assent (**Attachment 3A-4**). Samples will be transported in a cooler containing ice to the LACDPH, where they will be frozen.

The saliva samples will be sent to Salimetrics Laboratory for analysis (located at 101 Innovation Boulevard, Suite 302; State College, PA 16803). Salimetrics utilizes a high sensitivity (0.15 ng/mL) enzyme immunoassay for the quantitative measurement of cotinine in saliva samples**.** The intent is to obtain a sole source contract with Salimetrics Laboratory. However, in the event that sole source approval is not obtained from LACDPH Materials Management Division because lower prices are available elsewhere, a laboratory with equal or higher sensitivity and comparable quality assurance procedures will be used.

B.2.5 Indoor Air Quality (IAQ) monitoring for a seven day period (LA County), maximum of 100 households randomly selected from MUH Resident Survey participants per the intervention and comparison study conditions.

Who Collects the Data: Collected by Solutions Field Data Collectors and Westat Field Data Collector Supervisor hired from LA County, data analyzed by LACDPH.

Frequency: LA County: Samples collected twice, approximately nine months apart. Equipment will be placed in the apartment at the end of the MUH Resident Survey and visual assessment.

Procedures: IAQ monitoring enables us to collect data on residents' exposure to particulates smaller than 2.5 micrometers in diameter, the size of SHS particles as well as other particles know to be associated with respiratory conditions. Airborne particle monitoring equipment will measure particle levels for seven full days to capture a representative sample Field Data Collectors will place monitors in the main living area of each unit in the same location at baseline and follow-up. To reduce the burden of the air quality monitoring to the MUH residents, the pump noise of the monitors will be mitigated with muffling material in a plastic receptacle to eliminate annoyance for unit occupants. We estimate that it will take 30 minutes to set up the equipment and train one resident to complete the household diary, 30 minutes to collect the equipment, and five minutes daily for the resident to complete the diary.

The following equipment will be used per unit: (1) An industry-standard real-time SidePak laser photometer for measuring continuous $PM_{2.5}$ levels; (2) An industry-standard gravimetric $PM_{2.5}$ filter-and-pump sample; and (3) a novel and inexpensive real-time Dylos particle counter, which has been used to roughly discriminate different types of aerosol sources allowing us to segregate levels associated with cooking, ambient, or suspended dust sources in the monitored unit. Real-time particle monitors will be calibrated in the laboratory against a TEOM particle standard to obtain mass conversion factors for a range of particle source types.

Following the protocol developed for airborne particle monitoring, the Field Data Collector will set up the monitor (**Attachment 11A**) and instruct the residents on how to complete a diary (**Attachment 11A-1**). Diaries kept by the residents during the seven days help to identify periods of SHS exposure and exposure to other sources of particulates that could obscure the effects of a smoke-free policy, including tobacco smoke odor, as well as times spent at home, cooking and cleaning activities, and other particle-generating activities (**Attachment 11A-1** for household diary). For units assigned to airborne particle monitoring, we estimate 30 minutes for set up.

Field Data Collectors will return to units selected for environmental airborne particle assessment seven days after data collection began in the unit to retrieve the air monitoring equipment and diaries.

The effect of tobacco smoke contamination (e.g., tobacco odor) will be controlled in the statistical modeling of the data. All real-time data will be immediately downloaded at LACDPH by the LACDPH staff once the monitors are retrieved from a given unit and stored on a password-protected server. Filter samples will be frozen until re-weighing is performed. Duplicate filter samples will be gathered in each unit for each monitoring period and blanks will be used for each batch of weighing.

B.2.6. Resident Focus Groups in Minnesota, Maine, and Florida. The Minnesota, Maine, and Florida component research questions are:

1. What are the most often experienced and most challenging barriers to adopting voluntary and administrative MUH policies to protect residents from the ill effects of exposure to SHS in their housing units?
2. What are examples of how these barriers were avoided, removed, or mitigated?
3. What are effective strategies for adopting voluntary and administrative policies?
4. How can local successes in adopting and implementing voluntary or other policies be scaled up to the national level?

Who Collects Data: Collected by Healthy Housing Solutions and Westat senior project team members; data analyzed by Solutions.

Where/What: Four Focus Groups of up to 10 residents of the MUH complexes whose operators were interviewed in Minnesota, Maine, and Florida (estimated total of 120 resident participants). Residents will be recruited through flyers, newsletter articles, and door-to-door (**Attachments 12A-1 and 12A-2**). All participants will be asked to complete consent (**Attachment 13A-1**) and a short demographic and attitudinal survey (**Attachment 13A**).

Frequency: One time.

Purpose: To provide qualitative data on residents' views of the process of adopting and enforcing MUH policies to protect residents from the ill effects of exposure to SHS in their housing units. Qualitative research techniques such as focus groups allow in-depth exploration of one topic during the group session and are thus able to identify differences in participants' perceptions of the topic at the time of administration. These focus groups will have two primary themes: 1) the process by which residents were incorporated into the development of existing MUH policies (**Attachment 13B**) and 2) the outcomes of the policies adopted (**Attachment 13C**).

Procedures: Once the MUH operators in these communities have been interviewed, residents will be recruited from those complexes by posting flyers and door hangers in the buildings and by entries in any existing community newsletters (**Attachments 12A-1 and 12A-2**). Interested potential participants will call a toll-free number to be screened for assignment to a focus group

(**Attachment 12A**). The telephone screening interview will be used to assure a mix of resident types (smokers v. nonsmokers, residents of market-rate v. subsidized housing, parents v. nonparents) are assigned to the different focus groups. There will be a maximum of 4 focus groups per state. Two of these will focus on residents' involvement in the process of adoption and implementation of MUH policies to protect residents from the ill effects of exposure to SHS in their housing units; the other two will focus on their experience with the policies. Each type of focus group (process and outcome-oriented) has its own question guide (**Attachments 13B and 13C**). Within each of these broad thematic groupings, we will look at residents in MUH units that had voluntarily or have been required by local law or administrative policy that 1) ban smoking in common areas (playgrounds, hallways, laundry rooms, etc.) but not the individual units or 2) ban smoking throughout the complex, including the units. Our telephone screening survey will be used to assign interested respondents to the appropriate focus group.

Solutions and Westat representatives will travel to the location and serve as facilitators for the focus groups. Conduct of the focus groups will occur as follows:

- Groups will be held in locations convenient to residents, and at least one group per jurisdiction will be held in the evening. This may require rental of venues if they cannot be provided at the MUH complexes.
- No more than 10 questions related to a main theme will be covered in the session. Follow-up to participants' comments will occur during the allotted time.
- All group sessions will be audio-recorded to enable transcription of the session. The assistant facilitator will be responsible for monitoring the tape recorder, taking notes, and alerting the primary facilitator to the time elapsed. The assistant facilitator will assign respondents a code so that it will be possible to identify their individual comments during transcription.
- The facilitator or assistant facilitator may use a flip chart and markers to note major themes or to temporarily "table" topics for later discussion.
- Participants will be provided an introductory package that contains a consent form and a short demographic and attitudinal survey. These forms will be collected by the assistant facilitator at the start of the discussion.
- The facilitator will welcome the participants, remind them of the purpose of the group, and set ground rules for participation (e.g., raising hands, no right/wrong answers, everyone gets to speak, "what is said in the room stays in the room." the fact that the session will be tape-recorded, etc.).
- There will be an ice-breaker to increase participants' comfort level with discussion.
- The facilitator will manage time so that all topic areas are addressed. The facilitator will manage the discussion in a non-judgmental way so as to elicit participants' expression of views on all topics.
- After the participants leave, the facilitator and assistant facilitator will debrief while the tape is running to identify date, time, and name of group.

B.3 Methods to Maximize Response Rates and Deal with Non-response in Los Angeles County

Published findings for both residential and operator surveys suggest that some nonresponse can be expected. Nonresponse in pre/post surveys stems primarily from noncontact, refusals, and attrition. Nonresponse is a potentially serious methodological threat to the interpretation of the study findings if it occurs differentially across the study conditions (i.e., non-ignorable nonresponse). Although differential nonresponse is a potential problem in both the cross-sectional and longitudinal aspects of the study, we are primarily concerned with differential nonresponse in the longitudinal study as it could bias conclusions made regarding the health, social, and cost impact of MUH policy adoption and implementation.

To reduce the potential for nonresponse bias, a wide array of strategies will be utilized and are presented below.

Preventing Nonresponse through Minimizing Noncontacts

Noncontacts are particularly problematic because if the Field Data Collectors are not able to conduct the screener questions, it is not possible to know if the unit would have been eligible for the survey. To minimize noncontact rates, Field Data Collectors will make multiple visits to each sampled unit. These visits will include weekdays and weekends. Field Data Collectors will also visit at different times of day, to the extent it is safe to be in the area.

Preventing Nonresponse through Avoidance of Refusals

Avoidance of refusals requires a thorough understanding of the primary factors for decisions regarding respondents agreeing to participate in the study. Key respondent refusal factors include untoward reaction to "introductory" materials and contacts (e.g., letters, phone contacts); lack of interest in study aims; lack of adequate incentive fees relative to burden of participation; cultural barriers; inadequate training and inexperience of Field Data Collectors; and task demands of study participation (e.g., length of survey forms, airborne particle monitoring data collection burden).

Each of these determinants of refusal will be mitigated through a wide array of methods, including hiring of high quality bilingual staff, implementation of quality assurance procedures such as close supervision of the Field Data Collectors by the Field Data Collector Supervisor and members of the study team, and through comprehensive training. For example, Field Data Collectors will undergo a rigorous three-day training conducted by Solutions, Westat, and LACDPH staff and contractors (Dr. Neil Klepeis) on the necessary skills to execute the study, including participant recruitment; administration of the MUH Operator and Resident Surveys; and handling and field storage procedures for completed surveys and samples. The goal of training will be to prepare staff to successfully perform field survey tasks in a consistent and standardized fashion. A comprehensive training manual will also be distributed to each Field Data Collector working on the LA County MUH operator and resident surveys. Topics of the training manual include general interviewer techniques (e.g., the appropriate way to ask questions and record answers, contacting and recruiting participants, professional behavior, and standards and ethics) and gaining cooperation and refusal conversion. To address cultural barriers, resident respondents will have the option of conducting the interviews in English or Spanish. In addition, all "introductory" materials will have been carefully reviewed to preclude

untoward reactions by participants, and will be translated into Spanish before data collection begins. Reasonable incentive fees will be offered to offset the burden of participation.

In spite of the use of extensive refusal avoidance procedures, participant refusal is unavoidable. Weighting procedures will be used to minimize the effects of nonresponse.

Preventing Nonresponse through Mitigation of Attrition
We will utilize two primary approaches to mitigate attrition. The first approach is to maintain contact information for study participants through implementation and maintenance of effective tracking procedures. In addition, establishing good rapport with the participants during Phase 1 (Baseline) data collection is critical to reducing attrition. The hiring of high quality Field Data Collectors and offering of comprehensive training increases the likelihood that their interactions with participants will promote cooperation. The second approach for mitigating attrition is through the calculation of adjustment weights to correct for possible attrition.

Methods for Investigating Impact of Nonresponse
Nonresponse will be evaluated at Baseline) and Post-Intervention of the study. Simple descriptive statistics, such as counts and frequencies, will be tabulated for respondents and nonrespondents. Nonrespondents can be further divided into categories of refusals and noncontact. After Post-Intervention), response rates will be calculated and comparisons between respondents and nonrespondents on socio-demographic characteristics (e.g., age, gender, and race/ethnicity) and other relevant factors will be performed.

Management of Missing Data and Other Issues

Missing data
For variables with less than 10% of missing data, an imputation strategy may be applied to estimate the missing data based on the distribution of each individual's baseline characteristics such as age, gender, race/ethnicity, education, and household income. If the survey data were poorly collected resulting in substantial missing data for some variables (>20%), the characteristics of the missing data will be carefully examined and handled with appropriate strategies.

Loss to follow up
Loss to follow-up is a potential methodological issue due to the high mobility of the renter population. We will be able to characterize the issue by comparing the distribution of baseline characteristics and outcomes of respondents who remained in the study to those who were lost to follow-up. Differential attrition is particularly problematic for interpreting the study findings and a wide array of precautions are being taken to mitigate nonresponse as noted above.

Seasonality
The occurrence of some indicators may vary from season to season. If the follow-up survey is conducted in a different season from the baseline survey, seasonality will be adjusted in the analytical models.

Weighting Los Angeles County Data
To ensure that the study findings can be generalized to the target MUH resident population, a population weight will be generated and used in all statistical analyses.

Description of Sample Weighting for Los Angeles Resident Survey
At the completion of Phase 2 data collection, the respondents will be weighted to provide unbiased estimates for the population of MUH residents in the 18 cities proposed for study. These weights will be used in all analyses.

The initial probability of selection for a respondent is the probability of selecting their MUH, times the probability of selecting their unit given their MUH was selected. The base weight for that respondent is one over this probability, and is given by the following equation:

$$BWGT \quad = \quad 1/[P(MUH)*P(unit|MUH)]$$

This base weight is multiplied by separate adjustments for Phase 1 (Baseline) non-contacts and nonresponse. These must be done separately since it is unknown if non-contacts are eligible or not (does someone truly live there and do they exclude smoking in the unit). Nonresponse can happen at two stages. If the residents refuse to answer any questions, then they are also of unknown eligibility and will be included in the first adjustment. Those who have confirmed eligibility but then do not complete the questionnaire (for whatever reason, including that the randomly sampled adult is not available at any attempted visit) will be adjusted for in a second nonresponse adjustment.

The eligibility adjustment will be based on the observed eligibility rate among those whose eligibility is finalized. So, for example, if 90% of units with finalized eligibility have been found to be eligible, then 90% of those with unknown eligibility will be assumed to be eligible as well.

Thus the weight after the first phase of data collection will be

$$WGT\_P1 \quad = \quad BWGT*ELIG\_ADJ*NR\_ADJ$$

Field Data Collectors will attempt to conduct Phase 2 (Post-Intervention) with all of the respondents to the first phase of data collection. Attrition will take place due to two sources: the Phase 1 (Baseline) respondent may no longer live in the MUH, or they may become a nonrespondent. If they have moved out of the MUH, they are no longer eligible for the study. It is unknown if they would have similar responses as those who remain, so it is possible that this exclusion will underestimate the full impact of the change in smoking policies. It is anticipated that the number of such movers will be relatively small due to the timing of the two phases of data collection.

The weights for movers will be set to 0. The Phase 2 (Post-Intervention) completed cases will have their Phase 1 (Baseline) weight adjusted for Phase 2 (Post Intervention) nonrespondents to provide a final weight:

$$FNL\_WGT \quad = \quad WGT\_P1*P2\_ADJ$$

To the extent that large numbers of completes are available for a given city, these adjustments will be conducted within the city. In many cases the number of completes will be too small, in which case the treatment cities will be collapsed for adjustment (and similarly the control cities).

The above procedure is for estimating effects and costs based on the proportion of MUH units. For analyses of effects and costs for adults living in MUHs, it will be necessary to multiply the FNL_WGT by the number of adults living in the unit. The same procedure will be followed for the weights per children.

There are no control totals for the number MUH units or the number of adults living in MUHs in each city (or even all of LA County), so there is no opportunity to post-stratify to reduce variability.

We are collecting air monitor measurements from 100 treatment units and 100 control units. These will be spread across 200 MUHs, from which one of the sampled units in each MUH will be selected to also have air monitoring. The air monitors from MUHs in a given size-by-treatment stratum will represent the air in all units in such MUHs. If the sampling frame indicates that there are N_h units in that stratum, and we collect air monitoring from n_h of them, the air monitor weight will be:

$$\text{AIR\_WGT} \quad = \quad N_h/n_h$$

Los Angeles County Operator Survey
Weighting the operators is more straightforward than the residents, since all operators in the sampled cities are eligible. The base weight is simply one over the probability of selecting the MUH:

$$\text{BWGT} \quad = \quad 1 /P \text{ (MUH)}$$

There is a nonresponse adjustment for Phase 1 (Baseline) refusal to participate. If a MUH has gone out of business, its weight will be set equal to 0:

$$\text{WGT\_P1} \quad = \quad \text{BWGT* NR\_ADJ}$$

This will be the final weight unless some of the operators either refuse to participate with Phase 2 (Post-Intervention) or have gone out of business in the interim. If either of those occurs, we will compute a final weight as:

$$\text{FNL\_WGT} \quad = \quad \text{WGT\_P1*P2\_ADJ}$$

B.4   Test of Procedures or Methods to be Undertaken
Both the MUH Operator and the MUH Resident Baseline Survey were subject to a pilot test conducted by Healthy Housing Solutions and Westat. Modified versions of the recruitment materials, consents, and Operator and Resident Surveys were piloted in MUHs in Baltimore and Gaithersburg, MD from October 21-31, 2011. The Post-Intervention version of the LA County

MUH Operator and Resident surveys will be a minimally modified version of the Baseline survey.

The goals of the pilot were to:
- Test and revise the protocols for survey administration and participant recruitment;
- Ensure clarity of questionnaire language; and
- Identify timing; skip pattern, and other complex conceptual issues that may not be readily obvious from simple reading of the questionnaire.

Following the pilot, the materials were revised to improve clarity, and shortened to reduce response burden by approximately 10-15% overall. The interviews and feedback received from awardees participating in the pilot led to the conclusion that collecting data from MUH operators and residents in-person is both feasible and preferable to a telephone survey of these respondent categories.

Who Collected the Data: Healthy Housing Solutions, Inc. and Westat.

Materials piloted:
1. Recruitment materials for operators (phone screening script, appointment confirmation letter);
2. Recruitment materials for residents (recruitment flyer, phone screening script, appointment confirmation letter);
3. Consent and MUH Operator Questionnaire with supplemental observational data; and
4. Consent and MUH Resident Questionnaire with supplemental observational data.

Purpose of the pilot was to:
- Test and revise the protocols for survey administration and participant recruitment;
- Ensure clarity of survey language;
- Identify timing; skip patterns, and other complex conceptual issues that may not be obvious from simple reading of the survey; and
- To determine whether the questions adapted from earlier studies were appropriate for the target respondents (preliminary cognitive testing).

To minimize burden and to use questions previously tested with similar populations or housing types, the MUH Operator and MUH Resident questionnaires adapted questions from the following studies (**Attachment 3A** for more details):

1. Roswell Park Cancer Institute's surveys of Multi-Unit Housing Operators and Residents;
2. Multi-unit Housing Owner/Manager Survey Questionnaire funded by the California Department of Public Health's Tobacco Control Program and conducted on behalf of the University of California, Los Angeles and the California Apartment Association;
3. Behavioral Risk Factor Surveillance Survey 2011;
4. Los Angeles County Health Survey 2011;
5. Massachusetts Tobacco Survey – Adults;
6. California Tobaccos Survey – Adults;

7. Strata Corporation and Context Research, Ltd. Residents in MultiUnit Dwellings, 2008. Conducted on behalf of the Heart and Stroke Foundation of B.C. and Yukon to support the British Columbia Smoke-Free Housing in Multi-Unit Dwelling (MUDs) Initiative;
8. National Survey of Lead and Allergens in Housing: Resident Questionnaire, study sponsored by the US. Department of Housing and Urban Development and the National Institute of Environmental Health and Sciences; and
9. Healthy Housing Inspection Manual, 2008, developed by the Centers for Disease Control and Prevention and the U.S. Department of Housing and Urban Development.

Healthy Housing Solutions and Westat piloted four operator and three resident surveys in English. Consents took approximately five minutes to complete. The operator surveys took approximately 50 minutes to complete. The visual assessments for the operator surveys took approximately 30 minutes. Resident surveys took approximately 35-50 minutes to complete, depending on person selected (resident adult completion took approximately 35 minutes; parents with children took 15 minutes). Visual assessments following the resident surveys took approximately 15 minutes. All participants received $30 gift card incentives at the completion of the interview.

Following the pilot of the MUH Operator and Resident Surveys, the survey materials were revised to improve clarity and shortened to reduce response burden by approximately 10-15% overall. The cotinine sampling collection protocol was not pilot tested because it is similar to the one that has been recently used by one of the study team members in LA County for the purpose of collecting data for the National Health Examination and Nutrition Survey. That individual will oversee the data collection and analysis using the same protocol. The key difference between the NHANES protocol and the one proposed here is that the Salimetrics testing methodology utilizes a high sensitivity (0.15 ng/mL) enzyme immunoassay for the quantitative measurement of cotinine in saliva samples.

There was no formal pilot of the IAQ monitoring protocols since this protocol is currently being used in MUH units studied by LACDPH'S CPPW program. This project has contracted with the same individual to oversee data analysis for the IAQ monitoring using the same protocol. However, to illustrate the feasibility of the study's technical approach, Table 7 presents the airborne particle monitoring data recently collected from 9 different multi-unit housing (MUH) locations in LA County in the table below. The monitored units cover a broad range of building and construction types, income levels, and types of secondhand smoke transfer. Sites were chosen among nonsmoking persons who complained of secondhand smoke odor in their unit. Typically, smoke was reported to travel up through cracks along the edge of the floor, or through cracks around electrical outlets or bathroom piping. In some cases, smoke odor was reported near air vents or when smoke came in through open balcony doors or windows when active smokers were present outdoors. These cases demonstrate that the problem of SHS transfer in MUH can affect nearly anyone who lives next to a smoker. In several of the units, the contractor obtained clear evidence of high levels of particulate matter associated with secondhand smoke.

Table 7. CPPW Recent IAQ Monitoring Results

	City	Complex Type	No. of Levels	Size of Complex	Unit Type	Hotspot – Infiltrating Smoke
1	Long Beach	Condominiums	2	4-12/BLDG; 3 BLDGS	3 BDRM	Cracks in bedroom floor; window
2	Santa Monica	High Rise Condos	17	500+/BLDG; 2 BLDGS	1 BDRM	Balcony and outlets
3	Santa Monica	Apartments	3	9-18/BLDG; 7 BLDGS	1 BDRM	Electrical
4	Los Angeles	Rent-Controlled Apts.	2	6/BLDG; 2 BLDG	STUDIO	Cracks in closet floor
5	Palmdale	Senior Living	4	200+/BLDG;1 BLDG	1 BDRM	Bathroom; outlets
6	Palmdale	Senior Living	4	1 BLDG	1 BDRM	Bathroom; outlets
7	Glendale	Condominiums	2	50+/BLDG; 1 BLDG	2 BDRM	Bathroom pipes
8	Pasadena	Apartments	3	10-30/BLDG;3 BLDG	2 BDRM	Floor Vents
9	Van Nuys	Apartments	2	8/BLDG; 4 BLDG	1 BDRM	Floor vents

B.5 Individuals Consulted on Statistical Aspects and/or Analyzing Data

Table 8 identifies the individuals who were consulted on statistical aspects and data analyses:

- Members of the Healthy Housing Solutions, Westat, and LACDPH team: Dr. Mark Weber, Dr. David Marker, Dr. Tony Kuo, Dr. Neil Klepeis, Mr. Rick Nevin, Ms. Sarah Wylie; Ms. Carolyn Kawecki, Mr. Jack Anderson, Ms. Mary Dingwall, and Ms. Linda Aragon.
- Developers of MUH Operator and Resident surveys referred to in the development of the pilot survey documents (Brian King, Michael Ong); and
- The Supervising Epidemiologist for the Los Angeles County Health Survey,(Amy Lightstone) and other LACDPH offices, including the senior health economist (Dr. Ricardo Basurto-Davila).

Table 8. List of individuals and organizations that were consulted for the study

Name	Organization	Contact Information
Dr. Mark Weber	Healthy Housing Solutions	Phone: 213- 351-7890 Email: mweber@ph.lacounty.gov

Dr. David Marker	Healthy Housing Solutions	Phone: 301- 251-4398 Email: markerd1@westat.com
Dr. Tony Kuo	LACDPH	Phone: 213- 351-7341 Email: tkuo@ph.lacounty.gov
Neil Klepeis, PhD, MS	Neil Klepeis and Associates	Phone: 831-406-1088 Email: neil@exposurescience.org
Mr. Rick Nevin	Healthy Housing Solutions	Phone: 703-435-2725 Email: ricknevin@verizon.net
Ms. Sarah Wylie	Healthy Housing Solutions	Phone: 919-699-3351 Email: sarah.wylie@gmail.com
Ms. Carolyn Kawecki	Healthy Housing Solutions	Phone: 301- 524-5078 Email: carolynkawecki@yahoo.com
Mr. Jack Anderson	Healthy Housing Solutions	Phone: 443-539-4182 Email:jandesron@healthyhousingsolutions.com
Ms. Mary Dingwall	Westat	Phone: 301-738-3583 Email: marydingwall@westat.com
Ms. Linda Aragon	LACDPH	Phone: 213-351-7811 Email: laragon@ph.lacounty.gov
Michael Ong, MD, PhD	Department of Medicine, General Internal Medicine and Health Services Research, University of California, Los Angeles	Phone: 310-794-0154 Email: mong@mednet.ucla.edu
UCLA ATS	UCLA Academic Technology Services, Statistical Consulting Services Group	Email: atsstat@ucla.edu
Amy Lightstone, MPH	Office of Health Assessment and Epidemiology, Los Angeles County Department of Public Health	Phone: 213-240-7785 Email: alightstone@ph.lacounty.gov
Richardo Basurto-Davila, PhD, MSc	Office of Health Assessment and Epidemiology, Los Angeles	Phone: 213-989-7127 Email: ribasurto-

	County Department of Public Health	davila@ph.lacounty.gov
Ning Rosenthal, PhD, MPH	Tobacco Control and Prevention Program, Project TRUST, Los Angeles County Department of Public Health	Phone: 213-427-4410 Email: nrosenthal@ph.lacounty.gov
Lana Sklyar, MPH	Tobacco Control and Prevention Program, Project TRUST, Los Angeles County Department of Public Health	Phone: 213-427-4409 Email:lsklyar@ph.lacounty.gov
Donna Sze, MPH	Tobacco Control and Prevention Program, Los Angeles County Department of Public Health	Phone: 213-351-7339 Email: dsze@ph.lacounty.gov
Jillian Wong, MPH	Tobacco Control and Prevention Program, Los Angeles County Department of Public Health	Phone: 213-351-7336 Email: jwong@ph.lacounty.gov
Christine Oh, PhD	Tobacco Control and Prevention Program, Los Angeles County Department of Public Health	Phone: 213-351-7324 Email: coh@ph.lacounty.gov
Janice Casil, MPP	Tobacco Control and Prevention Program, Project RENEW, Los Angeles County Department of Public Health	Phone: 213-427-4413 Email: jcasil@ph.lacounty.gov
Brian King, PhD	Office of Smoking and Health; National Center for Chronic Disease Prevention and Health Promotion, CDC	Phone: 770-488-5107 baking@cdc.gov

Table 9 identifies team leads for all activities.

Table 9. Leads in Data Collection, Research/Sampling Design, and Data Analysis

Task	Lead	Affiliation	Reviewer	Contact Information
Data Collection				
a) MUH Operator Survey for non-Los Angeles communities	Carol Kawecki,	Solutions	Solutions, Westat	Phone: (301) 524-5078 (Carol) Email: carolynkawecki@yahoo.com
b) Focus groups for non-Los Angeles communities	Carol Kawecki, Amanda Reddy	Solutions		Phone: (301) 524-5078 (Carol) Email: carolynkawecki@yahoo.com Email: areddy@healthyhousingsolutions.com
	Mary Dingwall	Westat		Phone: (301) 738-3583 (Mary) Email: MaryDingwall@Westat.com
c) All data collection activities for Los Angeles County	Carol Kawecki,	Solutions	Jack Anderson, Dr. Mark Weber, Dr. David Marker	Phone: (301) 524-5078 (Carol) Email: carolynkawecki@yahoo.com
	Mary Dingwall	Westat		Phone: (301) 738-3583 (Mary) Email: MaryDingwall@Westat.com
Study Design				
a) Los Angeles County study design	Dr. Mark Weber	Solutions	Solutions, Westat	Phone: (213) 351-7890 (Mark) Email: mweber@ph.lacounty.gov
	Dr. Tony Kuo	LACDPH		Phone: (213) 351-7341 (Tony) Email: tkuo@ph.lacounty.gov

b) **Non-Los Angeles communities study design**	Carol Kawecki,	Solutions	Solutions, Westat	**Phone: (301) 524-5078 (Carol)** **Email: carolynkawecki@yahoo.com**
	Mary Dingwall	**Westat**		**Phone: (301) 738-3583 (Mary)** **Email: MaryDingwall@Westat.com**
c) **Logic model**	**Dr. Mark Weber, Carol Kawecki,**	**Solutions**	**Solutions**	**Phone: (213) 351-7890 (Mark)** **Email: mweber@ph.lacounty.gov** **Phone: (301) 524-5078 (Carol)** **Email: carolynkawecki@yahoo.com**
	Dr. Tony Kuo, Ms. Linda Aragon	**LACDPH**		**Phone: (213) 351-7341(Tony)** **Email: tkuo@ph.lacounty.govPhone: (213) 351-7811 (Linda)** **Email: laragon@ph.lacounty.gov**
d) **Study sampling plan for Los Angeles County**	**Dr. Mark Weber**	**Solutions**	**Solutions, Westat LACDPH**	**Phone: (213) 351-7890 (Mark)** **Email: mweber@ph.lacounty.gov**
	Dr. David Marker	**Westat**		**Phone: (301) 251-4398 (David)** **Email: markerd1@westat.com**
e) **Sample weighting design**	**Dr. David Marker**	**Westat**	**Dr. Mark Weber**	**Phone: (301) 251-4398 (David)** **Email: markerd1@westat.com**
f) **MUH Operator and Resident Surveys**	**Dr. Mark Weber**	**Solutions,**	**Carol Kawecki, Mary Dingwall, Dr. David Marker, Rick Nevin, Jack Anderson**	**Phone: (213) 351-7890 (Mark)** **Email: mweber@ph.lacounty.gov**
	Dr. Tony Kuo, Ms. Linda Aragon	**LACDPH**		**Phone: (213) 351-7341 (Tony)Email: tkuo@ph.lacounty.gov** **Phone: (213) 351-7811 (Linda)** **Email: laragon@ph.lacounty.gov**
g) **Salivary cotinine collection**	**Dr. Tony Kuo**	**LACDPH**	**Dr. Mark Weber, Carol Kawecki, Mary Dingwall, Dr. David Marker, Jack Anderson**	**Phone: (213) 351-7341** **Email: tkuo@ph.lacounty.gov**
h) **Airborne particle monitoring**	**Dr. Neil Klepeis**	**LACDPH contractor**	**Carol Kawecki, Mary Dingwall, Dr. David Marker, Jack Anderson**	**Email: neil@exposurescience.org**

	Dr. Mark Weber	Solutions		Phone: (213) 351-7890 (Mark) Email: **mweber@ph.lacounty.gov**
i) Visual inspection protocol of MUH complexes	Carol Kawecki, Jack Anderson,	Solutions	LACDPH, Dr. Neil Klepeis, Dr. David Marker	Phone: (301) 524-5078 (Carol) Email: **carolynkawecki@yahoo.com** Email: **janderson@healthyhousingsolutions.com**
	Mary Dingwall	Westat		Phone: (301) 738-3583 (Mary) Email: **MaryDingwall@Westat.com**
Data Analysis				
a) Data analysis for Los Angeles	Dr. Mark Weber	Solutions,	Dr. David Marker, Carol Kawecki, Jack Anderson	Phone: (213) 351-7890 (Mark) Email: **mweber@ph.lacounty.gov**
	Dr. Tony Kuo	LACDPH		Phone: (213) 351-7341 (Tony) Email: **tkuo@ph.lacounty.gov**
b) Data analysis for non-Los Angeles communities	Carol Kawecki, Amanda Reddy	Solutions	Dr. Mark Weber, Dr. David Marker, Mary Dingwall, Jack Anderson	Phone: (301) 524-5078 (Carol) Email: **carolynkawecki@yahoo.com** Email: **areddy@healthyhousingsolutions.com**
c) Los Angeles cost analysis	Rick Nevin	Solutions	Dr. Ricardo Basurto-Davila, Dr. Mark Weber, Dr. David Marker	Email: **ricknevin@verizon.net**

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