

Methodological Note #006

## Sample Substitutions in the AmericasBarometer 2016/17

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### Key Findings:

- This note explains LAPOP's procedures for substituting sampling points that are hazardous, unapproachable, or otherwise unfit for inclusion, and offers an assessment of substitutions in the 2016/17 round of the AmericasBarometer.
- The number of substitutions in the 2016/17 round (888 interviews) is tiny relative to the total number of interviews (40,443 interviews): only 2.2% of all interviews.
- Security concerns are the main reasons for substitutions, but other problems include the absence of a sufficient number of households in the sampling point, insufficient respondent participation, poor infrastructure, and local hostility.
- What effect do substitutions have on the survey? We provide one estimate through a simulation exercise using LAPOP's self-reported crime victimization item. We find that substitutions are unlikely to introduce bias in the overall results that would threaten the reliability of cross-country comparisons.



Surveys based on area-probability sample designs do not provide carbon copies of the population of being studied.<sup>1</sup> One way in which the copy fails to be exact is that no survey sample can avoid at least some under-coverage of the population of interest.<sup>2</sup> Under-coverage (i.e., coverage bias) is first and foremost an artifact of two factors: the difference between the population of interest and the population included in the listing frame, and the difference between the population in the listing frame and the sampling frame.<sup>3</sup> Yet, under-coverage can also emerge when fieldwork deviates from the sample design.<sup>4</sup>

While collecting data for the AmericasBarometer, interviewers may need to deviate from the original sample design because of concerns for their personal safety in the pre-selected enumeration areas, when their access to these areas may be denied or not possible, or due to difficulties finding sufficient numbers of respondents to meet Probability Proportional to Size (PPS) criteria in the selected locations.<sup>5</sup> In those circumstances, LAPOP's local fieldwork partner may request that a sampling point be substituted. LAPOP then determines whether the substitution is justifiable. In theory, such requests, if large in number, could bias the probability of respondent selection towards those who live in safer and more accessible locations,<sup>6</sup> potentially introducing sampling bias. Investigators must weigh these implications against fieldwork costs and ethical concerns with regard to interviewer safety.

In this *Methodological Note*, we describe the substitutions made in the 2016/17 round of the AmericasBarometer. In general, there were relatively few deviations from the sample design. Substitutions that were made tended to come primarily within urban strata and in high-crime areas.<sup>7</sup> Nevertheless, there is considerable variation in the reasons behind sampling points substitutions across the countries in the AmericasBarometer. Overall, substitutions affected only 2% of all interviews.

## Why Substitutions Occur and Why They Matter

The AmericasBarometer draws nationally representative samples of voting-age adults using face-to-face interviews in Latin America and the Caribbean. Samples in each country follow a multistage probability design and are stratified by major regions of the country, size of municipality, and by urban and rural areas within municipalities. But these samples rely on available census data, which can sometimes – especially at a very local level – be outdated. Moreover, census sampling frames do not contain reliable, up-to-date information about issues like crime and accessibility.

For this kind of information, LAPOP must rely on the evaluations and expertise of our local fieldwork partners. Our partners sometimes request that particular enumeration areas be substituted before the start of the fieldwork, based on their knowledge of current, local conditions. More often, these kinds of requests are made during the fieldwork itself, once local teams arrive at the selected areas. In urban settings, interviewers may find that the selected enumeration areas no longer contain households as a result of urban renewal or spreading commerce or industry. More frequently, they encounter inhospitable environments: gated communities or doorman-controlled buildings that do not permit entry, or crime-prone areas that threaten the security of interviewers. In rural areas, sampling spots might not be reachable due to inclement weather conditions. Particularly in remote areas, communities may be so suspicious of outsiders that interviewers are kept from entering or are promptly invited to leave.

These kind of requests for deviating from the sample are unavoidable, but could introduce bias. If substitution requests were allowed without review and authorization and in large numbers, they could introduce bias by systematically privileging more accessible or more convenient sampling points. While LAPOP is continually developing remote quality-supervising techniques such as FALCON<sup>®</sup> and RIGHT<sup>®</sup> to minimize enumerator error,<sup>8</sup> sampling point substitution is an entirely different form of potential error. Consequently, it is important to carefully review and

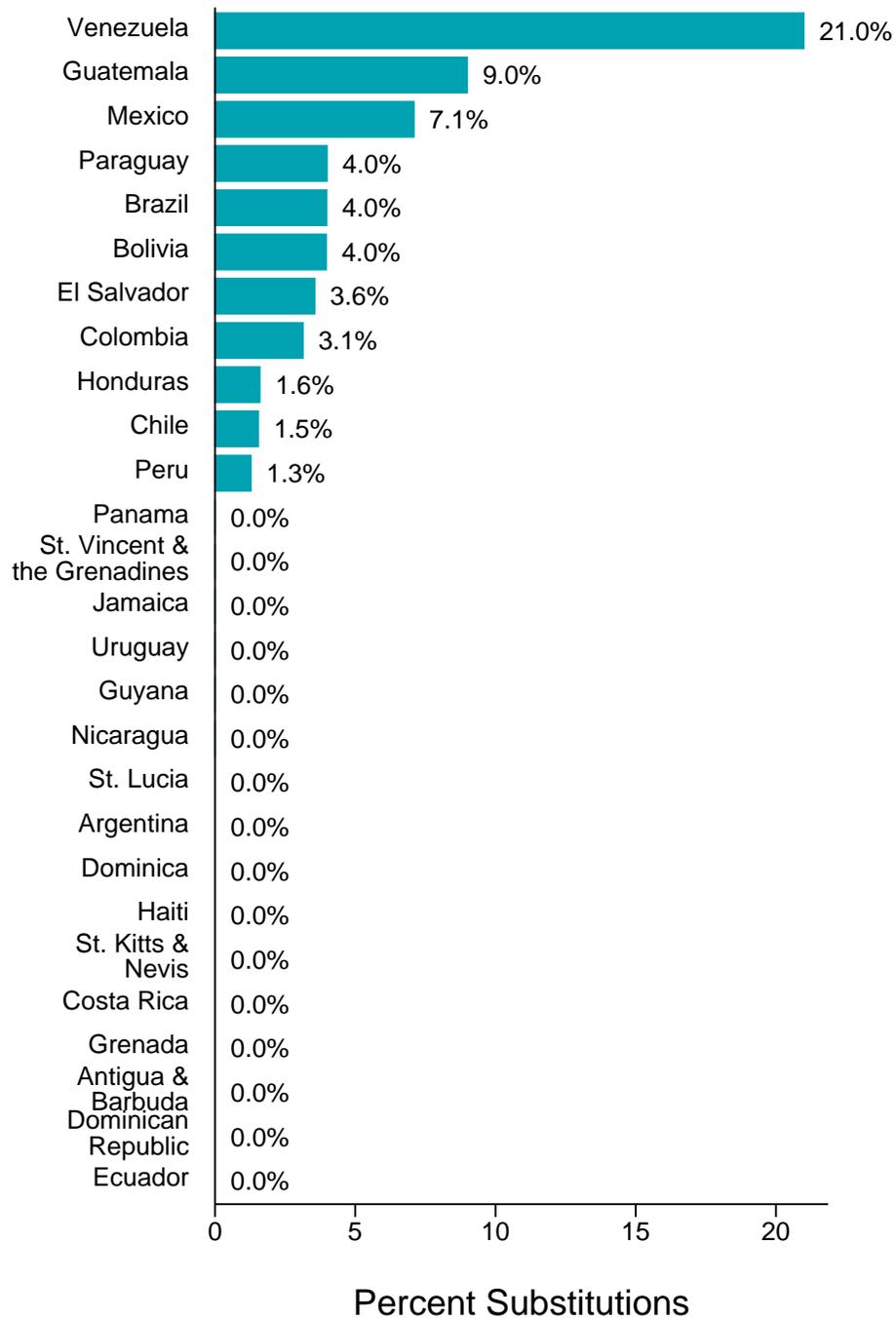
limit to the bare minimum substitution requests that emerge from the field and to grant such requests in way that is likely to minimize bias.

## LAPOP's Substitution Protocol

Local teams normally request the substitution of a selected sampling point if they believe interviewers might be at risk or local conditions make data collection impossible.<sup>9</sup> Any request from the field for substitution in the AmericasBarometer must be made in writing to LAPOP Central headquarters at Vanderbilt University, and include a detailed justification for the request. After LAPOP reviews the request, it works to identify a replacement sampling point. The LAPOP substitution protocol calls for ensuring, to the degree possible based on available data, that candidates for replacement are in an area with a similar population size, similar level of urbanization, and similar socioeconomic characteristics as the original selection. In addition, replacement sampling points must be within the same primary sampling unit (PSU) and ideally share the same census sector and segment. If multiple similar candidate sampling replacements are identified, a replacement is randomly selected from among them.<sup>10</sup>

## Potential Coverage Bias in the 2016/17 AmericasBarometer

Figure 1 displays the percentage of interviews conducted in substituted sampling points in each country of the 2016/17 round of the AmericasBarometer.<sup>11</sup> The total number of interviews conducted in the 147 replaced sampling points was 888, out of a total of 40,443 interviews. These replacement interviews represent 2.2% of total interviews. As a proportion of its national sample, the country with the most interviews being replaced was Venezuela, at 21% (324 interviews). Guatemala ranks second at 9% (138 interviews) and Mexico ranks third at 7.1% (108 interviews). In the next five countries, this proportion varies between 3% and 4%.



Source: © LAPOP AmericasBarometer Metadata, 2016/7

**Figure 1: Percentage of Interviews Conducted in Substituted Sampling Points, as a Proportion of Each National Sample, 2016/17**

The last three countries with substitutions have replacement rates in the vicinity of 1.5%. Local teams in the remaining sixteen countries of the 2016/17 round did not request any substitutions during their fieldwork.

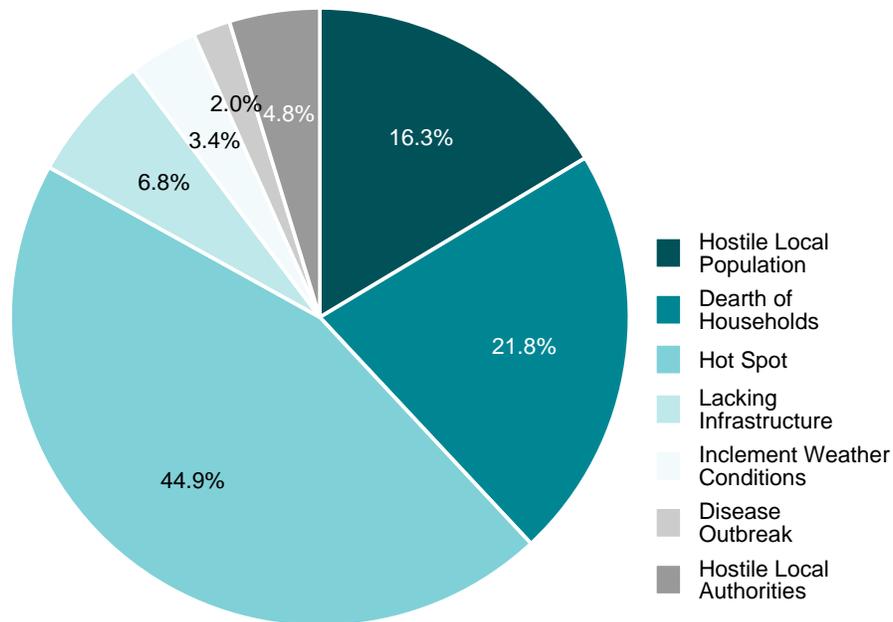
Table 1 offers another perspective on substitutions in the 2016/17 round. Here we show the proportion of all 147 substituted sampling points in the round that are accounted for by each national study. Venezuela accounts for the lion's share of substitutions, with Guatemala and Mexico accounting for the next largest shares.

**Table 1: Distribution of Substituted Sampling Points by Country, 2016/17**

Country	Percentage of Sampling Points Substituted
Venezuela	36.8%
Guatemala	15.6%
Mexico	12.2%
Bolivia	7.5%
Paraguay	6.8%
El Salvador	6.1%
Brazil	4.1%
Colombia	4.1%
Peru	3.4%
Chile	2.7%
Honduras	0.7%

Source: LAPOP AmericasBarometer Metadata, 2016/17

Still using substituted sampling points as the unit of analysis, Figure 2 shows the distribution of reasons given by local teams for requesting substitutions. By far, the most common justification for substituting a sampling point is concern over the security of the interviewers. Indeed, local teams in the top three countries of Table 1 (Venezuela, Guatemala, and Mexico) were also the most affected during fieldwork by concerns over crime. In these countries, some interviewers were robbed or detained during fieldwork; unsurprisingly, actual security incidents and crime-related substitution requests are correlated.<sup>12</sup> Still, security is not the only reason sampling points were substituted in the 2016/17 round. Field teams also cited other reasons, including an insufficient number



Source: ©AmericasBarometer Metadata, LAPOP, 2016/17

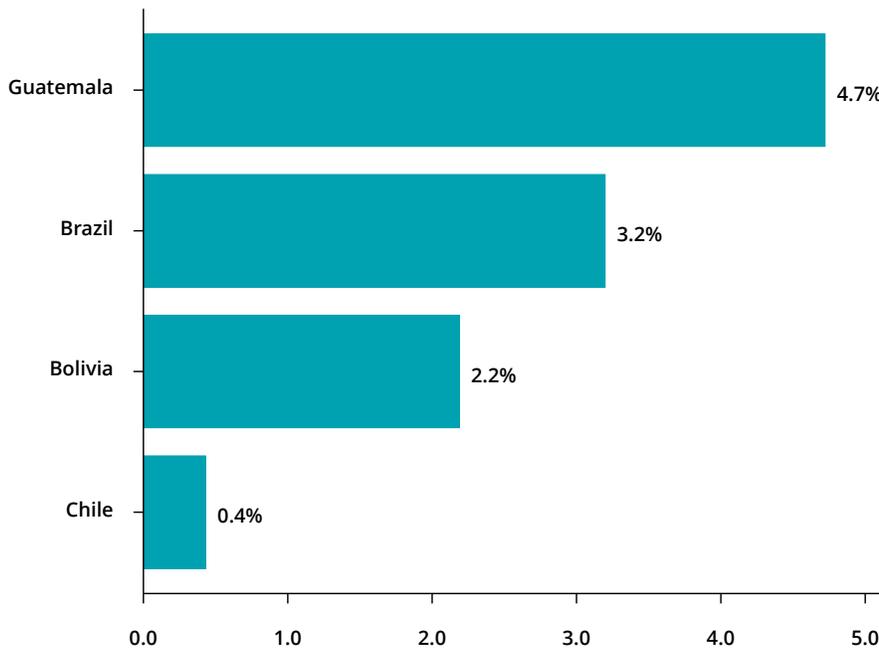
**Figure 2: Main Reason for Sampling Point Substitution, 2016/17**

of households, insufficient participation, poor infrastructure, hostile local authorities, inclement weather conditions (typically flooding), and disease outbreaks.<sup>13</sup>

Among the sampling point substitutions based on crime, more than half (57.6%) took place in Venezuela. Almost a quarter of them (22.7%) were justified on the basis of gang presence or gang-related violence in the area. Not surprisingly, most of the gang-related substitutions were located in El Salvador and Guatemala.

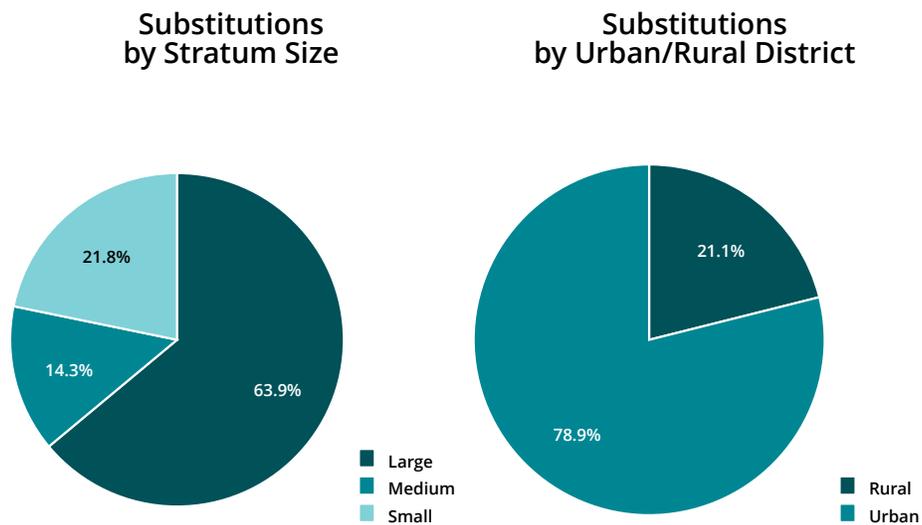
Several local teams also reported difficulties finding sufficient respondents to meet the cluster-size requirements of the sample, leading them to request substitutions. In two countries, Colombia and Paraguay, this

was the only reason for sample substitutions. In both countries, enumerators reported having run out of households in selected sampling points after several residents refused to participate in the survey. We note that census data are oftentimes outdated, and they do not accurately mirror the transformation of traditional residential areas into commercial districts, or the emergence of gated communities, with strictly controlled entrances. Gated communities, often with guards who will not allow interviewers to enter, present a growing problem since such communities likely concentrate groups of respondents with similar socio-economic characteristics, the absence of which could unbalance the sample socio-economically. For example, Paraguay's capital city, Asunción, has experienced strong economic growth, compared with decades past, and gated apartment buildings have mushroomed in more affluent neighborhoods over the last fifteen years. This housing transformation in sample areas in Asunción has made enumerators' jobs more difficult.<sup>14</sup>



Source: ©LAPOP AmericasBarometer Metadata, 2016/7

**Figure 3: Interviews Substituted Due to Local Population Hostility as a Percentage of Total Interviews by Country, 2016/17**

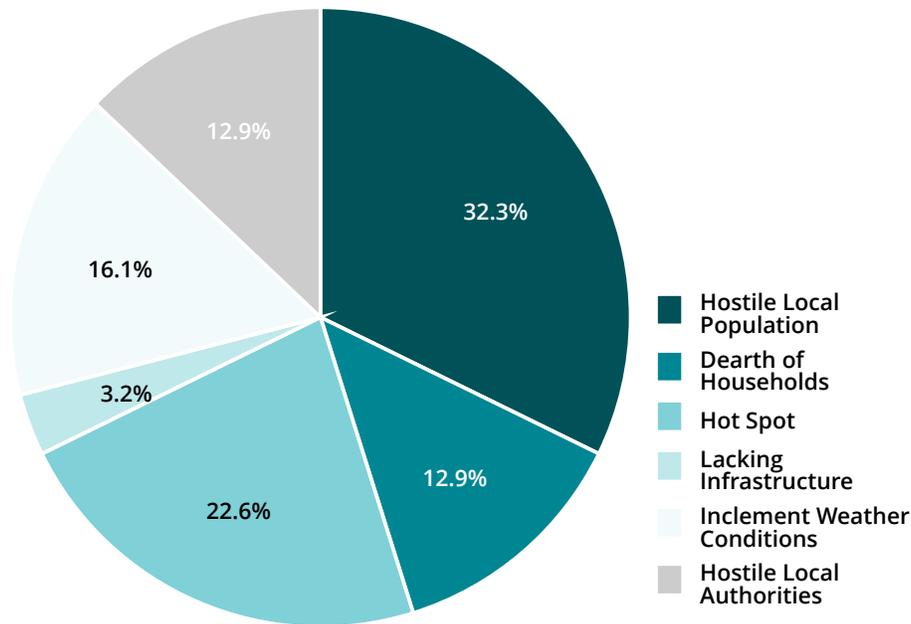


Source: ©AmericasBarometer Metadata, LAPOP, 2016/17

**Figure 4: Sampling Point Substitutions by Stratum Size and Urban/Rural Districts, 2016/17**

A final reason for sampling substitutions, though far less frequent overall, was local hostility toward the enumeration team. In Guatemala, for instance, around 4.7% of the interviews were conducted in substituted sampling points due to distrustful local populations denying enumerators entry into the community (see Figure 3). Suspicious neighbors sometimes also prevent enumerators from completing an interview. The repeated occurrence of lynchings directed against outsiders in some Guatemalan communities is likely indicative of this distrust.<sup>15</sup> In Guatemala and Mexico, interviewers also reported that local authorities refused to grant permission for fieldwork in some places. In a few cases, particularly in Bolivia and Guatemala, some locals became aggressive toward enumerating teams, threatening them, temporarily detaining them, and/or escorting them out of their communities.

Most substitutions took place in strata with larger, more urban populations.<sup>16</sup> Figure 4 shows that only one fifth of the substitutions were sampling points in rural settings. This is partly because rural areas are



Source: ©AmericasBarometer Metadata, LAPOP, 2016/17

**Figure 5: Main Reason for Substitutions in Rural Districts, 2016/17**

less likely to be afflicted by high crime or gang violence. Indeed, Figure 5 shows that, in rural settings, inclement weather, inaccessible roads, or other difficulties reaching the area are more frequently the causes for sampling point substitutions.

## Estimating the Impact of Substitutions on National-Level Results: Crime Victimization in El Salvador

For ethical and practical reasons, it is imperative that research teams, such as LAPOP, permit justifiable sampling substitutions. Our protocols seek to ensure that these substitutions introduce the least amount of

bias possible. Still, it would be useful to know what the data would have looked like had we made no substitutions.

While there is no definitive way to know, we propose a counterfactual in which we have reasonably strong data with which to measure bias. That counterfactual makes the strong assumption that all substitutions were made to avoid high-crime areas.<sup>17</sup> In fact, interviews at sampling points are often substituted for other reasons, as we point out above. In many of those cases (e.g. insufficient numbers of dwelling units or inclement weather), there is no reason to suspect that substituted segments, drawn in areas similar to the ones substituted for, produce systematic differences in responses. A more likely case of potential bias, though, and one we investigate here, occurs as a result of crime-related substitutions. Substitution of crime hot-spots by ones not so affected is almost certainly going to result in a reported underestimate of crime victimization, and similarly might affect other variables impacted by crime victimization. The question, though, is whether this effect is substantial, and would seriously bias our estimates of crime.

Calculating what the crime rate would have been if the crime hotspots had not been substituted is not easy, but in the case of El Salvador we can get a reasonable approximation with the help of detailed police records available at the neighborhood level. We are not interested in the precise level of the crime rate in those communities (since we know that police reports systematically understate crime victimization), but rather the ratio of the crime rate in hotspots vs. non-hotspots in the municipalities where we conducted our survey and in which we made substitutions due to high levels of crime. By estimating this ratio rather than the level itself, we can adjust the crime victimization data that we derived from our surveys to correct for the impact of substitutions on LAPOP's key crime survey item (**VIC1EXT**).

The Central American northern triangle (El Salvador, Guatemala, and Honduras) currently has one of the highest levels of crime in the world, plagued by organized crime, youth gangs, and street crime.<sup>18</sup> Crime is one of the most salient issues in Salvadoran politics.<sup>19</sup> At the beginning of

2015, the Salvadoran government launched the *Plan El Salvador Seguro* or El Salvador Safe Plan (PESS). The goal of the PESS is to pacify communities and strengthen the preventative safety capabilities of local governments. Three PESS stages have been implemented in target municipalities across the country, selected due to their score on a composite and weighted index of 14 official indicators of crime, poverty, and youth welfare.<sup>20</sup> Within each target municipality, PESS experts identify the most crime-prone areas, known as *prioritized sectors*.

Using this information, we simulate the impact of substitutions on the dependent variable most likely to be affected by replacing crime hotspots: self-reported crime victimization. First, we draw on within-municipality PESS data to estimate crime activity ratios comparing prioritized to non-prioritized sectors. Second, we use these ratios to estimate, within substituted clusters, how responses to the AmericasBarometer's crime victimization item (**VIC1EXT**) would have been collected by enumerators if all interviews had been conducted in the originally sampled clusters (i.e., including the hotspots).<sup>21</sup> Third, we compare the estimated crime victimization rate across the existing and simulated El Salvador data.<sup>22</sup> We conclude that the substitutions in El Salvador did not induce significant bias.

Nine clusters in six Salvadoran municipalities were substituted in the AmericasBarometer 2016's Salvadoran sample after they were identified as crime hotspots. If we assume that our local fieldwork partners requested that all enumeration areas be replaced because they were high-crime areas, then it ought to be the case that the replacement enumeration areas had relatively less crime than those in the sample before substitutions had been made.<sup>23</sup> But this suggests some bias in our estimates of crime victimization. Responses to our crime victimization question may well have been different had the fieldwork team been able to get into (and out of!) the hotspots that were substituted.

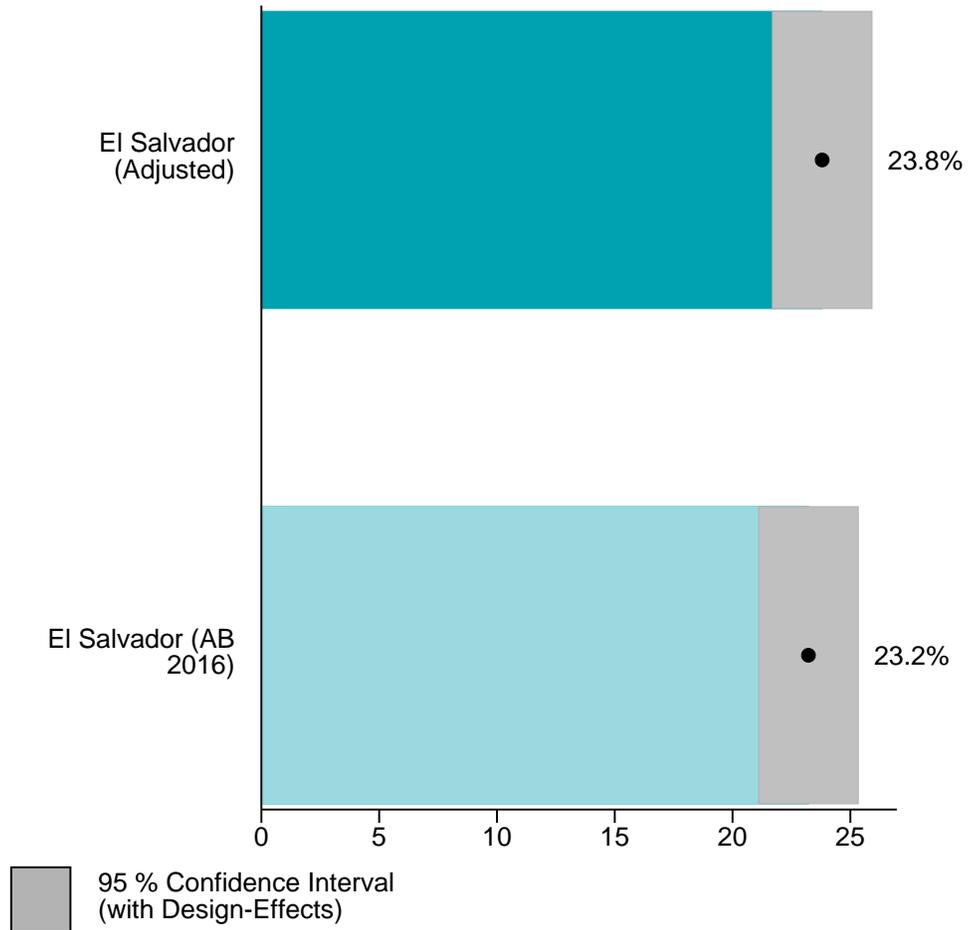
The PESS dataset provides us with a basis for calculating the relative crime rates between local areas within each target municipality. Colón and Zacatecoluca were the only municipalities by LAPOP for which

there whose substituted clusters -two in Zacatecoluca and one in Colón- have available PESS data. We can compare the official crime rate in the high-crime prioritized sectors to that of the relatively lower-crime non-prioritized sectors. This ratio gives us a sense of the true relationship between high-crime and low-crime neighborhoods, which could have been misrepresented because the former were dropped and substituted for the latter within each municipality.<sup>24</sup> In the Colón municipality, for each crime report filed in non-prioritized sectors, there are about 2.9 in prioritized (i.e., high crime) sectors. In the Zacatecoluca municipality, for every crime report filed in a non-prioritized sector, there are 2.7 crime reports filed in prioritized sector.

We assume that similar ratios would obtain when it comes to self-reported crime victimization. Had we been able to conduct interviews in the sampled high-crime enumeration area in Colón, the PESS data suggest that 2.9 times as many respondents would have told us they had been victimized than did in the lower-crime enumeration area in Colón where we did conduct interviews. In Zacatecoluca, this means that our estimate of crime victimization based on interviews conducted in lower-crime areas would have been 2.7 times higher had we not replaced the high-crime enumeration areas that were originally sampled. Of course, we do not allow the crime victimization rates to be higher than 100% in an enumeration area. Moreover, in those enumerations areas where our estimated crime victimization rate was zero, we multiply one by the corresponding crime activity ratio.

Figure 6 shows the AmericasBarometer's estimate of the crime victimization rate in El Salvador and our simulated estimate. The conclusion that emerges is that in this country, even assuming that all substitution requests occurred because of concern for the interviewers' safety in high-crime areas, substitution requests did not introduce significant bias that threatens cross-country comparisons of crime data. The simulated value is within the confidence interval of the crime victimization rate estimated from the unadjusted AmericasBarometer data. The bias introduced by substitutions is minimal for the parameter in question. Note that in this simulation we adjust only clusters in two Salvadoran

municipalities, for which we have excellent crime data. Had we adjusted all of the other substitute clusters in El Salvador and done the same for all other countries that had substitutions, El Salvador and each of the latter would likely have experienced change in reported crime victimization. We leave making such estimated adjustments up to individual researchers who might want to adjust the data to remove the effect of substitutions. We have given them in this paper a basis for doing so.



**Figure 6: Estimates of Crime Victimization Rate in El Salvador Using AmericasBarometer and Simulated Data**

## Conclusion

Coverage bias is a concern that affects the representativeness of any survey project. This *Methodological Note* explains LAPOP's procedures for substituting sampling points that are inhospitable to enumerator teams and offers an assessment of the impact of substitutions in the 2016/17 round of the AmericasBarometer. We find that the number of substitutions is tiny relative to the total number of interviews in the study. This also holds true for most of the individual countries, although substitution rates are substantially higher in Venezuela, Guatemala, and Mexico. Security concerns are the main reasons for sampling point substitutions, but other issues like deficient infrastructure or scarcity of households also matter. Our simulation with crime victimization provides initial evidence that our national-level findings are unlikely to be significantly affected by these sampling point substitutions.

## Appendix

### ***Computation of Ratios in Colón and Zacatecoluca Across PESS Sectors***

The PESS divided Colón into 16 sectors, while Zacatecoluca was divided into 21 sectors. In each of them, 4 are have been designated as prioritized sectors. The remaining sectors - 12 in Colón and 17 in Zacatecoluca - are designated non-prioritized sectors. We include only crime types included in the PESS data for both municipalities: femicide/homicide,<sup>25</sup> sexual assault, physical aggression, theft, car theft, robbery, car robbery, culpable homicide, culpable aggression, and violent threats. We assume that respondents to the **VIC1EXT** question would include any of these crimes in their responses. We sum the rates for each type of sector within each municipality, then calculate the ratio of crime rates in non-prioritized to prioritized sectors. Table 2 shows the number of crimes

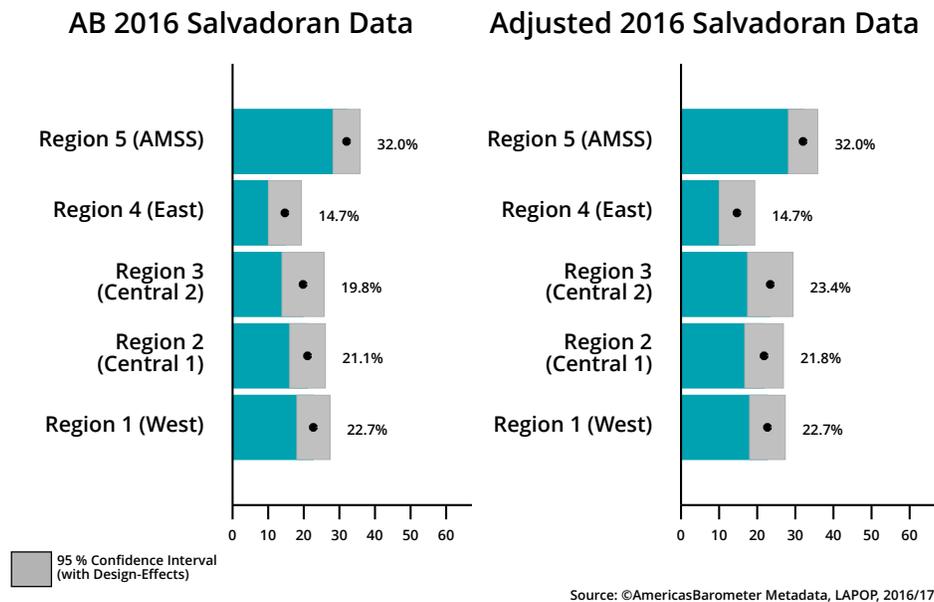
per sector and our calculated ratios.

**Table 2: Crime Rate in Prioritized and Non-Prioritized Sectores within Colón and Zacatecoluca, by Type of Crime**

Type of Crime	Colón			Zacatecoluca		
	Non-Prioritized Sectors	Prioritized Sectors	Ratio	Non-Prioritized Sectors	Prioritized Sectors	Ratio
Homicide	3.42	13.5	1:3.95	3.23	11	1:3.4
Sexual Crime	1.08	5.0	1:4.61	0.88	1.75	1:1.98
Physical Aggression	2.42	7.0	1:2.9	0.06	1.0	1:17.0
Theft	7.75	20.5	1:2.64	3.18	6.75	1:2.1
Car Theft	1.0	2.75	1:2.75	0.23	1.0	1:4.25
Robbery	3.25	11.25	1:3.46	3.12	7.0	1:2.24
Car Robbery	1.83	5.25	1:2.86	0.94	1.75	1:1.86
Culpable Homicide	1.08	1.75	1:1.61	2.65	8.5	1:3.21
Culpable Aggression	2.92	3.25	1:1.11	0.59	1.75	1:2.97
Violent Threat	4.33	14.5	1:3.35	6.76	18.5	1:2.73
<b>Total (Rounded)</b>	<b>29.0</b>	<b>85.0</b>	<b>1:3.0</b>	<b>22.0</b>	<b>59.0</b>	<b>1:3.0</b>

### ***Within-Country Comparison of Salvadoran Real and Simulated Samples***

Beyond the country-level comparison of the AmericasBarometer dataset and the simulated data for El Salvador, readers might wonder whether substitutions have an effect on estimates at more disaggregated levels within the Salvadoran national study. Figure 7 presents the same comparison of estimated crime victimization rates, but at the level of regions, the primary sampling strata. By design, the AmericasBarometer sample is representative at the level of regions. Regions 2 and 3, where Zacatecoluca and Colón are respectively located, change as we move from one dataset to the other. Nevertheless, these changes are not statistically significant.



**Figure 7: Estimates of Crime Victimization Rate in El Salvador Using AmericasBarometer and Simulated Data, 2016**

## Notes

1. Lohr (1999).
2. Much of this can be *ex ante* defined. For example, LAPOP surveys do not include households formed by non-nationals, or individuals living in military bases, healthcare facilities, prisons, other institutionalized settings, or outside of their countries.
3. Groves et al. (2004); Eckman and Kreuter (20013).
4. Biemer (2010).
5. Montalvo, Seligson, and Zechmeister (2018).
6. Groves et al. (2004).

7. Groves and Couper (1998). On occasion, natural disasters such as hurricanes (Seligson 2001) and earthquakes (Carlin, Love, and Zechmeister 2010) cause an uptick in the number of substitutions; there were no major natural disasters prior to or during fieldwork for the 2016/17 round.
8. Cohen and Larrea (2018); Montalvo, Seligson, and Zechmeister (2018).
9. Since its fifth round, the AfroBarometer has made public its sampling point substitution rate, by country. The AmericasBarometer prefers to report the substitution rate using the total number of interviews that are replaced rather than the total number of sampling points (or clusters). This distinction is important because the AmericasBarometer does not always replace an entire sampling point, which can make the sampling point substitution rate misleading. For reference, in this note we report on both the sampling point substitution rate and the proportion of total interviews replaced.
10. This procedure coincides with one of two procedures Chapman (1983) identifies for substitution in telephone-based surveys.
11. Since the Canada and U.S. surveys use online samples, they are excluded from this analysis.
12. While direct experience with crime or gangs sometimes provokes a substitution request, in other cases local teams identify unsafe areas based on past experience or local knowledge.
13. Specifically, this latter category refers to the diphtheria outbreak in Venezuela; for more information, see the following [link](#).
14. The Paraguayan local team attempted to negotiate entry into high-rise apartment buildings and gated communities, but often were unsuccessful.
15. As a form of community justice directed against potential criminals and suspected community outsiders, lynchings have been widespread since the return of democracy to Guatemala (Bateson 2013; Handy 2004; Seligson 2003; Weston 2011). According to data compiled by a Guatemalan NGO called GAM (Mutual Support Group), 1,602 people were lynched – 344 of them fatally – during the period 2008-2018. See <https://www.tn23.tv/2019/02/19/linchamientos-registrados-opacan-oportunidad-de-expandir-el-turismo-en-guatemala/>.
16. Small municipalities are those with fewer than 25,000 inhabitants, medium municipalities

- with between 25,000 and 100,000 inhabitants, and large municipalities with more than 100,000 inhabitants. Across the 2016/17 sample, 65.3% is urban and 34.7% is rural.
17. This assumption provides us with an upper bound on our estimate of the crime victimization rate.
  18. Cruz (2011).
  19. Azpuru (2010); Holland (2013).
  20. Most of the information in the index is provided by the Salvadoran National Police (PNC). More information on the index and the PESS is available at <https://www.infosegura.org/2017/12/20/indice-de-priorizacion-de-municipios-pess/>.
  21. The 2016/17 AmericasBarometer El Salvador survey was conducted between October 26 and December 1, 2016. The AmericasBarometer tracks data on crime victimization in the survey with two dichotomous items: **VIC1EXT** and **VIC1HOGAR**. Here we are only considering the **VIC1EXT** item. The difference between these two items is that the **VIC1EXT** asks respondents to report whether they were crime victimized themselves within the last 12 months, while the **VIC1HOGAR** asks them to report whether a household member was a victim of crime within the same period. We exclude the **VIC1HOGAR** item because responses on household crime victimization are more likely to be geographically noisy than the **VIC1EXT** item. Enumerators read the following **VIC1EXT** item wording to respondents: “Have you been a victim of any type of crime in the past 12 months? That is, have you been a victim of robbery, burglary, assault, fraud, blackmail, extortion, violent threats or any other type of crime in the past 12 months?” The **VIC1EXT** item has a dichotomous response format.
  22. See appendix for another comparative chart across Salvadoran regions (i.e., sample primary strata).
  23. Indeed, the sampled enumeration areas were prioritized sectors according to PESS.
  24. See Table 2 in the appendix for a detailed explanation of the simulation exercise.
  25. The AmericasBarometer of course does not interview the victims of homicide, but their surviving relatives may consider themselves to have been victimized and respond to **VIC1EXT** affirmatively. Note that if we removed homicides from our calculations, our simulation-based estimate would be even closer to the actual AmericasBarometer

estimates.

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As a charter member of the American Association for Public Opinion Research (AAPOR) Transparency Initiative, LAPOP is committed to routine disclosure of our data collection and reporting processes. More information about the AmericasBarometer sample designs can be found at [vanderbilt.edu/lapop/core-surveys](http://vanderbilt.edu/lapop/core-surveys).

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