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보건학석사 학위논문

**Recommendation of suitable sample  
size for exposure factors in  
deterministic exposure assessment of  
consumer products**

생활화학용품의 결정론적 노출평가를 위한  
노출계수 선정기준 검증

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# Abstract

**Introduction:** The exposure of consumer products (CPs) can be estimated using deterministic and probabilistic approaches. Although deterministic approaches are simple to apply, there are no guidelines for selecting representative exposure factors. The purposes of this study were to determine the effect of sample size on estimates of exposure factors using a large database and recommend a suitable sample size for obtaining an acceptable margin of error. In addition, the exposure levels were calculated by the 75<sup>th</sup> percentile of the exposure factors and compared with exposure level of the parent population.

**Methods:** This study used an existing database of 3,333 participants for the three exposure factors (frequency of use, amount of use, and duration of use) of 13 CPs, including cosmetics, cleaning products, and disinfectant. To examine how sample size affects the exposure factors by different sample sizes, the exposure factors were randomly resampled by ten different small samples. The three exposure factors of the parent population were compared with the corresponding values obtained from the smaller sample sizes. The inhalation and dermal exposure levels based on a small sample were calculated by the 75<sup>th</sup> and 95<sup>th</sup> percentiles of the exposure factors. The exposure levels by the 75<sup>th</sup> and 95<sup>th</sup> percentiles of the exposure factors were compared with the exposure distributions in the parent population.

**Results:** As sample sizes increased, the exposure factors became more similar to those of the parent population for the most CPs. For 3 of the 13 CPs, the 75<sup>th</sup>

percentiles of the exposure factors determined from sample sizes smaller than 50 were less than 10% different from those determined from the parent population. For 7 of the 13 CPs, the 75<sup>th</sup> percentiles of the exposure factors determined from sample sizes smaller than 100 were less than 10% different from those determined from the parent population. In addition, for the sample size of 100, the medians of inhalation and dermal exposure levels based on the 75<sup>th</sup> percentiles of the exposure factors were lower than the 95<sup>th</sup> percentiles of the exposure levels of the parent population.

**Conclusion:** This study quantified the potential errors of exposure factors for 13 CPs if sample sizes for exposure factor was smaller. Using these results, the error of exposure factors derived from small sample sizes might be estimated quantitatively. . The inhalation and dermal exposure levels estimated by the 75<sup>th</sup> percentiles of the exposure factors in smaller samples were less than the 95<sup>th</sup> percentile exposure levels of the population for most CPs. Further studies are needed to determine the appropriate percentile for estimating exposure levels in high exposure groups.

**Keywords:** Deterministic exposure assessment, Consumer products, Exposure factor, Sample size

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# Contents

<b>Abstract</b> .....	<b>i</b>
<b>List of Figures</b> .....	<b>v</b>
<b>List of Tables</b> .....	<b>vi</b>
<b>I. Introduction</b> .....	<b>1</b>
<b>II. Materials and Methods</b> .....	<b>7</b>
2.1. Study population .....	7
2.2. Data collection .....	9
2.3. Exposure estimation .....	11
2.4. Data analysis .....	14
<b>III. Results</b> .....	<b>18</b>
3.1. Exposure factors of the CPs in the population .....	18
3.2. Comparison exposure factors between the samples and the parent population	20
3.3. Comparison exposure levels based on the samples and the parent population	49
<b>IV. Discussion</b> .....	<b>53</b>
<b>V. Conclusion</b> .....	<b>59</b>

**References**..... 60

**국문초록**..... 66

**Appendix** ..... 69

## List of Figures

Figure 1. Process of comparison exposure factors and exposure estimates of samples and the parent population.....	1 6
Figure 2. Detailed description of resampling and comparing exposure factors and exposure estimates of samples and the parent population.....	1 7

# List of Tables

Table 1. Demographics of the study population. ....	8
Table 2. Characteristics and percentage of usage for the thirteen products. ....	1 0
Table 3. Exposure routes for each product. ....	1 3
Table 4. Input parameters for inhalation exposure assessment. ....	1 3
Table 5. Descriptive statistics of exposure factors in the parent population. ....	1 9
Table 6. Difference of frequency of shampoo use by the parent population and randomly selected samples ( $N=3,239$ ). ....	2 2
Table 7. Difference of amount of shampoo use by the parent population and randomly selected samples ( $N=3,239$ ). ....	2 2
Table 8. Difference of duration of shampoo use by the parent population and randomly selected samples ( $N=3,239$ ). ....	2 2
Table 9. Difference of frequency of dishwasher detergent use by the parent population and randomly selected samples ( $N=2,741$ ). ....	2 4
Table 10. Difference of amount of dishwasher detergent use by the parent population and randomly selected samples ( $N=2,741$ ). ....	2 4
Table 11. Difference of duration of dishwasher detergent use by the parent population and randomly selected samples ( $N=2,741$ ). ....	2 4
Table 12. Difference of frequency of body wash use by the parent population and randomly selected samples ( $N=2,302$ ). ....	2 6
Table 13. Difference of amount of body wash use by the parent population and randomly selected samples ( $N=2,302$ ). ....	2 6
Table 14. Difference of duration of body wash use by the parent population and randomly selected samples ( $N=2,302$ ). ....	2 6
Table 15. Difference of frequency of hair conditioner use by the parent population and randomly selected samples ( $N=2,072$ ). ....	2 8

Table 16. Difference of amount of body wash use by the parent population and randomly selected samples ( $N=2,072$ ). .....	2 8
Table 17. Difference of duration of body wash use by the parent population and randomly selected samples ( $N=2,072$ ). .....	2 8
Table 18. Difference of frequency of indoor disinfectant use by the parent population and randomly selected samples ( $N=1,881$ ).....	3 0
Table 19. Difference of frequency of indoor disinfectant use by the parent population and randomly selected samples ( $N=1,881$ ).....	3 0
Table 20. Difference of duration of indoor disinfectant use by the parent population and randomly selected samples ( $N=1,881$ ).....	3 0
Table 21. Difference of frequency of facial cleanser use by the parent population and randomly selected samples ( $N=1,719$ ). .....	3 2
Table 22. Difference of amount of facial cleanser use by the parent population and randomly selected samples ( $N=1,719$ ). .....	3 2
Table 23. Difference of duration of facial cleanser use by the parent population and randomly selected samples ( $N=1,719$ ). .....	3 2
Table 24. Difference of frequency of fabric deodorizer use by the parent population and randomly selected samples ( $N=1,204$ ).....	3 4
Table 25. Difference of amount of fabric deodorizer use by the parent population and randomly selected samples ( $N=1,204$ ). .....	3 4
Table 26. Difference of duration of fabric deodorizer use by the parent population and randomly selected samples ( $N=1,204$ ).....	3 4
Table 27. Difference of frequency of bottled bathroom cleaner use by the parent population and randomly selected samples ( $N=692$ ).....	3 6
Table 28. Difference of amount of bottled bathroom cleaner use by the parent population and randomly selected samples ( $N=692$ ).....	3 6
Table 29. Difference of duration of bottled bathroom cleaner use by the parent population and randomly selected samples ( $N=692$ ).....	3 6
Table 30. Difference of frequency of trigger-type bathroom cleaner use by the parent	

population and randomly selected samples ( $N=604$ ).....	3 8
Table 31. Difference of amount of trigger-type bathroom cleaner use by the parent population and randomly selected samples ( $N=604$ ).....	3 8
Table 32. Difference of duration of trigger-type bathroom cleaner use by the parent population and randomly selected samples ( $N=604$ ).....	3 8
Table 33. Difference of frequency of toilet rim cleaner use by the parent population and randomly selected samples ( $N=590$ ).....	4 0
Table 34. Difference of amount of toilet rim cleaner use by the parent population and randomly selected samples ( $N=590$ ). ....	4 0
Table 35. Difference of duration of toilet rim cleaner use by the parent population and randomly selected samples ( $N=590$ ).....	4 0
Table 36. Difference of frequency of mold stain remover use by the parent population and randomly selected samples ( $N=532$ ).....	4 2
Table 37. Difference of amount of mold stain remover use by the parent population and randomly selected samples ( $N=532$ ).....	4 2
Table 38. Difference of duration of mold stain remover use by the parent population and randomly selected samples ( $N=532$ ).....	4 2
Table 39. Difference of frequency of glass cleaner use by the parent population and randomly selected samples ( $N=480$ ). ....	4 4
Table 40. Difference of amount of glass cleaner use by the parent population and randomly selected samples ( $N=480$ ). ....	4 4
Table 41. Difference of duration of glass cleaner use by the parent population and randomly selected samples ( $N=480$ ). ....	4 4
Table 42. Difference of frequency of floor cleaner use by the parent population and randomly selected samples ( $N=442$ ). ....	4 6
Table 43. Difference of amount of floor cleaner use by the parent population and randomly selected samples ( $N=442$ ). ....	4 6
Table 44. Difference of duration of floor cleaner use by the parent population and randomly selected samples ( $N=442$ ). ....	4 6

Table 45. The inhalation exposures of consumer products with exposure factors in parent population and randomly selected sample of 100 . ..... 5 0

Table 46. The dermal exposures of consumer products with exposure factors in parent population and randomly selected sample of 100 in sample size of 100 and in the parent and population. .... 5 2

# **I. Introduction**

Consumer products (CPs) often contain hazardous chemicals. Although most people have used CPs for personal hygiene, beauty, and cleaning, substances in these CPs may adversely affect health (Bedoux et al. 2012; Dodson et al. 2012; Guo and Kannan 2013; Guo et al. 2014). Many of chemicals included in CPs as solvents, preservatives and antimicrobial agents are related to acute symptoms and have endocrine-disrupting properties (Nazaroff and Weschler 2004; Wolkoff et al. 1998). Some specific chemicals such as chlorine, chloramine, and ammonia gas, which are associated with respiratory irritation, may be emitted when using cleaning products (Fedoruk et al. 2005; Mrvos et al. 1993). Phthalates, parabens, and triclosan may have been linked to endocrine-disruptive effects or cancer (Witorsch and Thomas 2010).

Exposure assessments of CPs, which are performed to qualitatively and quantitatively estimate the intake of chemicals from different sources, represent an essential step in assessing the risks of CPs to human health (Asante-Duah 2002; WHO 1997). The different approaches for exposure assessments of CPs can be divided into three types: direct measurement, the use of biomonitoring data, and exposure scenarios. Direct measurement evaluates exposure by measuring at the point of contact (Nieuwenhuijsen 2015; Paustenbach 2015). Although direct measurement provides the most accurate exposure value, it requires expertise to conduct the measurements and is often costly (Kroes et al. 2002). Exposure can also be estimated from internal indicators, including chemicals in the blood, urine, and breath, after an

exposure occurs. The development of analytical chemistry has allowed for the measurement of trace levels of various environmental chemicals in biological tissues, thus contributing to the increased use of biomarkers in exposure assessment (Pirkle et al. 1995). The use of biomarkers provides an integrated measure of exposure from all sources, pathways, and routes of substances in CPs (Calafat et al. 2006). However, biomarker-based methods are limited in their ability to determine the source of exposure. The final type of method, exposure scenarios, make assumptions about how people contact the substances in CPs. The concentrations of the chemicals in CPs are estimated by modeling or from existing data rather than at the by measurement at the point of contact. Likewise, the frequency and duration of exposure are estimated by survey, behavioral observation, or activity models (Parmar et al. 1997; Slob and Krajnc 1994).

Exposure models are important tools for indirect exposure assessment. Exposure scenario provide meaningful information based on exposure models. There are several advantages of using models to quantify human exposure. Potential future exposure can be predicted by these exposure models, and the existing data can be made more useful by combining different sources into an analytical structure. The complexity adopted of the model can be set according to the needs of the evaluation. Multiple pathway and routes can be considered, and the need for resource-intensive tasks can be reduced (Fryer et al. 2006). Because of these advantages, a variety of exposure models have been developed to evaluate human chemical intake through contact with CPs. The Consumer Exposure and Uptake Model (ConsExpo) of the Dutch National

Institute for Public Health and The Environment (RIVM) is an example of a CP exposure model (Van Veen 1995). This model considers inhalation, ingestion and dermal exposure pathways. The United States Environmental Protection Agency (US EPA) developed the Consumer Exposure Model for cleaning products (US EPA 2015). The European Center for Ecotoxicology and Toxicology of Chemicals developed the Targeted Risk Assessment tool for first tier assessments of consumer exposure (ECHA 2010).

Model-based exposure assessments of chemicals in CPs have been carried out using probabilistic and deterministic methods. Probabilistic approaches consider probability distributions in input variables and predict the distribution of exposure in a target population (Cullen and Frey 1999). Probabilistic approaches provide more refined estimates than a deterministic approaches (Finley and Paustenbach 1994; WHO 2005). The output provides decision makers with exposures at policy-determined percentiles (e.g., the 95<sup>th</sup> or 99<sup>th</sup> percentile) and the proportion of the target population exceeding a specified reference exposure level (Cullen and Frey 1999). Despite these advantages, insufficient data can make probabilistic approaches insignificant; in many cases, the available exposure factor data (e.g., the frequency of usage, amount of usage, and duration of usage) are insufficient to determine the distribution of each variable because the actual data comes from small sample groups (Richardson 1996). For example, in one study that employed a probabilistic method to estimate exposure to CPs, the distribution of exposure factors was assumed just point or uniform (Gosens et al. 2014). Such an assumption may ignore large variations

among the distributions of exposure factors.

Deterministic methods use point estimates of input parameters to provide a single worst-case value (WHO 2005). The Consumer Model of the United Kingdom's Pesticide Safety Directorate is an example of a deterministic method (WHO 2001). Deterministic methods are used to screen CPs for hazardous exposure levels, because these methods are simple and conservative. However, deterministic methods may overestimate exposure level because they use extreme values for the parameters (Cullen and Frey 1999; Fryer et al. 2006). In addition, the uncertainty of a result represented by a single value is not considered quantitative in exposure estimation (Ferrier et al. 2002).

Deterministic approaches have been used to estimate exposure to CPs in many cases because of difficulties in estimating the distributions of exposure factors. These difficulties result from lack of reliable exposure factor data; data on the frequency of use, amount of usage and duration of use are needed to estimate inhalation and dermal exposure to CPs. Much exposure factor data come from small sample size, particularly data on the amount and the duration of CP use. In one study of usage patterns involving 1,030 participants in the United States, the amount and duration of use were not investigated; only the frequency of usage was examined (Wu et al. 2010). In another study in usage patterns in the Netherlands, frequency of use of 53 products was surveyed from 32 to 516 participants depending on the product, and the amount of use was obtained from 6 to 301 participants depending on the product. The duration of use was not investigated (Biesterbos et al. 2013). In a French study, information on

product use was obtained from 1,052 participants to estimate exposure to nail cosmetics. However, the amount and duration of use were obtained from only 32 to 97 participants depending on the product for only four products (Ficheux et al. 2014).

Criteria for selecting exposure factors are needed to apply deterministic methods. However, many studies used a specific percentile as the point value without definite evidence. ConsExpo 4.0 recommends that the specific percentile value of each exposure factor's distribution be selected depending on sample size (Bremmer et al. 2006). In ConsExpo, the 75<sup>th</sup> percentiles of exposure factors (frequency, amount, spray duration, exposure duration, etc.) were chosen as the default values for CPs (cosmetics, cleaning products, disinfectant products, etc.) (Råd 2012). However, these selections were not based on experimental data, and there is no established standard for selecting exposure factors for specific sample sizes. Therefore, criteria for selecting exposure factors should be developed based on experimental data.

In a previous study of usage patterns in South Korea, exposure factor data for thirteen CPs such as cosmetics (body wash, shampoo, body wash, hair conditioner, facial cleanser and fabric deodorizer), cleaning products (dishwasher detergent, bathroom cleaner, toilet rim cleaner, glass cleaner and floor cleaner) and disinfectants (indoor disinfectant and mold stain remover) were collected from 3,333 participants (KNIER 2012). Using this data, a deterministic approach for estimation exposure to CPs was demonstrated depending on sample size in this paper. Each exposure factor (i.e., frequency of use, amount of use and duration of use) of the population was compared with a corresponding value from a smaller sample size, which was

randomly selected from the survey of the population. The primary purpose of this study was to determine the effect of sample size on estimates of exposure factors for the larger population and recommend a suitable sample size for obtaining acceptable margins of errors. The secondary objective was to estimate the exposure levels by the 75<sup>th</sup> percentiles of the exposure factors and compare it with the exposure level of the parent population.

## **II. Materials and Methods**

### **2.1. Study population**

The survey was conducted in 15 metropolitan areas and provinces in South Korea. A total of 2,500 households were recruited considering the proportion of the population of each province to total population. The surveyed households in each province were selected randomly. When occupants refused the survey, or a house was empty, new participants were recruited until the allocated number of households in each survey province was reached. The surveyed population included those age 15 years and older. The demographic characteristics of the participants are summarized in Table 1. Female made up 75.5% of all survey participants. Participants were categorized into three age groups, young (15–34 years; 20.9% of respondents), middle-aged (35–49 years; 46.7%) and senior (50+ years; 32.4%), and three educational groups, low (middle school or less; 12.6%), medium (high school; 47.5%), and high level (college or more; 39.8%).

**Table 1. Demographics of the study population.**

Product	Gender N (%)		Age N (%)			Salary N (%)				Education N (%)			
	Male	Female	Young (15-34 years)	Middle (35-49 years)	Senior (>50 years)	Low (<\$2000)	Medium (\$2000- \$4000)	High (>\$4000)	Missing	Low (middle school or less)	Medium (high school)	High (college or more)	Missing
Shampoo	738 (22.8%)	2,501 (77.2%)	691 (21.3%)	1,531 (47.3%)	1,017 (30.5%)	255 (7.9%)	1,289 (39.8%)	918 (28.3%)	777 (24.0%)	388 (12.0%)	1,537 (47.5%)	1,310 (40.4%)	4 (0.1%)
Dishwasher detergent	315 (11.5%)	2,426 (88.5%)	485 (17.7%)	1,373 (50.1%)	883 (32.2%)	261 (9.5%)	1,246 (45.5%)	887 (32.4%)	347 (12.7%)	310 (11.3%)	1,380 (50.4%)	1,047 (38.2%)	4 (0.2%)
Body wash	305 (13.3%)	1,997 (86.8%)	543 (23.6%)	1,195 (51.9%)	564 (24.5%)	129 (3.9%)	987 (29.6%)	762 (22.9%)	424 (12.7%)	175 (5.3%)	1,143 (34.3%)	981 (29.4%)	3 (0.1%)
Hair conditioner	192 (9.3%)	1,880 (90.7%)	442 (21.3%)	1,060 (51.2%)	570 (27.5%)	163 (7.9%)	901 (43.5%)	698 (33.7%)	310 (15.0%)	203 (9.8%)	1,004 (48.5%)	863 (41.6%)	3 (0.1%)
Indoor disinfectant	123 (6.5%)	1,758 (93.5%)	213 (11.3%)	1,036 (55.1%)	632 (33.6%)	182 (9.7%)	927 (49.3%)	676 (35.9%)	96 (5.1%)	179 (9.5%)	1,020 (54.2%)	679 (36.1%)	3 (0.2%)
Facial cleanser	124 (7.2%)	1,595 (92.8%)	392 (22.8%)	930 (54.1%)	397 (23.1%)	84 (4.9%)	791 (46.0%)	590 (34.3%)	254 (14.8%)	127 (7.4%)	858 (49.9%)	732 (42.6%)	2 (0.1%)
Fabric deodorizer	128 (10.6%)	1,076 (89.3%)	272 (22.6%)	650 (54.0%)	282 (23.4%)	73 (6.1%)	536 (44.5%)	436 (36.2%)	159 (13.2%)	78 (6.5%)	569 (47.3%)	555 (46.1%)	2 (0.2%)
Bathroom cleaner (Bottled)	67 (2.0%)	626 (18.8%)	93 (2.8%)	383 (11.5%)	217 (6.5%)	44 (1.32%)	344 (10.3%)	245 (7.4%)	60 (1.8%)	41 (1.2%)	392 (11.8%)	260 (7.8%)	0
Bathroom cleaner (Trigger- type)	45 (7.4%)	564 (92.6%)	104 (17.1%)	379 (62.2%)	126 (20.7%)	26 (4.3%)	260 (43.7%)	267 (43.8%)	56 (9.2%)	21 (3.5%)	291 (47.8%)	295 (48.4%)	2 (0.3%)
Toilet rim cleaner	53 (9.0%)	537 (91.0%)	83 (14.1%)	341 (57.8%)	166 (28.1%)	36 (6.1%)	278 (47.1%)	240 (40.7%)	36 (6.1%)	27 (4.6%)	286 (48.5%)	277 (47.0%)	0
Mold stain remover	45 (8.5%)	487 (91.5%)	79 (14.9%)	314 (59.0%)	139 (26.1%)	30 (5.6%)	273 (51.3%)	191 (35.9%)	38 (7.1%)	24 (4.5%)	257 (48.3%)	251 (47.2%)	0
Glass cleaner	48 (10.0%)	432 (90.0%)	71 (15.0%)	282 (58.8%)	127 (26.5%)	22 (4.6%)	232 (48.3%)	177 (36.8%)	49 (10.2%)	25 (5.2%)	237 (49.4%)	216 (45.0%)	2 (0.4%)
Floor cleaner	37 (8.4%)	405 (91.6%)	50 (11.3%)	243 (55.0%)	149 (33.7%)	26 (5.9%)	203 (45.9%)	179 (40.5%)	34 (7.7%)	24 (5.4%)	235 (53.2%)	183 (41.4%)	0
Total	816 (24.5%)	2,517 (75.5%)	697 (20.9%)	1,557 (46.7%)	1,079 (32.4%)	268 (8.0%)	1,306 (39.2%)	926 (27.8%)	833 (25.0%)	420 (12.6%)	1,582 (47.5%)	1,327 (39.8%)	4 (0.1%)

Abbreviations: N, the number of user

Reorganized the previous report (KNIER 2012).

## 2.2. Data collection

The three exposure factors (frequency of use, amount of use, and duration of use) for 13 CPs were obtained from 3,333 participants in 2,500 households. The interviews were conducted in June and July of 2012. Researchers visited each household for face-to-face interviews. The detailed survey methodology is described in a previous study (Park et al. 2015). The characteristics of the 13 CPs are presented in Table 2. Exposure factors for each product were obtained from 442 to 3,239 participants depending on products (Table 2). These survey population referred to as ‘parent population’ below.

Small samples were resampled from the parent population. In order to analyze the variation in exposure factors by sample size, the exposure factors of samples were resampled in the parent population using ten sample sizes ( $N=5, 10, 20, 50, 75, 100, 125, 150$  and  $200$ ). Four percentiles ( $50^{\text{th}}, 75^{\text{th}}, 95^{\text{th}},$  and  $99^{\text{th}}$ ) were selected and recorded in each of the sampling operations. The small samples were resampled 10,000 times.

**Table 2. Characteristics and percentage of usage for the thirteen products.**

Products	Container type	Formulation	The percentage of the user (%)	The number of the user
Shampoo	Pump	Liquid	97.2	3,239
Dishwasher detergent	Pump	Liquid	82.2	2,741
Body wash	Pump	Liquid	69.1	2,302
Hair conditioner	Pump	Liquid	62.2	2,072
Indoor disinfectant	Bottle	Liquid	56.4	1,881
Facial cleanser	Tube	Cream	51.6	1,719
Fabric deodorizer	Trigger	Liquid	36.1	1,204
Bathroom cleaner (Bottled)	Bottle	Liquid	20.8	693
Bathroom cleaner (Trigger-type)	Trigger	Liquid	18.3	609
Toilet rim cleaner	Tube	Liquid	17.7	590
Mold stain remover	Trigger	Liquid	16.0	532
Glass cleaner	Trigger	Liquid	14.4	480
Floor cleaner	Bottle	Liquid	13.3	442

Reorganized the previous report (KNIER 2012).

### 2.3. Exposure estimation

This study considered daily exposure to 13 products via two pathways, inhalation and dermal contact. The exposure estimates were calculated separately for each pathway. We assumed that the total amount of each product entered into the body through inhalation or dermal contact. Daily inhalation exposure to each products was estimated using Equation 1 based on a model developed by the National Institute of Environmental Research (KNIER) in South Korea (KNIER 2015):

$$DE_i = \frac{A_p \times W_f \times \exp(-VR \times t) \times IR \times abs \times D \times n}{V \times BW} \quad (1)$$

where  $DE_i$  is daily exposure via inhalation (mg/kg/day),  $A_p$  is the amount of product use (mg),  $W_f$  is the fraction of a specific chemical in the product (unitless),  $VR$  is the ventilation rate ( $\text{h}^{-1}$ ),  $t$  is the duration of use (h),  $IR$  is the inhalation rate ( $\text{m}^3/\text{h}$ ),  $abs$  : is the absorption rate (unitless);,  $D$  is the exposure duration (h/event),  $n$  is the frequency of product use (event/day),  $V$  is the volume of space ( $\text{m}^3$ ), and  $BW$  is body weight (kg).

For dermal exposure, a KNIER model for trigger-type products and a RIVM model for other products were used (J.E. Delmaar 2005; KNIER 2015). Dermal exposure estimates for trigger-type products were derived using Equation 2:

$$DE_{d1} = \frac{R \times t \times W_f \times abs \times n}{BW} \quad (2)$$

where  $DE_{d1}$  is the daily dermal exposure to trigger-type products (mg/kg/day), and  $R$

is the rate at which the product is applied to the skin (mg/min).

For rinse-off products, dermal exposure estimates were derived using Equation 3:

$$DE_{d2} = \frac{A_p \times W_f \times abs \times n}{BW} \quad (3)$$

where  $DE_{d2}$  is the daily dermal exposure to rinse-off products (mg/kg/day).

The input parameters based on the exposure scenarios for each product are given in Tables 3 and 4. The values of  $W_f$  and  $abs$  were assumed to be 1 for both inhalation and dermal exposure.  $BW$  was assumed to be 64.2 kg, which is the mean weight of Korean adult, as reported in the default database of the KNIER exposure assessment tool (KNIER 2015). The  $IR$  was assumed to be 0.6 m<sup>3</sup>/h, which was the mean inhalation rate of Korean adult population taken from the defaults database of the Korean exposure factors handbook (Jang et al. 2007).  $A_p$ ,  $t$  and  $n$  were based on survey data.

**Table 3. Exposure routes for each product.**

Product	Route	Inhalation exposure	Dermal exposure
Mold stain remover		O	o ( $DE_{d1}$ )
Fabric deodorizer		O	o ( $DE_{d1}$ )
Glass cleaner		O	o ( $DE_{d1}$ )
Bathroom cleaner (Trigger-type)		O	o ( $DE_{d1}$ )
Bathroom cleaner (Bottled)		O	o ( $DE_{d2}$ )
Toilet rim cleaner		O	o ( $DE_{d2}$ )
Indoor disinfectant		O	o ( $DE_{d2}$ )
Dishwasher detergent		O	o ( $DE_{d2}$ )
Floor cleaner		O	o ( $DE_{d2}$ )
Shampoo		X	o ( $DE_{d2}$ )
Body wash		X	o ( $DE_{d2}$ )
Hair conditioner		X	o ( $DE_{d2}$ )
Facial cleanser		X	o ( $DE_{d2}$ )

**Table 4. Input parameters for inhalation exposure assessment.**

Product	Parameter	VR (/h)	D (min)	V (m <sup>3</sup> )
Mold stain remover		2 <sup>a</sup>	82 <sup>d</sup>	9.3 <sup>a</sup>
Bathroom cleaner (trigger-type)		2 <sup>a</sup>	82 <sup>d</sup>	9.3 <sup>a</sup>
Bathroom cleaner (bottled)		2 <sup>a</sup>	82 <sup>d</sup>	9.3 <sup>a</sup>
Toilet rim cleaner		2 <sup>a</sup>	82 <sup>d</sup>	9.3 <sup>a</sup>
Indoor disinfectant		2 <sup>a</sup>	82 <sup>d</sup>	9.3 <sup>a</sup>
Dishwasher detergent		2.5 <sup>b</sup>	82 <sup>d</sup>	24.5 <sup>b</sup>
Floor cleaner		0.5 <sup>c</sup>	82 <sup>d</sup>	33.3 <sup>c</sup>
Glass cleaner		0.5 <sup>c</sup>	82 <sup>d</sup>	33.3 <sup>c</sup>
Fabric deodorizer		0.5 <sup>c</sup>	1.2 <sup>e</sup>	33.3 <sup>c</sup>

<sup>a</sup> Ventilation rate and volume of the bathroom from KNIER (KNIER 2015). <sup>b</sup> Ventilation rate and volume of the kitchen from KNIER (KNIER 2015). <sup>c</sup> Ventilation rate and volume of the living room from KNIER (KNIER 2015). <sup>d</sup> Duration of housework from Korean exposure factors handbook (Jang et al. 2007). <sup>e</sup> Mean application time of fabric deodorizer from KNIER (KNIER 2012).

The remaining factor (amount of contact with the skin) for dermal exposure assessment for trigger-type products was assumed to be 46 mg/min (KNIER 2015).

## 2.4. Data analysis

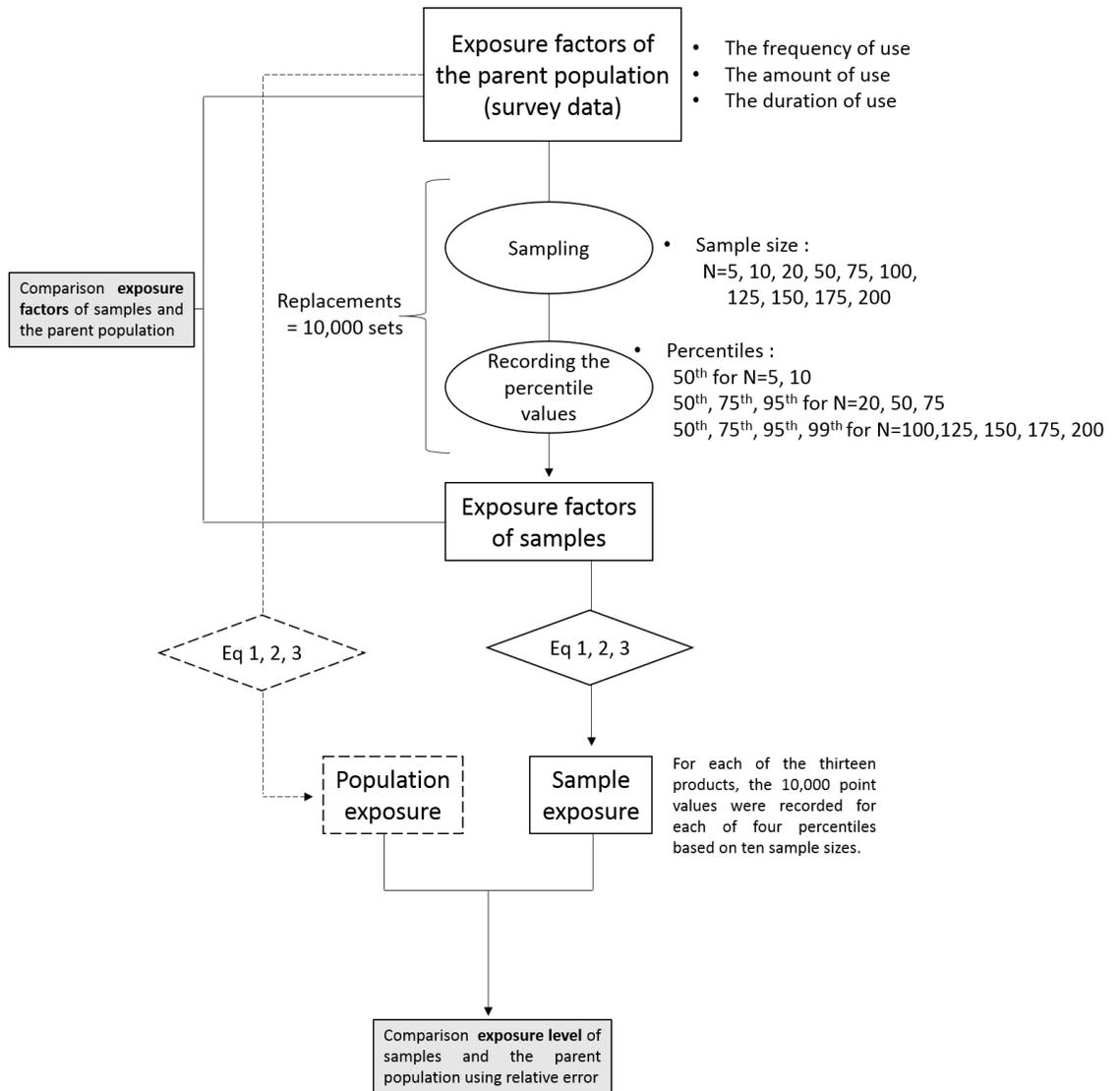
### *Comparison of exposure factors*

The three exposure factors for 13 CPs based on small samples randomly selected from the parent population were compared with the corresponding values from the parent population. The four different percentiles (50<sup>th</sup>, 75<sup>th</sup>, 95<sup>th</sup>, and 99<sup>th</sup>) of each exposure factor were used to comparison. For sample size of 5 and 10, only the 50<sup>th</sup> percentile was used for comparison due to the absence of the 75<sup>th</sup>, 95<sup>th</sup>, and 99<sup>th</sup> percentile values. For sample size of 20, 50, and 75 only the 50<sup>th</sup>, 75<sup>th</sup>, and 95<sup>th</sup> percentiles were used for comparison due to the absence of the 99<sup>th</sup> percentile value.

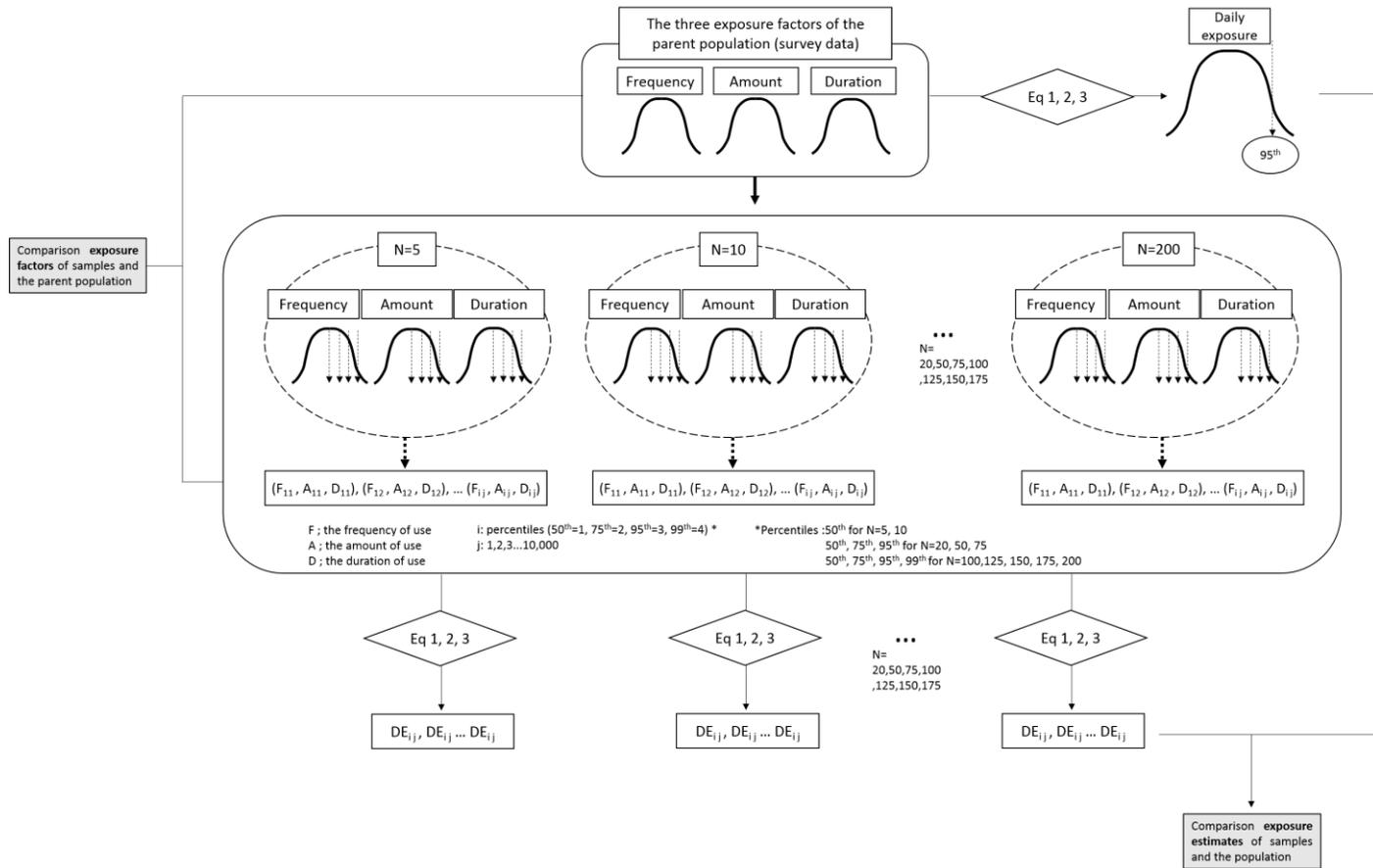
### *Comparison of exposure level*

The exposure levels for 13 CPs were calculated based the 10 sample sizes and the parent population (Figs. 1 and 2). For the exposure levels of the samples, the exposure levels were estimated using the same percentiles of the three exposure factors. The exposure levels of the randomly selected samples were calculated with the 10,000 point values of the 75<sup>th</sup> and 95<sup>th</sup> percentiles of each exposure factor. A total of 10,000 exposure values were obtained by calculating a random pair of 10,000 values for each exposure factor. For the exposure levels of the parent population, the distribution of exposure to each of the 13 CPs was obtained. The average of the 10,000 exposure values was compared to exposure distribution of the parent population.

R, an open-source statistical software programming language, was used to conduct the resampling. In addition, it was used for calculating mean and range of the three exposure factors for the 13 CPs and the differences in exposure levels between samples and the parent population.



**Figure 1. Process of comparison exposure factors and exposure estimates of samples and the parent population**



**Figure 2. Detailed description of resampling and comparing exposure factors and exposure estimates of samples and the parent population.**

## **III. Results**

### **3.1. Exposure factors of CPs in the parent population**

The number of users, medians and ranges of the exposure factors in the parent population are shown in Table 5. The percentage of people using shampoo was the largest (97.2%) among the 3,333 participants, and the percentage of people using floor cleaner was the lowest (13.3%). The most frequently used products were dishwasher detergent and facial cleanser (median = two uses per day). The median use frequency of glass cleaner was the lowest (approximately two times per month). The median amount used per application was highest for bottled bathroom cleaner, toilet rim cleaner, and floor cleaner (53.20 g per application) and lowest for facial cleanser (0.60 g per application). Trigger-type bathroom cleaner, bottled bathroom cleaner, indoor disinfectant, dishwasher detergent, and floor cleaner had the largest median durations per application (10 min), while fabric deodorizer had the smallest median duration (1 min).

**Table 5. Descriptive statistics of exposure factors in the parent population.**

Exposure factors		Frequency of use (event/day)		Amount of use (g/event)		Duration of use (min/event)	
Products	No of user	Median	Range (Min, Max)	Median	Range (Min, Max)	Median	Range (Min, Max)
Shampoo *	3,238	1.00	(0.14,3.00)	4.02	(0.53,12.07)	3.00	(0.33,15.00)
Dishwasher detergent	2,741	2.00	(0.03,10.00)	5.80	(1.45,43.50)	10.00	(0.33,35.00)
Body wash	2,302	1.00	(0.03,3.00)	3.95	(0.38,9.88)	5.00	(0.33,30.00)
Hair conditioner	2,072	1.00	(0.03,2.00)	3.57	(0.39,11.56)	3.00	(0.17,15.00)
Indoor disinfectant	1,881	0.14	(0.01,2.00)	5.95	(1.19,178.50)	10.00	(0.05,60.00)
Facial cleanser	1,719	2.00	(0.07,4.00)	0.60	(0.60,3.40)	3.00	(0.17,20.00)
Fabric deodorizer	1,204	0.29	(0.01,4.00)	3.36	(0.84,16.80)	1.00	(0.02,7.00)
Bathroom cleaner (Bottled)*	692	0.14	(0.03,4.00)	53.20	(5.32,532.00)	10.00	(0.17,30.00)
Bathroom cleaner (Trigger-type)*	604	0.29	(0.03,1.00)	6.19	(1.03,30.96)	10.00	(0.17,30.00)
Toilet rim cleaner	590	0.23	(0.03,1.00)	70.25	(10.64,532.00)	6.22	(0.08,10.83)
Mold stain remover	532	0.14	(0.01,2.00)	9.60	(1.92,76.80)	5.00	(0.17,30.00)
Glass cleaner	480	0.07	(0.01,1.00)	5.15	(1.03,30.90)	5.00	(0.05,15.00)
Floor cleaner	442	0.14	(0.02,1.43)	53.20	(10.64,532.00)	10.00	(0.17,60.00)

\* Five of the participants using trigger-type bathroom cleaner, one participant using bottled bathroom cleaner, and one participant using shampoo reported times of use of zero; these data are excluded in this table.

### **3.2. Comparison of exposure factors between the randomly selected samples and the parent population**

The means, standard deviations and ranges of the three exposure factors for the 13 CPs are presented Tables 6-44.

#### *Comparison of shampoo exposure factors between samples and the parent population*

For frequency of use, the 50<sup>th</sup>-percentile exposure factor for the sample size of five was less than 2% different from that of the parent population (Table 6). The 75<sup>th</sup>-percentile value for a sample size of 20 was the same as that of the parent population. The 95<sup>th</sup>-percentile values for different sample sizes were higher than those of the parent population, while the 99<sup>th</sup>-percentile values were similar to those of the parent population. For amount of use, the 50<sup>th</sup>-percentile exposure factors for a sample size of 10 was less than 9% different from that of the parent population (Table 7). The 75<sup>th</sup>- and 95<sup>th</sup>- percentiles values at a sample size of 20 were less than 6% and 4% different from that of the parent population, respectively. The 99<sup>th</sup>-percentile value for a sample size of 200 was less than 10% different from that of the parent population. For duration of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of 10 was less than 9% different from that of the parent population (Table 8). The 75<sup>th</sup>- and 95<sup>th</sup>-percentile

values for the sample size of 20 were 10% and 9% lower than that of the parent population, respectively. The 99<sup>th</sup>-percentile values for different sample sizes were similar to that of the parent population, with a difference of less than 2% for a sample size of 100.

**Table 6. Difference of frequency of shampoo use by the parent population and randomly selected samples ( $N=3,239$ ).**

Sample size	Frequency of use in the samples and the parent population (event/day)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
$N=5$	0.98±0.08	(0.43,2.00)	-	-	-	-	-	-
$N=10$	1.00±0.03	(0.43,1.00)	-	-	-	-	-	-
$N=20$	1.00±0.01	(0.57,1.00)	1.00±0.01	(1.00,2.00)	1.23±0.40	(1.00,2.05)	-	-
$N=50$	1.00±0.00	(0.93,1.00)	1.00±0.00	(1.00,1.00)	1.27±0.39	(1.00,2.00)	-	-
$N=75$	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.28±0.40	(1.00,2.00)	-	-
$N=100$	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.27±0.43	(1.00,2.00)	1.94±0.24	(1.00,2.01)
$N=125$	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.27±0.42	(1.00,2.00)	1.96±0.17	(1.00,2.00)
$N=150$	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.26±0.40	(1.00,2.00)	1.98±0.13	(1.00,2.00)
$N=175$	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.26±0.41	(1.00,2.00)	1.99±0.10	(1.00,2.00)
$N=200$	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.24±0.42	(1.00,2.00)	1.99±0.08	(1.00,2.00)
<b>Population</b>	1.00	-	1.00	-	1.00	-	2.00	-

**Table 7. Difference of amount of shampoo use by the parent population and randomly selected samples ( $N=3,239$ ).**

Sample size	Amount of use in the samples and the parent population (g/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
$N=5$	3.57±0.98	(0.53,7.03)	-	-	-	-	-	-
$N=10$	3.69±0.66	(1.22,6.03)	-	-	-	-	-	-
$N=20$	3.84±0.51	(1.22,5.03)	4.23±0.54	(2.01,6.03)	5.82±0.87	(4.02,10.16)	-	-
$N=50$	3.99±0.22	(2.01,4.02)	4.08±0.31	(4.02,6.03)	6.04±0.36	(4.02,9.15)	-	-
$N=75$	4.01±0.13	(2.01,4.02)	4.05±0.20	(4.02,6.03)	6.05±0.21	(4.02,8.65)	-	-
$N=100$	4.02±0.06	(2.01,4.02)	4.03±0.12	(4.02,6.03)	6.04±0.12	(4.02,8.04)	7.02±1.08	(6.03,10.08)
$N=125$	4.02±0.02	(2.01,4.02)	4.02±0.07	(4.02,6.03)	6.04±0.09	(4.02,8.04)	7.11±0.99	(6.03,10.06)
$N=150$	4.02±0.02	(2.77,4.02)	4.02±0.06	(4.02,6.03)	6.04±0.05	(6.03,8.04)	7.20±0.93	(6.03,10.06)
$N=175$	4.02±0.00	(3.54,4.02)	4.02±0.02	(4.02,6.03)	6.03±0.03	(6.03,8.04)	7.24±0.93	(6.03,10.06)
$N=200$	4.02±0.00	(4.02,4.02)	4.02±0.02	(4.02,6.03)	6.03±0.03	(6.03,8.04)	7.27±0.98	(6.03,10.06)
<b>Population</b>	4.02	-	4.02	-	6.03	-	8.04	-

**Table 8. Difference of duration of shampoo use by the parent population and randomly selected samples ( $N=3,239$ ).**

Sample size	Duration of use in the samples and the parent population (min/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
$N=5$	3.36±0.91	(1.00,10.00)	-	-	-	-	-	-
$N=10$	3.26±0.62	(1.50,5.50)	-	-	-	-	-	-
$N=20$	3.16±0.42	(2.00,5.00)	4.50±0.69	(3.00,10.00)	6.38±1.92	(3.00,15.00)	-	-
$N=50$	3.04±0.19	(2.25,5.00)	4.74±0.47	(3.00,5.00)	6.72±1.81	(4.55,10.00)	-	-
$N=75$	3.02±0.12	(3.00,5.00)	4.82±0.37	(3.00,5.00)	6.85±1.82	(5.00,10.00)	-	-
$N=100$	3.00±0.06	(3.00,4.92)	4.87±0.32	(3.00,5.00)	6.85±1.85	(5.00,10.00)	9.81±0.98	(5.00,15.00)
$N=125$	3.00±0.04	(3.00,4.00)	4.90±0.28	(3.00,5.00)	6.93±1.78	(5.00,10.00)	9.90±0.73	(5.00,15.00)
$N=150$	3.00±0.03	(3.00,4.00)	4.93±0.24	(3.00,5.00)	6.97±1.70	(5.00,10.00)	9.97±0.57	(5.00,15.00)
$N=175$	3.00±0.01	(3.00,3.50)	4.94±0.21	(3.58,5.00)	6.95±1.65	(5.00,10.00)	9.99±0.43	(5.04,15.00)
$N=200$	3.00±0.01	(3.00,3.58)	4.96±0.18	(3.50,5.00)	7.00±1.67	(5.00,10.00)	9.99±0.33	(5.01,15.00)
<b>Population</b>	3.00	-	5.00	-	7.00	-	10.00	-

*Comparison of exposure factors for dishwasher detergent between samples and the parent population*

For frequency of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of 75 was less than 10% different from that of the parent population (Table 9). The 75<sup>th</sup>-percentile values for different sample sizes were similar to that of the parent population. The 95<sup>th</sup>- and 99<sup>th</sup>-percentile values for different sample sizes were less than 5% different from that of the parent population. For amount of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of 5 was less than 5% different from that of the parent population (Table 10). The 75<sup>th</sup>-percentile value for a sample size of 50 was less than 9% different from that of the parent population. The 95<sup>th</sup>-percentile for a sample size of 150 was less than 10% different from that of the parent population. The 99<sup>th</sup>-percentile values for different sample sizes were similar to that of the parent population. For duration of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of 10 was less than 9% different from that of the parent population (Table 11). The 75<sup>th</sup>-percentile value for a sample size of 20 was less than 10% different from that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 75 was less than 10% different from that of the parent population. The 99<sup>th</sup> percentiles with different sample sizes were lower than that of the parent population.

**Table 9. Difference of frequency of dishwasher detergent use by the parent population and randomly selected samples (N=2,741).**

Sample size	Frequency of use in the samples and the parent population (event/day)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	2.36±0.63	(0.03,5.00)	-	-	-	-	-	-
N=10	2.37±0.45	(0.14,4.00)	-	-	-	-	-	-
N=20	2.33±0.43	(0.86,3.50)	2.99±0.25	(2.00,5.00)	3.91±0.72	(3.00,10.00)	-	-
N=50	2.24±0.40	(2.00,3.00)	3.00±0.06	(2.00,4.00)	4.11±0.51	(3.00,6.55)	-	-
N=75	2.19±0.39	(2.00,3.00)	3.00±0.02	(2.50,4.00)	4.17±0.43	(3.00,6.00)	-	-
N=100	2.15±0.34	(2.00,3.00)	3.00±0.01	(2.25,3.00)	4.17±0.42	(3.00,5.05)	5.14±0.83	(3.01,10.00)
N=125	2.12±0.33	(2.00,3.00)	3.00±0.00	(3.00,3.00)	4.18±0.38	(3.00,5.00)	5.21±0.79	(3.76,10.00)
N=150	2.10±0.29	(2.00,3.00)	3.00±0.00	(3.00,3.00)	4.17±0.35	(3.00,5.00)	5.24±0.70	(4.00,10.00)
N=175	2.09±0.28	(2.00,3.00)	3.00±0.00	(3.00,3.00)	4.15±0.34	(3.00,5.00)	5.21±0.58	(4.00,10.00)
N=200	2.07±0.24	(2.00,3.00)	3.00±0.00	(3.00,3.00)	4.15±0.35	(3.00,5.00)	5.17±0.57	(4.00,10.00)
Population	2.00	-	3.00	-	4.00	-	5.00	-

**Table 10. Difference of amount of dishwasher detergent use by the parent population and randomly selected samples (N=2,741).**

Sample size	Amount of use in the samples and the parent population (g/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	5.51±1.33	(2.90,14.50)	-	-	-	-	-	-
N=10	5.58±0.82	(2.90,8.70)	-	-	-	-	-	-
N=20	5.71±0.44	(2.90,8.70)	6.48±1.12	(5.80,11.60)	9.62±2.44	(5.80,29.73)	-	-
N=50	5.80±0.07	(2.90,5.80)	6.29±1.03	(5.80,8.70)	9.77±1.69	(5.80,29.00)	-	-
N=75	5.80±0.00	(5.80,5.80)	6.18±0.92	(5.80,8.70)	9.69±1.51	(5.80,20.30)	-	-
N=100	5.80±0.00	(5.80,5.80)	6.08±0.81	(5.80,8.70)	9.62±1.51	(8.70,17.55)	15.09±4.57	(8.70,29.15)
N=125	5.80±0.00	(5.80,5.80)	6.00±0.74	(5.80,8.70)	9.61±1.42	(8.70,17.40)	15.50±4.24	(8.70,29.00)
N=150	5.80±0.00	(5.80,5.80)	5.97±0.66	(5.80,8.70)	9.57±1.32	(8.70,14.50)	15.74±3.87	(8.70,29.00)
N=175	5.80±0.00	(5.80,5.80)	5.94±0.59	(5.80,8.70)	9.55±1.29	(8.70,14.50)	15.77±3.68	(8.70,29.00)
N=200	5.80±0.00	(5.80,5.80)	5.90±0.51	(5.80,8.70)	9.50±1.33	(8.70,14.50)	15.63±3.74	(8.70,29.00)
Population	5.80	-	5.80	-	8.70	-	14.50	-

**Table 11. Difference of duration of dishwasher detergent use by the parent population and randomly selected samples (N=2,741).**

Sample size	Duration of use in the samples and the parent population (min/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	8.91±2.62	(2.00,20.00)	-	-	-	-	-	-
N=10	9.11±1.75	(3.00,17.50)	-	-	-	-	-	-
N=20	9.49±1.28	(4.50,13.75)	10.93±1.75	(6.12,20.00)	16.93±3.80	(10.00,30.25)	-	-
N=50	9.89±0.61	(5.00,10.00)	10.48±1.32	(10.00,15.00)	17.93±2.65	(10.00,30.00)	-	-
N=75	9.96±0.36	(5.00,10.00)	10.30±1.03	(10.00,15.00)	18.19±2.38	(10.07,30.00)	-	-
N=100	9.99±0.14	(5.25,10.00)	10.19±0.84	(10.00,15.00)	18.36±2.37	(13.10,30.00)	24.12±4.63	(15.00,30.05)
N=125	10.00±0.11	(5.00,10.00)	10.12±0.69	(10.00,15.00)	18.58±2.14	(14.80,30.00)	24.54±4.21	(15.00,30.00)
N=150	10.00±0.05	(6.50,10.00)	10.08±0.52	(10.00,15.00)	18.71±2.02	(15.00,25.72)	24.93±4.00	(15.00,30.00)
N=175	10.00±0.02	(8.00,10.00)	10.06±0.44	(10.00,15.00)	18.88±1.96	(15.00,30.00)	25.18±4.15	(16.30,30.00)
N=200	10.00±0.00	(10.00,10.00)	10.03±0.31	(10.00,15.00)	18.99±1.95	(15.00,25.00)	25.39±4.49	(20.00,30.00)
Population	10.00	-	10.00	-	20.00	-	30.00	-

*Comparison of exposure factors of body wash between samples and the parent population*

For frequency of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of 5 was less than 3% different from that of the parent population (Table 12). The 75<sup>th</sup>-percentile value for a sample size of 20 was the same as that of the parent population. The 95<sup>th</sup>-percentile values for different sample sizes were higher than that of the parent population. The 99<sup>th</sup>-percentile value for a sample size of 100 was 5% different from that of the parent population. For amount of use, the 50<sup>th</sup>-percentile for a sample size of 5 was less than 5% different from that of the parent population (Table 13). The 75<sup>th</sup>-percentile value for a sample size of 200 was less than 10% than that of the parent population. The 95<sup>th</sup>-percentile values for different sample sizes were similar to that of the parent population. The 99<sup>th</sup>-percentile value for a sample size of 200 was less than 7% than that of the parent population. For duration of use, the 50<sup>th</sup>-percentile value for a sample size of 50 was less than 6% different from that of the parent population (Table 14). The 75<sup>th</sup>-percentile value for a sample size of 20 was less than 7% different from that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 50 was less than 10% different from that of the parent population. The 99<sup>th</sup>-percentile value for a sample size of 100 was less than 6% different from that of the parent population.

**Table 12. Difference of frequency of body wash use by the parent population and randomly selected samples (N=2,302).**

Sample size	Frequency of use in the samples and the parent population (event/day)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	0.97±0.11	(0.14,2.00)	-	-	-	-	-	-
N=10	0.99±0.05	(0.43,1.00)	-	-	-	-	-	-
N=20	1.00±0.01	(0.64,1.00)	1.00±0.01	(1.00,1.25)	1.19±0.37	(1.00,2.05)	-	-
N=50	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.22±0.35	(1.00,2.00)	-	-
N=75	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.21±0.35	(1.00,2.00)	-	-
N=100	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.19±0.38	(1.00,2.00)	1.90±0.29	(1.00,2.01)
N=125	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.18±0.35	(1.00,2.00)	1.94±0.20	(1.00,2.00)
N=150	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.18±0.34	(1.00,2.00)	1.96±0.16	(1.00,2.00)
N=175	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.16±0.33	(1.00,2.00)	1.98±0.13	(1.00,2.00)
N=200	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.15±0.33	(1.00,2.00)	1.99±0.11	(1.00,2.00)
Population	1.00	-	1.00	-	1.00	-	2.00	-

**Table 13. Difference of amount of body wash use by the parent population and randomly selected samples (N=2,302).**

Sample size	Amount of use in the samples and the parent population (g/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	3.77±0.99	(0.38,5.92)	-	-	-	-	-	-
N=10	3.81±0.60	(0.90,5.92)	-	-	-	-	-	-
N=20	3.89±0.32	(1.45,5.92)	4.62±0.85	(3.95,5.92)	5.98±0.60	(3.95,9.88)	-	-
N=50	3.95±0.08	(1.98,3.95)	4.56±0.87	(3.95,5.92)	5.98±0.29	(3.95,8.99)	-	-
N=75	3.95±0.00	(3.95,3.95)	4.52±0.84	(3.95,5.92)	5.95±0.18	(5.92,8.49)	-	-
N=100	3.95±0.00	(3.95,3.95)	4.47±0.84	(3.95,5.92)	5.93±0.13	(4.05,7.90)	7.08±1.28	(5.92,9.88)
N=125	3.95±0.00	(3.95,3.95)	4.42±0.84	(3.95,5.92)	5.93±0.10	(5.92,7.90)	7.21±1.19	(5.92,9.88)
N=150	3.95±0.00	(3.95,3.95)	4.40±0.80	(3.95,5.92)	5.93±0.06	(5.92,7.90)	7.29±1.12	(5.92,9.88)
N=175	3.95±0.00	(3.95,3.95)	4.36±0.76	(3.95,5.92)	5.93±0.05	(5.92,7.90)	7.35±1.13	(5.92,9.88)
N=200	3.95±0.00	(3.95,3.95)	4.33±0.76	(3.95,5.92)	5.93±0.03	(5.92,7.90)	7.35±1.18	(5.92,9.88)
Population	3.95	-	3.95	-	5.92	-	7.90	-

**Table 14. Difference of duration of body wash use by the parent population and randomly selected samples (N=2,302).**

Sample size	Duration of use in the samples and the parent population (min/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	6.23±2.50	(1.00,20.00)	-	-	-	-	-	-
N=10	6.04±1.88	(2.25,11.08)	-	-	-	-	-	-
N=20	5.72±1.50	(3.00,10.00)	9.36±1.48	(5.00,16.25)	12.89±3.20	(5.25,30.00)	-	-
N=50	5.27±0.87	(3.17,10.00)	9.84±0.70	(5.00,10.50)	13.57±2.69	(10.00,25.50)	-	-
N=75	5.13±0.58	(3.50,10.00)	9.95±0.37	(5.00,10.42)	13.81±2.46	(10.00,20.00)	-	-
N=100	5.07±0.38	(5.00,10.00)	9.98±0.22	(5.00,10.00)	13.89±2.26	(10.00,20.00)	18.95±2.44	(10.00,30.00)
N=125	5.04±0.28	(5.00,10.00)	9.99±0.15	(5.00,10.00)	14.04±2.01	(10.00,20.00)	19.25±2.00	(10.00,30.00)
N=150	5.02±0.17	(5.00,10.00)	10.00±0.06	(6.88,10.00)	14.09±1.80	(10.00,20.00)	19.44±1.74	(12.51,30.00)
N=175	5.01±0.12	(5.00,8.00)	10.00±0.03	(8.00,10.00)	14.20±1.64	(10.00,20.00)	19.59±1.47	(10.89,30.00)
N=200	5.01±0.10	(5.00,10.00)	10.00±0.03	(8.00,10.00)	14.24±1.53	(10.00,20.00)	19.66±1.35	(12.52,30.00)
Population	5.00	-	10.00	-	15.00	-	20.00	-

*Comparison of exposure factors of hair conditioner between samples and the parent population*

For frequency of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of 5 was less than 2% different from that of the parent population (Table 15). The 75<sup>th</sup>-percentile value for a sample size of 20 was the same as that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 75 was less than 10% different from that of the parent population. The 99<sup>th</sup>-percentile value for a sample size of 100 was less than 10% different from that of the parent population. For amount of use, the 50<sup>th</sup>-percentile values for different sample sizes were lower than that of the parent population, while 75<sup>th</sup>-percentile values were similar to that of the parent population (Table 16). The 95<sup>th</sup> -percentile exposure factor for a sample size of 50 was less than 6% different from that of the parent population. The 99<sup>th</sup>-percentile values for different sample sizes were lower than that of the parent population. For duration of use, the 50<sup>th</sup>-percentile value for a sample size of 75 was less than 10% different from that of the parent population (Table 17). The 75<sup>th</sup>-percentile value for a sample size of 100 was less than 10% different from that of the parent population. The 95<sup>th</sup>-percentile values for different sample sizes were similar to that of the parent population. The 99<sup>th</sup>-percentile values for different sample sizes were lower than that of the parent population.

**Table 15. Difference of frequency of hair conditioner use by the parent population and randomly selected samples (N=2,072).**

Sample size	Frequency of use in the samples and the parent population (event/day)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	0.98±0.09	(0.29,2.00)	-	-	-	-	-	-
N=10	0.99±0.04	(0.43,1.00)	-	-	-	-	-	-
N=20	1.00±0.01	(0.57,1.00)	1.00±0.00	(1.00,1.25)	1.13±0.31	(1.00,2.00)	-	-
N=50	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.13±0.29	(1.00,2.00)	-	-
N=75	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.10±0.26	(1.00,2.00)	-	-
N=100	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.08±0.26	(1.00,2.00)	1.81±0.39	(1.00,2.00)
N=125	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.07±0.24	(1.00,2.00)	1.86±0.30	(1.00,2.00)
N=150	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.05±0.20	(1.00,2.00)	1.90±0.26	(1.00,2.00)
N=175	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.04±0.18	(1.00,2.00)	1.92±0.24	(1.00,2.00)
N=200	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.04±0.18	(1.00,2.00)	1.95±0.22	(1.00,2.00)
Population	1.00	-	1.00	-	1.00	-	2.00	-

**Table 16. Difference of amount of body wash use by the parent population and randomly selected samples (N=2,072).**

Sample size	Amount of use in the samples and the parent population (g/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	0.98±0.09	(0.29,2.00)	-	-	-	-	-	-
N=10	0.99±0.04	(0.43,1.00)	-	-	-	-	-	-
N=20	1.00±0.01	(0.57,1.00)	1.00±0.00	(1.00,1.25)	1.13±0.31	(1.00,2.00)	-	-
N=50	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.13±0.29	(1.00,2.00)	-	-
N=75	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.10±0.26	(1.00,2.00)	-	-
N=100	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.08±0.26	(1.00,2.00)	1.81±0.39	(1.00,2.00)
N=125	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.07±0.24	(1.00,2.00)	1.86±0.30	(1.00,2.00)
N=150	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.05±0.20	(1.00,2.00)	1.90±0.26	(1.00,2.00)
N=175	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.04±0.18	(1.00,2.00)	1.92±0.24	(1.00,2.00)
N=200	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)	1.04±0.18	(1.00,2.00)	1.95±0.22	(1.00,2.00)
Population	1.00	-	1.00	-	1.00	-	2.00	-

**Table 17. Difference of duration of body wash use by the parent population and randomly selected samples (N=2,072).**

Sample size	Duration of use in the samples and the parent population (min/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	2.61±0.78	(1.00,7.00)	-	-	-	-	-	-
N=10	2.61±0.53	(1.00,5.00)	-	-	-	-	-	-
N=20	2.62±0.44	(1.00,4.50)	3.47±0.65	(2.00,5.75)	5.11±0.93	(3.00,10.25)	-	-
N=50	2.68±0.42	(2.00,3.25)	3.38±0.53	(3.00,5.00)	5.17±0.57	(3.00,10.00)	-	-
N=75	2.72±0.42	(2.00,3.00)	3.34±0.47	(3.00,5.00)	5.11±0.40	(3.30,10.00)	-	-
N=100	2.75±0.39	(2.00,3.00)	3.30±0.43	(3.00,5.00)	5.07±0.31	(4.03,10.00)	7.28±1.89	(5.00,10.05)
N=125	2.78±0.38	(2.00,3.00)	3.28±0.42	(3.00,5.00)	5.05±0.26	(4.80,9.40)	7.54±1.72	(5.00,10.00)
N=150	2.80±0.35	(2.00,3.00)	3.26±0.39	(3.00,5.00)	5.04±0.19	(5.00,7.55)	7.65±1.62	(5.00,10.00)
N=175	2.82±0.34	(2.00,3.00)	3.25±0.38	(3.00,5.00)	5.03±0.15	(5.00,8.00)	7.77±1.61	(5.00,10.00)
N=200	2.84±0.32	(2.00,3.00)	3.25±0.37	(3.00,5.00)	5.02±0.12	(5.00,7.00)	7.84±1.70	(5.00,10.00)
Population	3.00	-	3.00	-	5.00	-	8.93	-

*Comparison of exposure factors for indoor disinfectant between samples and the parent population*

For frequency of use, the 50<sup>th</sup>-percentile value for a sample size of five was the same as that of the parent population (Table 18). The 75<sup>th</sup>-percentile values for different sample sizes were higher than that of the parent population, while the 95<sup>th</sup>-percentile values were similar to that of the parent population. The 99<sup>th</sup>-percentile values for different sample sizes were lower than that of the parent population. For amount of use, the 50<sup>th</sup>-percentile exposure factors for different sample sizes were higher than that of the parent population (Table 19). The 75<sup>th</sup>-percentile value for a sample size of 200 was less than 10% different from that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 75 was less than 9% different from that of the parent population. The 99<sup>th</sup>-percentile values for different sample sizes were higher than that of the parent population. For duration of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of 50 was less than 6% different from that of the parent population (Table 20). The 75<sup>th</sup>- and 95<sup>th</sup>-percentile values for a sample size of 100 were less than 10% different from those of the parent population. The 99<sup>th</sup>-percentile values for different sample sizes were similar to that of the parent population.

**Table 18. Difference of frequency of indoor disinfectant use by the parent population and randomly selected samples (N=1,881).**

Sample size	Frequency of use in the samples and the parent population (event/day)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	0.14±0.05	(0.03,0.57)	-	-	-	-	-	-
N=10	0.14±0.03	(0.03,0.43)	-	-	-	-	-	-
N=20	0.14±0.01	(0.03,0.29)	0.19±0.07	(0.14,0.57)	0.42±0.17	(0.14,1.05)	-	-
N=50	0.14±0.00	(0.07,0.15)	0.18±0.06	(0.14,0.43)	0.45±0.12	(0.14,1.00)	-	-
N=75	0.14±0.00	(0.10,0.14)	0.18±0.06	(0.14,0.29)	0.45±0.10	(0.19,1.00)	-	-
N=100	0.14±0.00	(0.10,0.14)	0.18±0.06	(0.14,0.29)	0.45±0.09	(0.29,1.00)	0.80±0.23	(0.29,1.01)
N=125	0.14±0.00	(0.14,0.14)	0.17±0.06	(0.14,0.29)	0.44±0.07	(0.29,1.00)	0.83±0.20	(0.39,1.00)
N=150	0.14±0.00	(0.14,0.14)	0.17±0.05	(0.14,0.29)	0.44±0.06	(0.29,1.00)	0.85±0.18	(0.43,1.00)
N=175	0.14±0.00	(0.14,0.14)	0.17±0.05	(0.14,0.29)	0.44±0.05	(0.29,1.00)	0.87±0.18	(0.43,1.00)
N=200	0.14±0.00	(0.14,0.14)	0.17±0.05	(0.14,0.29)	0.44±0.05	(0.29,1.00)	0.89±0.18	(0.43,1.00)
Population	0.14	-	0.14	-	0.43	-	1.00	-

**Table 19. Difference of frequency of indoor disinfectant use by the parent population and randomly selected samples (N=1,881).**

Sample size	Amount of use in the samples and the parent population (g/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	9.17±4.08	(2.98,29.75)	-	-	-	-	-	-
N=10	8.75±2.89	(4.46,23.80)	-	-	-	-	-	-
N=20	8.39±2.66	(5.95,17.85)	13.88±3.09	(5.95,29.75)	24.25±6.52	(11.90,65.45)	-	-
N=50	8.14±2.64	(5.95,11.90)	13.76±2.64	(5.95,28.26)	26.33±4.45	(15.17,59.50)	-	-
N=75	7.92±2.70	(5.95,11.90)	13.64±2.55	(10.41,17.85)	27.11±3.86	(17.85,42.84)	-	-
N=100	7.74±2.52	(5.95,11.90)	13.47±2.51	(11.90,17.85)	27.73±3.54	(17.85,59.50)	34.62±9.93	(17.91,60.69)
N=125	7.60±2.52	(5.95,11.90)	13.37±2.56	(11.90,17.85)	28.15±2.96	(17.85,54.74)	35.49±9.64	(17.85,59.50)
N=150	7.51±2.41	(5.95,11.90)	13.29±2.43	(11.90,17.85)	28.43±2.62	(17.85,29.75)	35.82±9.15	(26.83,59.50)
N=175	7.36±2.38	(5.95,11.90)	13.18±2.35	(11.90,17.85)	28.64±2.43	(17.85,29.75)	35.56±8.88	(25.35,59.50)
N=200	7.30±2.28	(5.95,11.90)	13.04±2.26	(11.90,17.85)	28.87±2.23	(17.85,29.75)	35.17±9.99	(29.75,59.50)
Population	5.95	-	11.90	-	29.75	-	30.94	-

**Table 20. Difference of duration of indoor disinfectant use by the parent population and randomly selected samples (N=1,881).**

Sample size	Duration of use in the samples and the parent population (min/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	8.74±3.50	(1.00,30.00)	-	-	-	-	-	-
N=10	8.69±2.24	(2.50,25.00)	-	-	-	-	-	-
N=20	8.92±1.87	(4.50,20.00)	12.06±3.26	(5.00,30.00)	23.59±6.37	(10.00,60.00)	-	-
N=50	9.45±1.39	(5.00,10.00)	11.42±2.46	(10.00,20.00)	25.96±4.42	(10.00,50.00)	-	-
N=75	9.69±1.13	(5.00,10.00)	11.19±2.14	(10.00,20.00)	26.82±4.19	(11.85,50.00)	-	-
N=100	9.78±0.89	(5.00,10.00)	10.95±1.90	(10.00,20.00)	27.28±4.23	(15.25,31.00)	31.75±6.23	(20.00,60.00)
N=125	9.88±0.68	(5.00,10.00)	10.80±1.78	(10.00,20.00)	27.81±3.76	(15.00,30.00)	32.08±6.07	(20.00,60.00)
N=150	9.93±0.51	(5.00,10.00)	10.70±1.63	(10.00,20.00)	28.07±3.50	(17.75,30.00)	32.18±5.56	(20.00,60.00)
N=175	9.95±0.42	(5.00,10.00)	10.60±1.48	(10.00,17.50)	28.39±3.33	(20.00,30.00)	31.91±4.99	(22.60,60.00)
N=200	9.96±0.36	(5.00,10.00)	10.53±1.42	(10.00,20.00)	28.61±3.23	(20.00,30.00)	31.31±5.19	(30.00,60.00)
Population	10.00	-	10.00	-	30.00	-	30.00	-

*Comparison of exposure factors for facial cleanser between samples and the parent population*

For frequency of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of 20 was less than 9% different from that of the parent population (Table 21). The 75<sup>th</sup>-percentile value for a sample size of 20 was the same as that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 20 was 2% different from that of the parent population. The 99<sup>th</sup>-percentile values for different sample sizes were lower than that of the parent population. For amount of use, the 50<sup>th</sup>-percentile exposure factors for different sample sizes were higher than that of the parent population (Table 22). The 75<sup>th</sup>- and 95<sup>th</sup>-percentile values for a sample size of 20 were less than 3% and 6% different from those of the parent population, respectively. The 99<sup>th</sup>-percentile values for different sample sizes were lower than that of the parent population. For the duration of use, the 50<sup>th</sup>-percentile values for different sample sizes were lower than that of the parent population (Table 23). The 75<sup>th</sup>-percentile value for a sample size of 75 was less than 9% different from that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 20 was less than 10% different from that of the parent population, and the 95<sup>th</sup>-percentile values for the other sample sizes were higher than that of the parent population. The 99<sup>th</sup>-percentile value was similar to that of the parent population.

**Table 21. Difference of frequency of facial cleanser use by the parent population and randomly selected samples (N=1,719).**

Sample size	Frequency of use in the samples and the parent population (event/day)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	1.70±0.46	(0.43,2.00)	-	-	-	-	-	-
N=10	1.75±0.37	(1.00,2.00)	-	-	-	-	-	-
N=20	1.83±0.33	(1.00,2.00)	2.00±0.02	(1.00,2.00)	2.04±0.17	(2.00,3.05)	-	-
N=50	1.94±0.21	(1.00,2.00)	2.00±0.00	(2.00,2.00)	2.01±0.10	(2.00,3.00)	-	-
N=75	1.97±0.16	(1.00,2.00)	2.00±0.00	(2.00,2.00)	2.01±0.05	(2.00,3.00)	-	-
N=100	1.99±0.11	(1.00,2.00)	2.00±0.00	(2.00,2.00)	2.00±0.03	(2.00,3.00)	2.38±0.48	(2.00,3.01)
N=125	2.00±0.07	(1.00,2.00)	2.00±0.00	(2.00,2.00)	2.00±0.02	(2.00,2.80)	2.42±0.44	(2.00,3.00)
N=150	2.00±0.05	(1.00,2.00)	2.00±0.00	(2.00,2.00)	2.00±0.01	(2.00,3.00)	2.44±0.42	(2.00,3.00)
N=175	2.00±0.03	(1.00,2.00)	2.00±0.00	(2.00,2.00)	2.00±0.01	(2.00,2.30)	2.47±0.44	(2.00,3.00)
N=200	2.00±0.02	(1.00,2.00)	2.00±0.00	(2.00,2.00)	2.00±0.00	(2.00,2.05)	2.48±0.50	(2.00,3.00)
Population	2.00	-	2.00	-	2.00	-	3.00	-

**Table 22. Difference of amount of facial cleanser use by the parent population and randomly selected samples (N=1,719).**

Sample size	Amount of use in the samples and the parent population (g/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	0.94±0.41	(0.60,1.43)	-	-	-	-	-	-
N=10	0.93±0.35	(0.60,1.43)	-	-	-	-	-	-
N=20	0.89±0.36	(0.60,1.43)	1.40±0.15	(0.60,1.43)	1.51±0.33	(0.60,3.40)	-	-
N=50	0.83±0.35	(0.60,1.43)	1.43±0.03	(0.60,1.43)	1.46±0.20	(1.43,3.40)	-	-
N=75	0.79±0.35	(0.60,1.43)	1.43±0.01	(0.60,1.43)	1.44±0.12	(1.43,3.40)	-	-
N=100	0.76±0.31	(0.60,1.43)	1.43±0.00	(1.43,1.43)	1.43±0.07	(1.43,3.40)	2.19±0.95	(1.43,3.40)
N=125	0.74±0.31	(0.60,1.43)	1.43±0.00	(1.43,1.43)	1.43±0.04	(1.43,3.40)	2.29±0.87	(1.43,3.40)
N=150	0.72±0.28	(0.60,1.43)	1.43±0.00	(1.43,1.43)	1.43±0.02	(1.43,2.51)	2.36±0.83	(1.43,3.40)
N=175	0.70±0.27	(0.60,1.43)	1.43±0.00	(1.43,1.43)	1.43±0.01	(1.43,2.02)	2.40±0.87	(1.43,3.40)
N=200	0.68±0.24	(0.60,1.43)	1.43±0.00	(1.43,1.43)	1.43±0.00	(1.43,1.43)	2.43±0.98	(1.43,3.40)
Population	0.60	-	1.43	-	1.43	-	3.40	-

**Table 23. Difference of duration of facial cleanser use by the parent population and randomly selected samples (N=1,719).**

Sample size	Duration of use in the samples and the parent population (min/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	2.56±0.84	(0.50,10.00)	-	-	-	-	-	-
N=10	2.54±0.56	(1.00,5.08)	-	-	-	-	-	-
N=20	2.55±0.45	(1.00,5.00)	3.46±0.75	(2.00,10.00)	6.04±2.04	(3.00,15.25)	-	-
N=50	2.58±0.44	(1.50,3.00)	3.33±0.63	(2.67,5.00)	6.33±1.77	(3.00,12.90)	-	-
N=75	2.61±0.44	(2.00,3.00)	3.25±0.53	(3.00,5.00)	6.33±1.75	(4.30,10.60)	-	-
N=100	2.61±0.42	(2.00,3.00)	3.19±0.46	(3.00,5.00)	6.27±1.81	(3.58,10.03)	9.98±1.67	(5.00,15.05)
N=125	2.63±0.42	(2.00,3.00)	3.15±0.40	(3.00,5.00)	6.23±1.72	(5.00,10.00)	10.11±1.35	(5.00,15.00)
N=150	2.64±0.40	(2.00,3.00)	3.12±0.35	(3.00,5.00)	6.25±1.67	(5.00,10.00)	10.22±1.18	(5.00,15.00)
N=175	2.65±0.40	(2.00,3.00)	3.10±0.31	(3.00,5.00)	6.17±1.59	(5.00,10.00)	10.24±0.99	(5.00,15.00)
N=200	2.66±0.39	(2.00,3.00)	3.08±0.26	(3.00,5.00)	6.14±1.59	(5.00,10.00)	10.18±0.94	(5.00,15.00)
Population	3.00	-	3.00	-	5.50	-	10.00	-

*Comparison of exposure factors for fabric deodorizer between samples and the parent population*

For frequency of use, the 50<sup>th</sup>-percentile exposure factors were similar to that of the parent population, with a difference of less than 4% for a sample size of five (Table 24). The 75<sup>th</sup>-percentile value for a sample size of 50 was less than 7% different from that of the parent population. The 95<sup>th</sup>-percentile values were similar to that of the parent population, with a difference of less than 2% for the sample size of 20. The 99<sup>th</sup>-percentile value for a sample size of 125 was less than 10% different from that of the parent population. For amount of use, the 50<sup>th</sup>-percentile exposure factors for different sample sizes were lower than that of the parent population (Table 25). The 75<sup>th</sup>-percentile value for a sample size of 20 was less than 2% different from that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 75 was less than 8% different from that of the parent population. The 99<sup>th</sup>-percentile values for different sample sizes were lower than that of the parent population. For duration of use, the 50<sup>th</sup>-percentile value for a sample size of 5 was less than 5% different from that of parent population (Table 26). The 75<sup>th</sup>-percentile values for different sample sizes were lower than that of the parent population. The 95<sup>th</sup>-percentile values for different sample sizes were higher than that of the parent population, while the 99<sup>th</sup>-percentile values were similar to that of the parent population.

**Table 24. Difference of frequency of fabric deodorizer use by the parent population and randomly selected samples (N=1,204).**

Sample size	Frequency of use in the samples and the parent population (event/day)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	0.28±0.18	(0.03,2.00)	-	-	-	-	-	-
N=10	0.26±0.11	(0.05,1.00)	-	-	-	-	-	-
N=20	0.25±0.08	(0.10,1.00)	0.48±0.19	(0.14,1.00)	1.02±0.34	(0.29,3.05)	-	-
N=50	0.25±0.06	(0.14,0.43)	0.46±0.13	(0.29,1.00)	1.05±0.20	(0.43,3.00)	-	-
N=75	0.26±0.05	(0.14,0.43)	0.45±0.08	(0.29,1.00)	1.03±0.15	(0.47,2.30)	-	-
N=100	0.27±0.05	(0.14,0.43)	0.44±0.06	(0.29,1.00)	1.01±0.11	(0.57,2.00)	1.73±0.63	(1.00,3.01)
N=125	0.27±0.04	(0.14,0.43)	0.44±0.05	(0.29,1.00)	1.01±0.09	(0.94,2.00)	1.81±0.57	(1.00,3.00)
N=150	0.27±0.04	(0.14,0.43)	0.43±0.03	(0.29,1.00)	1.00±0.06	(1.00,2.00)	1.86±0.53	(1.00,3.00)
N=175	0.28±0.03	(0.14,0.29)	0.43±0.03	(0.29,1.00)	1.00±0.04	(1.00,2.00)	1.89±0.50	(1.00,3.00)
N=200	0.28±0.03	(0.14,0.29)	0.43±0.02	(0.29,1.00)	1.00±0.02	(1.00,2.00)	1.91±0.52	(1.00,3.00)
Population	0.29	-	0.43	-	1.00	-	2.00	-

**Table 25. Difference of amount of fabric deodorizer use by the parent population and randomly selected samples (N=1,204).**

Sample size	Amount of use in the samples and the parent population (g/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	3.17±0.87	(0.84,8.40)	-	-	-	-	-	-
N=10	3.12±0.62	(1.68,7.14)	-	-	-	-	-	-
N=20	3.05±0.53	(2.10,4.20)	4.12±0.49	(2.52,8.40)	6.86±2.15	(2.60,16.80)	-	-
N=50	2.98±0.44	(2.52,4.20)	4.17±0.16	(3.36,7.56)	7.52±1.49	(4.20,16.80)	-	-
N=75	2.96±0.43	(2.52,4.20)	4.19±0.09	(3.36,5.04)	7.78±1.20	(4.20,13.86)	-	-
N=100	2.97±0.41	(2.52,4.20)	4.20±0.05	(3.36,4.41)	7.95±1.05	(4.20,12.60)	10.67±2.83	(5.91,16.80)
N=125	2.97±0.42	(2.52,4.20)	4.20±0.03	(3.36,4.20)	8.08±0.81	(4.20,12.60)	10.97±2.65	(6.32,16.80)
N=150	2.97±0.40	(2.52,4.20)	4.20±0.01	(3.36,4.20)	8.15±0.69	(4.20,12.60)	11.12±2.50	(7.58,16.80)
N=175	2.97±0.42	(2.52,4.20)	4.20±0.01	(3.36,4.20)	8.23±0.57	(4.20,9.66)	11.19±2.50	(8.40,16.80)
N=200	2.97±0.41	(2.52,3.36)	4.20±0.00	(4.20,4.20)	8.27±0.52	(4.24,8.48)	11.19±2.63	(8.40,16.80)
Population	3.36	-	4.20	-	8.40	-	12.60	-

**Table 26. Difference of duration of fabric deodorizer use by the parent population and randomly selected samples (N=1,204).**

Sample size	Duration of use in the samples and the parent population (min/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	0.95±0.59	(0.03,5.00)	-	-	-	-	-	-
N=10	0.92±0.38	(0.08,3.25)	-	-	-	-	-	-
N=20	0.90±0.24	(0.12,3.00)	1.66±0.61	(0.50,5.00)	3.33±0.91	(1.00,5.58)	-	-
N=50	0.94±0.14	(0.33,1.75)	1.68±0.49	(1.00,3.00)	3.55±0.74	(1.77,5.28)	-	-
N=75	0.97±0.12	(0.33,1.00)	1.69±0.43	(1.00,3.00)	3.56±0.72	(2.00,5.15)	-	-
N=100	0.98±0.09	(0.50,1.00)	1.71±0.40	(1.00,3.00)	3.56±0.75	(2.05,5.00)	4.92±0.47	(3.00,7.00)
N=125	0.99±0.07	(0.50,1.00)	1.74±0.38	(1.00,3.00)	3.56±0.72	(2.87,5.00)	4.97±0.36	(3.00,6.64)
N=150	0.99±0.05	(0.50,1.00)	1.76±0.35	(1.00,3.00)	3.56±0.69	(3.00,5.00)	5.00±0.27	(3.00,6.26)
N=175	1.00±0.04	(0.50,1.00)	1.78±0.33	(1.00,3.00)	3.55±0.68	(2.77,5.00)	5.01±0.21	(3.00,5.89)
N=200	1.00±0.03	(0.50,1.00)	1.80±0.31	(1.00,2.38)	3.53±0.68	(3.00,5.00)	5.01±0.17	(3.00,5.51)
Population	1.00	-	2.00	-	3.31	-	5.00	-

*Comparison of exposure factors for bottled bathroom cleaner between samples and the parent population*

For frequency of use, the 50<sup>th</sup>-percentile exposure factors for a sample size of 20 was less than 8% different from that of the parent population (Table 27). The 75<sup>th</sup>-percentile value for a sample size of 20 was the same as that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 175 was less than 10% different from that of the parent population. The 99<sup>th</sup>-percentile values for different sample sizes were similar to that of the parent population. For amount of use, the 50<sup>th</sup>-percentile exposure factors for different sample sizes were higher than that of the parent population (Table 28). The 75<sup>th</sup>-percentile value for a sample size of 100 was less than 9% different from that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 50 was less than 5% different from that of parent population. The 99<sup>th</sup>-percentile values for different sample sizes were similar to that of the parent population. For duration of use, the 50<sup>th</sup>-percentile exposure factors for different sample sizes were similar to that of the parent population (Table 29). The 75<sup>th</sup>-percentile value for a sample size of 20 was less than 7% different from that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 75 was less than 9% different from that of the parent population. The 99<sup>th</sup>-percentile values for different sample sizes were similar to that of the parent population.

**Table 27. Difference of frequency of bottled bathroom cleaner use by the parent population and randomly selected samples (N=692).**

Sample size	Frequency of use in the samples and the parent population (event/day)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	0.18±0.10	(0.03, 1.00)	-	-	-	-	-	-
N=10	0.16±0.05	(0.03, 0.79)	-	-	-	-	-	-
N=20	0.15±0.03	(0.07, 0.43)	0.29±0.11	(0.14, 1.00)	0.70±0.26	(0.14, 2.10)	-	-
N=50	0.14±0.01	(0.12, 0.29)	0.29±0.07	(0.14, 0.57)	0.79±0.20	(0.29, 1.00)	-	-
N=75	0.14±0.00	(0.14, 0.29)	0.29±0.06	(0.14, 0.57)	0.82±0.20	(0.29, 1.00)	-	-
N=100	0.14±0.00	(0.14, 0.14)	0.29±0.04	(0.14, 0.46)	0.85±0.20	(0.43, 1.00)	1.02±0.14	(0.57, 2.02)
N=125	0.14±0.00	(0.14, 0.14)	0.29±0.04	(0.14, 0.43)	0.87±0.18	(0.43, 1.00)	1.03±0.14	(0.57, 1.76)
N=150	0.14±0.00	(0.14, 0.14)	0.29±0.03	(0.14, 0.43)	0.88±0.17	(0.43, 1.00)	1.02±0.11	(0.57, 1.51)
N=175	0.14±0.00	(0.14, 0.14)	0.29±0.02	(0.14, 0.43)	0.90±0.17	(0.43, 1.00)	1.02±0.06	(0.57, 1.26)
N=200	0.14±0.00	(0.14, 0.14)	0.29±0.02	(0.14, 0.43)	0.91±0.17	(0.44, 1.00)	1.00±0.00	(1.00, 1.01)
Population	0.14	-	0.29	-	1.00	-	1.00	-

**Table 28. Difference of amount of bottled bathroom cleaner use by the parent population and randomly selected samples (N=692).**

Sample size	Amount of use in the samples and the parent population (g/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	80.96±33.83	(26.60, 266.00)	-	-	-	-	-	-
N=10	77.92±25.27	(39.90, 186.20)	-	-	-	-	-	-
N=20	75.27±23.80	(53.20, 159.60)	120.95±24.79	(53.20, 226.10)	194.23±54.70	(58.52, 532.00)	-	-
N=50	72.17±23.64	(53.20, 106.40)	119.01±21.36	(53.20, 159.60)	202.62±40.29	(106.40, 436.24)	-	-
N=75	70.52±24.27	(53.20, 106.40)	117.39±19.97	(106.40, 159.60)	206.01±37.72	(159.60, 532.00)	-	-
N=100	68.64±22.52	(53.20, 106.40)	115.56±18.88	(106.40, 159.60)	207.68±37.22	(159.60, 319.20)	316.08±97.84	(159.60, 532.00)
N=125	67.51±22.71	(53.20, 106.40)	114.07±18.27	(106.40, 159.60)	209.57±34.59	(159.60, 266.00)	325.43±92.06	(159.60, 532.00)
N=150	66.18±21.19	(53.20, 106.40)	112.72±16.18	(106.40, 159.60)	211.19±31.70	(159.60, 266.00)	329.80±84.36	(159.60, 532.00)
N=175	64.90±20.90	(53.20, 106.40)	111.50±14.58	(106.40, 159.60)	212.25±30.07	(159.60, 266.00)	330.11±85.29	(173.43, 532.00)
N=200	64.02±19.82	(53.20, 106.40)	110.77±13.70	(106.40, 159.60)	212.96±29.38	(159.60, 266.00)	325.07±91.68	(212.80, 532.00)
Population	53.20	-	106.40	-	212.80	-	319.20	-

**Table 29. Difference of duration of bottled bathroom cleaner use by the parent population and randomly selected samples (N=692).**

Sample size	Duration of use in the samples and the parent population (min/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	10.11±3.59	(1.00, 30.00)	-	-	-	-	-	-
N=10	9.89±2.06	(3.50, 30.00)	-	-	-	-	-	-
N=20	9.94±0.96	(5.00, 20.00)	13.97±4.01	(7.75, 30.00)	24.53±5.23	(10.00, 30.00)	-	-
N=50	10.00±0.14	(5.00, 15.00)	13.84±3.58	(10.00, 20.00)	26.60±4.05	(10.00, 30.00)	-	-
N=75	10.00±0.05	(5.00, 10.00)	13.75±3.27	(10.00, 20.00)	27.49±3.83	(15.15, 30.00)	-	-
N=100	10.00±0.00	(10.00, 10.00)	13.79±3.05	(10.00, 20.00)	28.14±3.63	(20.00, 30.00)	29.98±0.46	(20.00, 30.00)
N=125	10.00±0.00	(10.00, 10.00)	13.80±2.92	(10.00, 20.00)	28.55±3.12	(20.00, 30.00)	29.99±0.20	(20.38, 30.00)
N=150	10.00±0.00	(10.00, 10.00)	13.81±2.68	(10.00, 20.00)	28.91±2.65	(20.00, 30.00)	30.00±0.07	(25.10, 30.00)
N=175	10.00±0.00	(10.00, 10.00)	13.83±2.48	(10.00, 20.00)	29.18±2.37	(20.00, 30.00)	30.00±0.00	(30.00, 30.00)
N=200	10.00±0.00	(10.00, 10.00)	13.79±2.33	(10.00, 20.00)	29.35±2.22	(20.00, 30.00)	30.00±0.00	(30.00, 30.00)
Population	10.00	-	15.00	-	30.00	-	30.00	-

*Comparison of exposure factors for trigger-type bathroom cleaner between samples and the parent population*

For frequency of use, the 50<sup>th</sup>-percentile exposure factors for sample sizes of 5 and 10 were similar to those of the parent population, while the 50<sup>th</sup>-percentile values for the other sample sizes were lower than that of the parent population (Table 30). The 75<sup>th</sup>-percentile values for different sample sizes were higher than that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 20 was 7% different from that of the parent population. The 99<sup>th</sup>-percentile value for a sample size of 100 was the same as that of the parent population. For amount of use, the 50<sup>th</sup>-percentile value for a sample size of 50 was less than 10% different from that of the parent population (Table 31). The 75<sup>th</sup>-percentile value for a sample size of 20 was less than 3% different from that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 50 was less than 7% different from that of the parent population. The 99<sup>th</sup>-percentile value for a sample size of 125 was less than 10% different from that of the parent population. For duration of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of five was less than 5% different from that of the parent population (Table 32). The 75<sup>th</sup>-percentile value for a sample size of 125 was less than 10% different from that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 50 was less than 8% different from that of the parent population. The 99<sup>th</sup>-percentile value for a sample size of 100 was the same as that of the parent population.

**Table 30. Difference of frequency of trigger-type bathroom cleaner use by the parent population and randomly selected samples (N=604).**

Sample size	Frequency of use in the samples and the parent population (event/day)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	0.29±0.18	(0.03,1.00)	-	-	-	-	-	-
N=10	0.27±0.12	(0.05,1.00)	-	-	-	-	-	-
N=20	0.25±0.09	(0.10,0.64)	0.51±0.18	(0.14,1.00)	0.93±0.16	(0.29,1.00)	-	-
N=50	0.24±0.07	(0.14,0.43)	0.50±0.11	(0.25,1.00)	0.99±0.05	(0.43,1.00)	-	-
N=75	0.24±0.07	(0.14,0.43)	0.49±0.08	(0.29,1.00)	1.00±0.02	(0.57,1.00)	-	-
N=100	0.25±0.06	(0.14,0.43)	0.49±0.07	(0.29,1.00)	1.00±0.01	(0.59,1.00)	1.00±0.00	(1.00,1.00)
N=125	0.25±0.06	(0.14,0.43)	0.48±0.07	(0.29,1.00)	1.00±0.00	(0.91,1.00)	1.00±0.00	(1.00,1.00)
N=150	0.25±0.06	(0.14,0.43)	0.48±0.07	(0.43,1.00)	1.00±0.00	(0.94,1.00)	1.00±0.00	(1.00,1.00)
N=175	0.26±0.06	(0.14,0.29)	0.48±0.07	(0.43,0.86)	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)
N=200	0.26±0.05	(0.14,0.29)	0.48±0.07	(0.43,0.57)	1.00±0.00	(1.00,1.00)	1.00±0.00	(1.00,1.00)
Population	0.29	-	0.43	-	1.00	-	1.00	-

**Table 31. Difference of amount of trigger-type bathroom cleaner use by the parent population and randomly selected samples (N=604).**

Sample size	Amount of use in the samples and the parent population (g/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	7.36±2.97	(2.06,30.96)	-	-	-	-	-	-
N=10	7.16±2.21	(2.58,20.64)	-	-	-	-	-	-
N=20	7.08±2.01	(3.10,15.48)	10.61±1.66	(5.16,20.64)	17.91±4.86	(8.36,30.96)	-	-
N=50	6.76±1.70	(4.13,10.32)	10.42±0.70	(5.16,15.48)	19.25±3.23	(10.32,30.96)	-	-
N=75	6.62±1.55	(5.16,10.32)	10.35±0.37	(6.71,15.48)	19.51±2.56	(10.32,30.96)	-	-
N=100	6.49±1.34	(5.16,10.32)	10.33±0.19	(8.77,15.48)	19.75±2.22	(10.58,30.96)	27.17±4.59	(15.48,30.96)
N=125	6.43±1.22	(5.16,10.32)	10.32±0.05	(10.32,15.48)	19.95±1.80	(10.32,30.96)	27.87±3.85	(15.48,30.96)
N=150	6.39±1.10	(5.16,10.32)	10.32±0.00	(10.32,10.32)	20.13±1.46	(15.48,28.64)	28.34±3.46	(18.11,30.96)
N=175	6.35±1.03	(5.16,10.32)	10.32±0.00	(10.32,10.32)	20.22±1.35	(15.48,30.96)	28.75±3.43	(20.64,30.96)
N=200	6.32±0.96	(5.16,10.32)	10.32±0.00	(10.32,10.32)	20.33±1.19	(15.48,25.80)	29.25±3.35	(20.64,30.96)
Population	6.19	-	10.32	-	20.64	-	30.96	-

**Table 32. Difference of duration of trigger-type bathroom cleaner use by the parent population and randomly selected samples (N=604).**

Sample size	Duration of use in the samples and the parent population (min/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	10.44±4.93	(1.00,30.00)	-	-	-	-	-	-
N=10	10.04±3.24	(1.00,25.00)	-	-	-	-	-	-
N=20	9.92±2.17	(3.00,20.00)	16.52±3.89	(6.25,30.00)	25.43±4.86	(10.00,30.00)	-	-
N=50	9.94±0.80	(5.00,15.00)	17.38±3.05	(10.00,20.00)	27.64±3.59	(17.75,30.00)	-	-
N=75	9.97±0.39	(5.00,15.00)	17.72±2.69	(10.00,20.00)	28.46±3.16	(20.00,30.00)	-	-
N=100	9.99±0.21	(5.00,15.00)	17.95±2.53	(10.00,20.00)	29.07±2.64	(20.00,30.00)	30.00±0.15	(20.10,30.00)
N=125	10.00±0.08	(6.00,15.00)	18.17±2.48	(10.00,20.00)	29.40±2.02	(20.00,30.00)	30.00±0.12	(20.00,30.00)
N=150	10.00±0.05	(5.75,10.00)	18.30±2.32	(10.00,20.00)	29.60±1.60	(20.00,30.00)	30.00±0.00	(30.00,30.00)
N=175	10.00±0.00	(10.00,10.00)	18.42±2.23	(10.00,20.00)	29.78±1.22	(20.00,30.00)	30.00±0.00	(30.00,30.00)
N=200	10.00±0.00	(10.00,10.00)	18.47±2.24	(10.88,20.00)	29.87±0.96	(20.00,30.00)	30.00±0.00	(30.00,30.00)
Population	10.00	-	20.00	-	30.00	-	30.00	-

*Comparison of exposure factors for toilet rim cleaner between samples and the parent population*

For frequency of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of 20 was less than 8% different from that of the parent population (Table 33). The 75<sup>th</sup>-percentile value for a sample size of 20 was less than 7% different from that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 50 was less than 7% different from that of the parent population. The 99<sup>th</sup>-percentile values for different sample sizes were similar to that of the parent population. For amount of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of 20 was less than 5% different from that of the parent population (Table 34). The 75<sup>th</sup>-percentile value for a sample size of 50 was lower than 10% different from that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 100 was less than 10% different from that of the parent population. The 99<sup>th</sup>-percentile values for different sample sizes were similar to that of the parent population. For duration of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of 50 was less than 10% different from that of the parent population (Table 35). The 75<sup>th</sup>-percentile value for a sample size of 20 was less than 5% different from that of the parent population. The 95<sup>th</sup>- and 99<sup>th</sup>-percentile exposure factors for different sample sizes were similar to that of the parent population.

**Table 33. Difference of frequency of toilet rim cleaner use by the parent population and randomly selected samples (N=590).**

Sample size	Frequency of use in the samples and the parent population (event/day)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	0.17±0.08	(0.03, 1.00)	-	-	-	-	-	-
N=10	0.16±0.05	(0.07, 0.57)	-	-	-	-	-	-
N=20	0.15±0.03	(0.07, 0.36)	0.27±0.09	(0.14, 1.00)	0.60±0.25	(0.14, 1.00)	-	-
N=50	0.14±0.01	(0.14, 0.29)	0.28±0.06	(0.14, 0.43)	0.67±0.23	(0.29, 1.00)	-	-
N=75	0.14±0.00	(0.14, 0.29)	0.28±0.04	(0.14, 0.43)	0.70±0.23	(0.29, 1.00)	-	-
N=100	0.14±0.00	(0.14, 0.21)	0.28±0.03	(0.14, 0.43)	0.71±0.24	(0.29, 1.00)	0.99±0.07	(0.43, 1.00)
N=125	0.14±0.00	(0.14, 0.29)	0.29±0.02	(0.14, 0.43)	0.72±0.23	(0.43, 1.00)	1.00±0.03	(0.43, 1.00)
N=150	0.14±0.00	(0.14, 0.14)	0.29±0.01	(0.14, 0.43)	0.73±0.22	(0.43, 1.00)	1.00±0.03	(0.50, 1.00)
N=175	0.14±0.00	(0.14, 0.14)	0.29±0.01	(0.14, 0.43)	0.74±0.21	(0.43, 1.00)	1.00±0.01	(0.57, 1.00)
N=200	0.14±0.00	(0.14, 0.14)	0.29±0.01	(0.14, 0.43)	0.75±0.22	(0.43, 1.00)	1.00±0.01	(0.57, 1.00)
Population	0.14	-	0.29	-	0.71	-	1.00	-

**Table 34. Difference of amount of toilet rim cleaner use by the parent population and randomly selected samples (N=590).**

Sample size	Amount of use in the samples and the parent population (g/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	61.81±21.18	(26.60, 159.60)	-	-	-	-	-	-
N=10	59.02±14.22	(26.60, 133.00)	-	-	-	-	-	-
N=20	55.38±9.16	(26.60, 106.40)	89.05±22.96	(53.20, 159.60)	129.47±28.04	(53.20, 279.30)	-	-
N=50	53.27±1.65	(53.20, 106.40)	96.31±19.25	(53.20, 106.40)	136.76±23.19	(106.40, 242.06)	-	-
N=75	53.21±0.38	(53.20, 79.80)	100.03±15.73	(53.20, 106.40)	140.95±23.22	(106.40, 175.56)	-	-
N=100	53.20±0.00	(53.20, 53.20)	102.21±13.28	(53.20, 106.40)	143.88±23.89	(106.40, 159.60)	171.45±30.47	(106.40, 268.66)
N=125	53.20±0.00	(53.20, 53.20)	103.81±10.89	(53.20, 106.40)	146.44±21.55	(106.40, 159.60)	172.97±28.89	(106.40, 266.00)
N=150	53.20±0.00	(53.20, 53.20)	104.71±8.43	(53.20, 106.40)	148.97±19.41	(106.40, 159.60)	173.02±25.14	(133.53, 266.00)
N=175	53.20±0.00	(53.20, 53.20)	105.35±6.57	(53.20, 106.40)	150.82±18.42	(106.40, 159.60)	171.96±23.71	(120.23, 266.00)
N=200	53.20±0.00	(53.20, 53.20)	105.82±4.88	(53.20, 106.40)	151.96±18.42	(106.40, 159.60)	168.05±24.00	(159.60, 266.00)
Population	53.20	-	106.40	-	159.60	-	159.60	-

**Table 35. Difference of duration of toilet rim cleaner use by the parent population and randomly selected samples (N=590).**

Sample size	Duration of use in the samples and the parent population (min/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	6.37±2.67	(0.50, 10.00)	-	-	-	-	-	-
N=10	6.31±2.07	(1.00, 10.00)	-	-	-	-	-	-
N=20	6.03±1.82	(2.25, 10.00)	9.58±1.23	(5.00, 10.00)	10.01±0.09	(5.25, 10.52)	-	-
N=50	5.47±1.30	(4.50, 10.00)	9.96±0.36	(5.00, 10.00)	10.00±0.02	(10.00, 10.43)	-	-
N=75	5.24±0.99	(5.00, 10.00)	10.00±0.13	(5.00, 10.00)	10.00±0.01	(10.00, 10.22)	-	-
N=100	5.13±0.66	(5.00, 10.00)	10.00±0.07	(5.38, 10.00)	10.00±0.00	(10.00, 10.09)	10.12±0.17	(10.00, 10.50)
N=125	5.07±0.48	(5.00, 10.00)	10.00±0.02	(8.00, 10.00)	10.00±0.00	(10.00, 10.07)	10.14±0.17	(10.00, 10.50)
N=150	5.03±0.31	(5.00, 10.00)	10.00±0.00	(10.00, 10.00)	10.00±0.00	(10.00, 10.03)	10.14±0.15	(10.00, 10.50)
N=175	5.01±0.20	(5.00, 10.00)	10.00±0.00	(10.00, 10.00)	10.00±0.00	(10.00, 10.00)	10.14±0.15	(10.00, 10.50)
N=200	5.01±0.10	(5.00, 9.00)	10.00±0.00	(10.00, 10.00)	10.00±0.00	(10.00, 10.00)	10.13±0.16	(10.00, 10.50)
Population	5.00	-	10.00	-	10.00	-	10.09	-

*Comparison of exposure factors of mold stain remover between samples and the parent population*

For frequency of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of 50 was less than 8% different from that of the parent population (Table 36). The 75<sup>th</sup>-percentile value for a sample size of 100 was less than 8% different from that of the parent population. The 95<sup>th</sup>- and 99<sup>th</sup>-percentile values for different sample sizes were lower than that of the parent population. For amount of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of 50 was less than 5% different from that of the parent population (Table 37). The 75<sup>th</sup>- and 95<sup>th</sup>-percentile values for a sample size of 20 were 6% and 9% lower than those of the parent population, respectively. The 99<sup>th</sup>-percentile values for different sample sizes were higher than that of the parent population. For duration of use, the 50<sup>th</sup>-percentile value for a sample size of 200 was less than 9% different from that of the parent population (Table 38). The 75<sup>th</sup>-percentile value for a sample size of 50 was less than 6% different from that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 75 was less than 8% different from that of the parent population. The 99<sup>th</sup>-percentile values for different sample sizes were similar to that of the parent population.

**Table 36. Difference of frequency of mold stain remover use by the parent population and randomly selected samples (N=532).**

Sample size	Frequency of use in the samples and the parent population (event/day)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	0.12±0.06	(0.03,0.43)	-	-	-	-	-	-
N=10	0.12±0.04	(0.03,0.29)	-	-	-	-	-	-
N=20	0.12±0.03	(0.03,0.29)	0.17±0.05	(0.07,0.43)	0.34±0.14	(0.14,1.05)	-	-
N=50	0.13±0.02	(0.03,0.14)	0.16±0.05	(0.14,0.29)	0.35±0.09	(0.14,1.00)	-	-
N=75	0.13±0.02	(0.07,0.14)	0.16±0.04	(0.14,0.29)	0.35±0.07	(0.29,1.00)	-	-
N=100	0.13±0.02	(0.07,0.14)	0.15±0.03	(0.14,0.29)	0.35±0.07	(0.29,1.00)	0.66±0.28	(0.29,1.01)
N=125	0.14±0.02	(0.07,0.14)	0.15±0.03	(0.14,0.29)	0.35±0.07	(0.29,0.54)	0.69±0.25	(0.29,1.00)
N=150	0.14±0.01	(0.07,0.14)	0.15±0.02	(0.14,0.29)	0.35±0.06	(0.29,0.51)	0.71±0.23	(0.29,1.00)
N=175	0.14±0.01	(0.07,0.14)	0.14±0.01	(0.14,0.29)	0.36±0.07	(0.29,0.43)	0.73±0.24	(0.29,1.00)
N=200	0.14±0.01	(0.07,0.14)	0.14±0.01	(0.14,0.29)	0.36±0.07	(0.29,0.43)	0.75±0.27	(0.29,1.00)
Population	0.14	-	0.14	-	0.43	-	1.00	-

**Table 37. Difference of amount of mold stain remover use by the parent population and randomly selected samples (N=532).**

Sample size	Amount of use in the samples and the parent population (g/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	11.94±4.94	(1.92,38.40)	-	-	-	-	-	-
N=10	11.61±3.73	(3.84,24.00)	-	-	-	-	-	-
N=20	11.02±3.06	(4.80,19.20)	18.07±2.79	(5.76,36.96)	26.46±8.69	(10.08,58.56)	-	-
N=50	10.08±1.68	(6.72,19.20)	19.00±1.12	(9.60,19.20)	28.51±7.41	(19.20,57.60)	-	-
N=75	9.80±1.07	(7.68,19.20)	19.14±0.56	(9.60,19.20)	29.31±7.13	(19.20,57.60)	-	-
N=100	9.70±0.70	(9.60,19.20)	19.19±0.23	(10.56,19.20)	29.99±7.12	(19.20,39.36)	42.69±8.49	(19.20,57.79)
N=125	9.64±0.42	(9.60,19.20)	19.20±0.12	(11.52,19.20)	30.63±6.55	(19.20,38.40)	43.56±7.68	(26.50,57.60)
N=150	9.62±0.23	(9.60,19.20)	19.20±0.00	(19.20,19.20)	30.97±6.09	(19.20,38.40)	43.76±7.00	(19.20,57.60)
N=175	9.61±0.12	(9.60,13.44)	19.20±0.00	(19.20,19.20)	31.30±5.74	(19.20,38.40)	43.82±7.24	(28.80,57.60)
N=200	9.60±0.06	(9.60,12.48)	19.20±0.00	(19.20,19.20)	31.60±5.66	(19.20,38.40)	43.69±8.52	(28.80,57.60)
Population	9.60	-	19.20	-	28.80	-	38.40	-

**Table 38. Difference of duration of mold stain remover use by the parent population and randomly selected samples (N=532).**

Sample size	Duration of use in the samples and the parent population (min/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	7.19±3.77	(0.50,30.00)	-	-	-	-	-	-
N=10	6.94±2.48	(1.00,25.00)	-	-	-	-	-	-
N=20	6.78±2.20	(2.33,15.00)	11.23±3.04	(5.00,30.00)	23.58±6.70	(5.03,30.00)	-	-
N=50	6.42±2.07	(3.00,10.00)	10.60±1.68	(5.25,20.62)	26.59±4.46	(10.00,30.00)	-	-
N=75	6.15±2.03	(4.00,10.00)	10.36±1.19	(5.50,20.00)	27.71±3.85	(10.00,30.00)	-	-
N=100	6.00±1.84	(5.00,10.00)	10.20±0.89	(10.00,20.00)	28.38±3.53	(15.00,30.00)	29.99±0.32	(20.00,30.00)
N=125	5.83±1.76	(5.00,10.00)	10.11±0.71	(10.00,15.00)	28.85±2.85	(15.00,30.00)	30.00±0.12	(20.00,30.00)
N=150	5.66±1.53	(5.00,10.00)	10.06±0.50	(10.00,15.00)	29.14±2.45	(20.00,30.00)	30.00±0.00	(30.00,30.00)
N=175	5.55±1.44	(5.00,10.00)	10.03±0.35	(10.00,15.00)	29.41±2.10	(20.00,30.00)	30.00±0.00	(30.00,30.00)
N=200	5.45±1.27	(5.00,10.00)	10.02±0.24	(10.00,15.00)	29.63±1.72	(20.00,30.00)	30.00±0.00	(30.00,30.00)
Population	5.00	-	10.00	-	30.00	-	30.00	-

*Comparison of exposure factors for glass cleaner between samples and the parent population*

For frequency of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of 50 was the same as that of the parent population (Table 39). The 75<sup>th</sup>-percentile value for a sample size of 20 was the same as that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 50 was less than 7% different from that of the parent population. The 99<sup>th</sup>-percentile value for a sample size of 100 was less than 10% different from that of the parent population. For amount of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of 5 was less than 2% different from that of the parent population (Table 40). The 75<sup>th</sup>-percentile values for different sample sizes were lower than that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 75 was less than 10% different from that of the parent population. The 99<sup>th</sup>-percentile value for a sample size of 100 was less than 9% different from that of the parent population. For duration of use, the 50<sup>th</sup>-percentile exposure factors for different sample sizes were higher than that of the parent population, while the 75<sup>th</sup>-percentile values were similar to that of the parent population (Table 41). The 95<sup>th</sup>-percentile value for a sample size of 20 was less than 7% different from that of the parent population. The 99<sup>th</sup>-percentile value for a sample size of 100 was less than 6% different from that of the parent population.

**Table 39. Difference of frequency of glass cleaner use by the parent population and randomly selected samples (N=480).**

Sample size	Frequency of use in the samples and the parent population (event/day)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	0.09±0.05	(0.03, 1.00)	-	-	-	-	-	-
N=10	0.08±0.03	(0.03, 0.29)	-	-	-	-	-	-
N=20	0.08±0.03	(0.03, 0.14)	0.14±0.03	(0.03, 0.46)	0.37±0.24	(0.10, 1.00)	-	-
N=50	0.07±0.02	(0.03, 0.14)	0.14±0.01	(0.07, 0.29)	0.40±0.19	(0.14, 1.00)	-	-
N=75	0.07±0.01	(0.03, 0.14)	0.14±0.00	(0.07, 0.21)	0.40±0.16	(0.14, 1.00)	-	-
N=100	0.07±0.01	(0.03, 0.14)	0.14±0.00	(0.10, 0.14)	0.40±0.14	(0.14, 1.00)	0.90±0.21	(0.29, 1.00)
N=125	0.07±0.01	(0.03, 0.14)	0.14±0.00	(0.10, 0.14)	0.40±0.12	(0.14, 1.00)	0.93±0.16	(0.29, 1.00)
N=150	0.07±0.01	(0.07, 0.14)	0.14±0.00	(0.13, 0.14)	0.39±0.09	(0.14, 1.00)	0.94±0.14	(0.29, 1.00)
N=175	0.07±0.01	(0.07, 0.10)	0.14±0.00	(0.14, 0.14)	0.40±0.08	(0.14, 1.00)	0.97±0.11	(0.32, 1.00)
N=200	0.07±0.01	(0.07, 0.10)	0.14±0.00	(0.14, 0.14)	0.40±0.07	(0.29, 1.00)	0.98±0.09	(0.43, 1.00)
Population	0.07	-	0.14	-	0.43	-	1.00	-

**Table 40. Difference of amount of glass cleaner use by the parent population and randomly selected samples (N=480).**

Sample size	Amount of use in the samples and the parent population (g/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	5.05±2.44	(1.03, 20.60)	-	-	-	-	-	-
N=10	4.73±1.49	(2.06, 14.42)	-	-	-	-	-	-
N=20	4.53±0.97	(2.58, 10.30)	7.98±2.37	(3.09, 20.60)	16.53±6.15	(5.15, 30.90)	-	-
N=50	4.57±0.64	(3.09, 8.76)	8.37±2.08	(5.15, 13.39)	18.11±4.71	(8.91, 30.90)	-	-
N=75	4.63±0.59	(3.09, 6.18)	8.58±1.95	(5.15, 10.30)	18.58±3.93	(10.30, 30.90)	-	-
N=100	4.66±0.53	(3.09, 5.15)	8.72±1.85	(5.15, 10.30)	18.74±3.36	(10.30, 30.90)	28.25±4.53	(15.45, 30.90)
N=125	4.67±0.53	(3.09, 5.15)	8.86±1.79	(5.15, 10.30)	19.03±2.79	(10.30, 30.90)	28.97±3.46	(15.45, 30.90)
N=150	4.68±0.50	(3.09, 5.15)	8.97±1.67	(5.15, 10.30)	19.19±2.33	(10.30, 30.90)	29.45±2.98	(15.45, 30.90)
N=175	4.69±0.51	(3.09, 5.15)	9.07±1.58	(5.15, 10.30)	19.35±2.11	(10.30, 30.90)	29.83±2.82	(17.55, 30.90)
N=200	4.7±0.49	(3.09, 5.15)	9.20±1.49	(5.15, 10.30)	19.56±1.99	(10.30, 30.90)	30.22±2.55	(15.46, 30.90)
Population	5.15	-	10.30	-	20.60	-	30.90	-

**Table 41. Difference of duration of glass cleaner use by the parent population and randomly selected samples (N=480).**

Sample size	Duration of use in the samples and the parent population (min/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	6.89±2.86	(0.33, 15.00)	-	-	-	-	-	-
N=10	6.99±2.32	(0.75, 10.00)	-	-	-	-	-	-
N=20	6.97±2.23	(2.00, 10.00)	9.86±0.73	(5.00, 10.08)	10.68±1.54	(10.00, 15.00)	-	-
N=50	6.62±2.14	(4.00, 10.00)	10.00±0.09	(5.00, 10.00)	10.65±1.36	(10.00, 15.00)	-	-
N=75	6.41±2.14	(5.00, 10.00)	10.00±0.00	(10.00, 10.00)	10.49±1.21	(10.00, 15.00)	-	-
N=100	6.23±1.95	(5.00, 10.00)	10.00±0.00	(10.00, 10.00)	10.33±1.09	(10.00, 15.00)	14.21±1.75	(10.00, 15.00)
N=125	6.08±1.91	(5.00, 10.00)	10.00±0.00	(10.00, 10.00)	10.24±0.88	(10.00, 15.00)	14.41±1.33	(10.00, 15.00)
N=150	5.89±1.70	(5.00, 10.00)	10.00±0.00	(10.00, 10.00)	10.19±0.71	(10.00, 15.00)	14.61±1.05	(10.00, 15.00)
N=175	5.76±1.61	(5.00, 10.00)	10.00±0.00	(10.00, 10.00)	10.13±0.52	(10.00, 15.00)	14.75±0.92	(10.00, 15.00)
N=200	5.70±1.50	(5.00, 10.00)	10.00±0.00	(10.00, 10.00)	10.07±0.40	(10.00, 15.00)	14.88±0.72	(10.00, 15.00)
Population	5.00	-	10.00	-	10.00	-	15.00	-

*Comparison of exposure factors for floor cleaner between samples and the parent population*

For frequency of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of 10 was less than 8% different from that of the parent population (Table 42). The 75<sup>th</sup>-percentile value for a sample size of 100 was less than 7% different from that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of only 20 was less than 2% different from that of the parent population, and the 95<sup>th</sup>-percentile values for the other sample sizes were higher than that of the parent population. The 99<sup>th</sup>-percentile values for different sample sizes were similar to that of the parent population. For amount of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of 75 was less than 10% different from that of the parent population (Table 43). The 75<sup>th</sup>-percentile value for a sample size of 20 was less than 4% different from that of the parent population. The 95<sup>th</sup>-percentile values for different sample sizes were lower than that of the parent population. The 99<sup>th</sup>-percentile values for different sample sizes were similar to that of the parent population. For duration of use, the 50<sup>th</sup>-percentile exposure factor for a sample size of five was less than 9% different from that of the parent population (Table 44). The 75<sup>th</sup>-percentile value for a sample size of 20 was less than 8% different from that of the parent population. The 95<sup>th</sup>-percentile value for a sample size of 50 was less than 5% different from that of the parent population. The 99<sup>th</sup>-percentile values for different sample sizes were similar to that of the parent population.

**Table 42. Difference of frequency of floor cleaner use by the parent population and randomly selected samples (N=442).**

Sample size	Frequency of use in the samples and the parent population (event/day)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	0.16±0.07	(0.03, 1.00)	-	-	-	-	-	-
N=10	0.15±0.04	(0.03, 0.43)	-	-	-	-	-	-
N=20	0.15±0.02	(0.07, 0.29)	0.24±0.07	(0.14, 1.00)	0.56±0.28	(0.14, 1.02)	-	-
N=50	0.14±0.00	(0.13, 0.29)	0.25±0.06	(0.14, 0.43)	0.64±0.24	(0.29, 1.00)	-	-
N=75	0.14±0.00	(0.14, 0.14)	0.26±0.05	(0.14, 0.29)	0.67±0.24	(0.29, 1.00)	-	-
N=100	0.14±0.00	(0.14, 0.14)	0.27±0.05	(0.14, 0.29)	0.68±0.25	(0.29, 1.00)	0.99±0.07	(0.29, 1.00)
N=125	0.14±0.00	(0.14, 0.14)	0.27±0.04	(0.14, 0.29)	0.70±0.24	(0.29, 1.00)	1.00±0.04	(0.43, 1.00)
N=150	0.14±0.00	(0.14, 0.14)	0.28±0.03	(0.14, 0.29)	0.70±0.23	(0.29, 1.00)	1.00±0.02	(0.50, 1.00)
N=175	0.14±0.00	(0.14, 0.14)	0.28±0.03	(0.14, 0.29)	0.71±0.23	(0.29, 1.00)	1.00±0.01	(0.58, 1.00)
N=200	0.14±0.00	(0.14, 0.14)	0.28±0.02	(0.14, 0.29)	0.72±0.24	(0.43, 1.00)	1.00±0.01	(0.57, 1.00)
Population	0.14	-	0.29	-	0.57	-	1.00	-

**Table 43. Difference of amount of floor cleaner use by the parent population and randomly selected samples (N=442).**

Sample size	Amount of use in the samples and the parent population (g/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	74.34±31.19	(10.64, 266.00)	-	-	-	-	-	-
N=10	71.43±23.03	(26.60, 159.60)	-	-	-	-	-	-
N=20	67.41±21.29	(39.90, 159.60)	110.47±20.90	(53.20, 266.00)	181.21±50.25	(53.20, 430.92)	-	-
N=50	61.54±17.97	(53.20, 106.40)	108.70±10.77	(53.20, 159.60)	189.73±38.59	(106.40, 319.20)	-	-
N=75	58.48±15.90	(53.20, 106.40)	107.41±6.62	(53.20, 159.60)	190.74±36.99	(106.40, 281.96)	-	-
N=100	56.33±11.70	(53.20, 106.40)	106.75±3.89	(106.40, 159.60)	190.18±37.38	(109.06, 268.66)	283.79±47.02	(159.60, 426.66)
N=125	55.15±10.00	(53.20, 106.40)	106.48±2.06	(106.40, 159.60)	190.22±35.12	(159.60, 266.00)	288.66±40.72	(159.60, 400.06)
N=150	54.28±7.05	(53.20, 106.40)	106.42±1.08	(106.40, 159.60)	190.07±32.76	(159.60, 266.00)	291.37±35.29	(159.60, 373.46)
N=175	53.81±5.67	(53.20, 106.40)	106.41±0.59	(106.40, 159.60)	189.11±31.29	(159.60, 266.00)	291.01±29.60	(159.60, 346.86)
N=200	53.42±3.21	(53.20, 106.40)	106.40±0.00	(106.40, 106.40)	188.65±31.08	(159.60, 266.00)	288.03±26.78	(159.60, 320.26)
Population	53.20	-	106.40	-	210.14	-	297.39	-

**Table 44. Difference of duration of floor cleaner use by the parent population and randomly selected samples (N=442).**

Sample size	Duration of use in the samples and the parent population (min/event)							
	50 <sup>th</sup> percentile		75 <sup>th</sup> percentile		95 <sup>th</sup> percentile		99 <sup>th</sup> percentile	
	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)	AM±SD	Range (Min, Max)
N=5	9.11±4.02	(1.00, 30.00)	-	-	-	-	-	-
N=10	8.98±2.49	(1.50, 30.00)	-	-	-	-	-	-
N=20	9.12±1.79	(3.00, 20.00)	13.33±4.07	(5.00, 30.00)	26.45±6.17	(10.00, 60.00)	-	-
N=50	9.67±1.08	(5.00, 10.08)	12.81±3.16	(10.00, 25.38)	28.57±3.24	(11.65, 45.50)	-	-
N=75	9.84±0.81	(5.00, 10.00)	12.66±2.81	(10.00, 20.00)	29.27±2.16	(16.50, 40.00)	-	-
N=100	9.94±0.45	(5.00, 10.00)	12.54±2.61	(10.00, 20.00)	29.63±1.55	(20.00, 40.00)	36.03±8.31	(25.05, 60.00)
N=125	9.97±0.33	(5.00, 10.00)	12.41±2.50	(10.00, 20.00)	29.80±1.02	(20.00, 30.50)	36.81±7.71	(27.60, 57.60)
N=150	9.99±0.15	(5.21, 10.00)	12.45±2.36	(10.00, 20.00)	29.89±0.70	(20.00, 30.27)	37.21±6.96	(27.55, 55.10)
N=175	10.00±0.09	(5.08, 10.00)	12.39±2.30	(10.00, 20.00)	29.95±0.51	(20.00, 30.00)	37.20±6.44	(30.00, 52.60)
N=200	10.00±0.01	(9.00, 10.00)	12.39±2.28	(10.00, 20.00)	29.99±0.25	(20.73, 30.00)	36.79±6.27	(30.00, 50.10)
Population	10.00	-	12.38	-	30.00	-	40.00	-

The 75<sup>th</sup>-percentile values for the three exposure factors determined using a sample size of 200 were  $\leq 10\%$  different from those of the parent population for nine products (all CPs but indoor disinfectant, fabric deodorizer, trigger-type bathroom cleaner, and glass cleaner). For all 13 CPs, the 75<sup>th</sup>-percentile values for the three exposure factors determined from a sample size of 150 were  $\leq 20\%$  different from those of the parent population. The 75<sup>th</sup>-percentile values for a sample size of 100 were  $\leq 20\%$  different from those of the parent population for all CPs except indoor disinfectant. For indoor disinfectant, the 75<sup>th</sup>-percentile values of the three exposure factors determined using different sample sizes were  $\leq 30\%$  different from those of the parent population. The 75<sup>th</sup>-percentile values for a sample size of 50 were  $\leq 30\%$  different from those of the parent population for all 13 CPs. The 95<sup>th</sup>-percentile values for all three exposure factors determined from a sample size of 200 were  $\leq 10\%$  different from those of the parent population in nine products (all CPs except shampoo, body wash, mold stain remover, and floor cleaner). The 95<sup>th</sup>-percentile values for a sample size of 100 were  $\leq 20\%$  different from those of the parent population in all products except shampoo and floor cleaner. In shampoo and floor cleaner, the 95<sup>th</sup>-percentile values of the three exposure factors determined using different sample sizes were  $\leq 30\%$  different from those of the parent population. The 95<sup>th</sup>-percentile values for a sample size of 50 were  $\leq 30\%$  different from those of the parent population.

For floor cleaner, the relative error between the exposure factor values of the randomly selected samples and the parent population increased with increasing sample size at the 95<sup>th</sup> percentile for frequency of use. This trend was different from

the tendency found in the other CPs. For frequency of use, 5.0% of respondents reported using floor cleaner extremely often (Figure A13a). The probability of including an outlying value may increase as the sample size grows.

### **3.3. Comparison of exposure levels based on the randomly selected samples and the parent population**

#### *Comparison of inhalation exposure between samples and the parent population*

The means and ranges of the inhalation exposure levels estimated using the 75<sup>th</sup> and 95<sup>th</sup> percentiles for a sample size of 100 and the 75<sup>th</sup>, 95<sup>th</sup>, and 99<sup>th</sup> percentiles of the inhalation exposure levels of the parent population are presented in Table 45. The percentages of exposure levels calculated based on the 75<sup>th</sup> and 95<sup>th</sup> percentiles of exposure factors for a sample size of 100 exceeding the 95<sup>th</sup> and 99<sup>th</sup> percentiles of the exposure level of the parent population are presented in Table 45. The distributions of inhalation exposure based on the 75<sup>th</sup>- and 95<sup>th</sup>-percentile values of the three exposure factors for a sample size of 100 are presented in Figure A14-A22. The 75<sup>th</sup>-percentile inhalation exposure levels for the three exposure factors of the samples were lower than the 95<sup>th</sup>-percentile exposure estimates of the parent population for all CPs except mold stain remover. The 95<sup>th</sup>-percentile inhalation exposure levels for the three exposure factors of the samples far exceeded the 99<sup>th</sup>-percentile exposure estimates of the parent population for toilet rim cleaner, glass cleaner and floor cleaner. For the other products, the 95<sup>th</sup>-percentile inhalation exposure levels of the three exposure factors of the samples exceeded the 99<sup>th</sup>-percentile exposure estimates of the parent population by 0.1% to 5%.

**Table 45. The inhalation exposures of consumer products with exposure factors in parent population and randomly selected sample of 100 .**

Products	Inhalation exposure of the samples (Sample size=100) (mg/kg/day)						Inhalation exposure of the parent population (mg/kg/day)	
	75 <sup>th</sup>			95 <sup>th</sup>			95 <sup>th</sup>	99 <sup>th</sup>
	AM±SD	Range (Min, Max)	Excess rate * (%)	AM±SD	Range (Min, Max)	Excess rate * (%)		
Dishwasher detergent	6.22±0.85	(4.49, 8.97)	0.0	9.78±2.06	(4.83, 20.23)	0.1	11.96	19.46
Disinfectant	2.26±0.87	(1.2, 5.02)	0.0	6.91±1.91	(2.58, 20.98)	4.1	6.01	10.04
Fabric deodorizer	0.01±0	(0.01, 0.02)	0.0	0.04±0.01	(0.02, 0.09)	5.0	0.02	0.05
Bathroom cleaner (Bottled)	29.22±7.44	(10.72, 67.31)	0.0	95.48±31.93	(34.56, 189.44)	1.3	26.51	89.75
Bathroom cleaner (Trigger-type)	3.8±0.67	(2.08, 9.28)	0.0	10.32±1.45	(5.34, 18.37)	4.0	10.92	15.63
Toilet rim cleaner	28.55±4.64	(7.48, 44.87)	0.0	99.53±37.26	(44.87, 157.06)	60.6	52.72	81.60
Mold stain remover	2.84±0.6	(1.48, 5.4)	4.8	5.6±1.83	(2.77, 19.4)	2.2	4.78	9.11
Glass cleaner	0.44±0.09	(0.26, 0.52)	0.0	2.64±1.04	(0.58, 10.9)	82.5	0.76	1.84
Floor cleaner	9.83±1.76	(4.94, 16.09)	0.0	38.92±16.31	(13.62, 86.36)	46.1	18.77	37.55

\* Percent exceeding the 95<sup>th</sup> percentile of the population's inhalation exposure levels.

*Comparison of dermal exposure between samples and the parent population*

The means and ranges of the dermal exposure levels estimated using the 75<sup>th</sup> and 95<sup>th</sup> percentiles for a sample size of 100 and the 75<sup>th</sup>, 95<sup>th</sup>, and 99<sup>th</sup> percentiles of the dermal exposure levels of the parent population are presented in Table 46. The percentages of the exposure levels calculated based on the 75<sup>th</sup> and 95<sup>th</sup> percentiles of exposure factors for a sample size of 100 exceeding the 95<sup>th</sup> and 99<sup>th</sup> percentiles of exposure of the parent population are presented in Table 46. The distributions of dermal exposure based on the 75<sup>th</sup> and 95<sup>th</sup> percentiles of the three exposure factors for a sample size of 100 are presented in Figures A23-A35. The dermal exposure levels based on the 75<sup>th</sup> percentiles of the three exposure factors of the samples were lower than the 95<sup>th</sup> percentile of exposure estimates of the parent population, for all CPs except mold stain remover. For all CPs, the dermal exposure levels based on the 95<sup>th</sup> percentiles of the three exposure factors of the samples exceeded the 99<sup>th</sup> percentiles of exposure estimates of the parent population by 0.1% to 98.0%.

**Table 46. The dermal exposures of consumer products with exposure factors in parent population and randomly selected sample of 100 in sample size of 100 and in the parent and population.**

Products	Dermal exposure of the samples (Sample size=100) (mg/kg/day)						Dermal exposure of the parent population (mg/kg/day)	
	75 <sup>th</sup>			95 <sup>th</sup>			95 <sup>th</sup>	99 <sup>th</sup>
	AM±SD	Range (Min, Max)	Excess rate* (%)	AM±SD	Range (Min, Max)	Excess rate* (%)		
Shampoo	6.22±0.85	(4.49, 8.97)	0.0	9.78±2.06	(4.83, 20.23)	26.4	93.98	125.30
Dishwasher detergent	284.06±38.03	(203.27, 406.54)	0.0	626.18±121.90	(406.54, 1366.43)	8.5	542.06	903.43
Body wash	69.63±13.05	(61.53, 92.29)	0.0	110.41±34.92	(92.29, 246.11)	17.6	92.29	153.82
Hair conditioner	60.00±0.00	(60, 60)	0.0	95.38±24.63	(60.00, 220.56)	7.4	90.00	120.00
Disinfectant	36.92±14.06	(26.48, 79.44)	0.0	192.55±44.99	(79.44, 463.40)	70.0	92.68	164.17
Facial cleanser	44.55±0.00	(44.55, 44.55)	0.0	44.68±2.27	(44.55, 105.92)	0.1	44.55	102.89
Fabric deodorizer	0.54±0.15	(0.20, 1.52)	0.4	2.59±0.63	(1.23, 7.17)	48.9	1.23	2.20
Bathroom cleaner (Bottled)	522.6±123.97	(236.76,1154.21)	0.0	2744.67±833.80	(1065.42,4971.96)	53.0	355.14	1657.32
Bathroom cleaner (Trigger-type)	6.25±1.29	(3.07, 14.33)	2.1	20.82±1.90	(12.74, 21.50)	97.3	10.75	14.33
Toilet rim cleaner	451.81±73.45	(118.38, 710.28)	0.0	1575.44±589.72	(710.28, 2485.98)	73.7	828.66	1065.42
Mold stain remover	1.10±0.25	(1.02, 3.07)	0.0	7.10±1.69	(3.07, 21.50)	98.0	3.07	4.09
Glass cleaner	1.02±0.01	(0.72, 1.02)	0.0	2.97±1.10	(1.02, 10.75)	11.7	2.05	3.69
Floor cleaner	442.9±78.37	(236.76, 710.28)	0.0	2022.81±845.95	(710.28, 4184.74)	53.7	828.66	1657.32

\* Percent exceeding the 95<sup>th</sup> percentile of the population's dermal exposure levels.

## IV. Discussion

The relative errors in the three exposure factors between the samples and the parent population are quantitatively presented for the 13 CPs (Tables 6-44). Overall, as sample size increased, the exposure factors of the samples became closer to those of the parent population. The relative errors differed for different products. For seven of the 13 CPs (shampoo, dishwasher detergent, facial cleanser, bottled bathroom cleaner, toilet rim cleaner and floor cleaner), most of the 75<sup>th</sup> percentiles of the three exposure factors were within 10% for different sample sizes. The exposure factors of some products had significant error until the sample size reached 200 (disinfectant, trigger-type bathroom cleaner, fabric deodorizer, glass cleaner).

Based on the errors observed for different sample sizes, the error in estimating exposure may be quantified for a given sample size. Many researchers have used default values or their own data in deterministic exposure assessments. The default values provided by ConsExpo, which were determined based on reference to other studies and assumptions, widely used (Gosens et al. 2014). ConsExpo provides the default values for all products studied in this paper except for fabric deodorizer (Bremmer et al. 2006; Prud'Homme de Lodder et al. 2006a; Prud'Homme de Lodder et al. 2006b). For dishwasher detergent, body wash, and toilet rim cleaner, CPs, the three exposure factors were determined by the survey (). For trigger-type bathroom cleaner, indoor disinfectant, and glass cleaner, only a subset of the three exposure factors were set by the survey (). For the other products, the default values were based

on an assumption rather than survey data.

ConsExpo's default exposure factors for dishwasher detergent may slight error. In ConsExpo, the defaults for the frequency, amount, and duration of use were determined as the 75<sup>th</sup>-percentile values of 45, 592 and 163 participants in a previous study, respectively (Prud'Homme de Lodder et al. 2006b; Weegels 1997). For dishwasher detergent, the 75<sup>th</sup>-percentile values of the frequency of use for a sample size of 50 was nearly the same as that of the parent population. For amount of use, the relative errors between the 75<sup>th</sup>-percentile values of the samples and the parent population was 2% for a sample size of 200. For duration of use, the relative errors between the 75<sup>th</sup>-percentile values of the samples and parent population was 0.3% for a sample size of 200.

For body wash, ConsExpo's default value for amount of use may be significantly different from the actual value of the population, while the errors in the two other exposure factors are thought to be negligible. In ConsExpo, the frequency and duration of use were obtained from a study of 86 participants (Groot-Marcus et al. 1995). The amount of use was based on a RIVM study of 12 (Bremmer et al. 2006). The 75<sup>th</sup>-percentile values of frequency use were the same as that of the parent population. For duration of use, the 75<sup>th</sup>-percentile values for a sample size of 75 and 100 were similar to that of the parent population. For amount of use, the 75<sup>th</sup>-percentile value for a sample size of 20 was approximately 17% different from that of the parent population.

For toilet rim cleaner, ConsExpo's defaults may have considerable error for all three exposure factors. The defaults for frequency of use ( $N=10$ ), amount of use ( $N=12$ ), and duration of use ( $N=12$ ) of use were derived from a previous survey (Weegels 1997). The 75<sup>th</sup>-percentile values of frequency, amount, and duration of use for a sample size of 20 were 7%, 16%, and 4% different from those of the parent population, respectively.

ConsExpo's default of value for frequency of use for trigger-type bathroom cleaner may have only a small error because of the fairly large sample size. In contrast, the default for the duration of use may have considerable error. The default value for amount of use was not based on the survey and, the error of amount of use could not be quantified. In ConsExpo, default frequency of use was derived from the frequency of commercial dry cleaning in a previous survey of 2,512 participants (Eisenhower 1987). The default value for amount of use was based on an assumption rather than survey data. The default value of duration of use derived from a RIVM study of five people (Weerdesteijn et al. 1999). The default value for amount of use was derived from AISE's assumption (AISE 2002). The relative errors between the 75<sup>th</sup>-percentile values of the samples and that of the parent population remained above 10% until the sample size reached 200. However, the error in ConsExpo's default value was considered to be small because the sample size was fairly large. For duration of use, the 75<sup>th</sup>-percentile value for a sample size of 20 was approximately 17% different from that of the parent population.

For indoor disinfectant, ConsExpo's default value for frequency of use may have

significant error. The default values for the other two exposure factors were determined by assumptions and, the error of the two exposure factors could not be quantified. The default value for duration of use was derived from a study of 10 people (Weerdesteijn et al. 1999). The default values for frequency and amount of use were assumed. The 75<sup>th</sup>-percentile value of duration of use for a sample size of 20 was 21% different from that of the parent population.

For glass cleaner, ConsExpo's default for duration of use may have little error. The other two defaults were not based on survey data and, the error of the two exposure factors could not be quantified. The default value for duration of use was derived from a previous study of 10 people (Weerdesteijn et al. 1999). The defaults for frequency and amount of use were assumed by ConsExpo. The 75<sup>th</sup>-percentile value of duration of use for a sample size of 20 was similar to that of the parent population.

The exposure levels to CPs were underestimated when the exposures were calculated as the 75<sup>th</sup> percentiles of the exposure factors. Meanwhile, the deterministic exposure assessment produced higher values than the probabilistic approach used in the Gosen's study (Gosen, 2014). However, the comparison of the exposure levels by deterministic and probabilistic approaches of Gosen's study was different from that in this study. In probabilistic assessment in Gosen's study, the exposure distribution was estimated by combining the individual probability distributions of the three exposure factors. In our study, the actual distribution of exposure level was used for comparison. In addition, the distribution of the exposure factors for probabilistic exposure

assessment in Gosen's study were assumed point or uniform, and the actual distribution of the exposure factors were not considered. Furthermore, the exposure factors used in the deterministic exposure assessment were derived from ConsExpo. As noted above, in many cases, the default ConsExpo values have errors caused by small sample size. Consequently, the results of the present study are more reliable. In Safford's study, the exposure levels of CPs obtained using a deterministic method were compared with those obtained using a probabilistic approach (Safford et al. 2015). Three products studied by Safford were also evaluated in the present study. The exposure levels of shampoo and hair conditioner obtained using the deterministic method were lower than those obtained from the probabilistic approach. In contrast, the exposure level of body wash estimated by the deterministic method was higher than that obtained by the probabilistic approach. Similar to the case of Gosen's study, the protocol of the probabilistic assessment in Safford's study was different from in this study. Thus, the results of this study may be more accurate than that of Safford's study.

The survey population required to obtain the data should be calculated in consideration of the usage rate. The number of censuses you need can be calculated by dividing the number of data needed by usage. For example, in the case of shampoo, which has a high usage rate (97.2%), 103 people are required to obtain data on 100 persons. For floor cleaner, which has a low usage rate (13.3%), 752 people are required to obtain data on 100 persons.

The gender distribution of survey respondents in this study was uneven

(significantly more females responded than males). However, more accurate usage patterns can be obtained from women because women make up a large portion of the users of the 13 CPs. Indeed, in ConsExpo, the default values for products mainly used by women are set up for women (Bremmer et al. 2006). Therefore, the usage patterns from women are relevant for exposure assessment. Another limitation of this study was that seasonal variation was not considered. The surveys were conducted in summer. However, personal hygiene products (e.g., shampoo and body wash) and disinfectants are used more frequently in summer than in winter. Conducting the survey in summer guaranteed that the exposure factors of these products were not underestimated.

Considering the errors observed for different sample sizes, the errors of exposure factors determined from previous survey data may be quantified. In addition, researchers may determine the sample size necessary to obtain accurate exposure factors in deterministic exposure assessments. The estimated exposure levels based on the 75<sup>th</sup>-percentile values were smaller than the 95<sup>th</sup>-percentile values of the parent population for most CPs in this study. In future studies, it is necessary to establish appropriate percentiles to reflect high-level exposure groups.

## **V. Conclusion**

The relative errors of the three exposure factors between the smaller samples and the parent population were quantified for 13 CPs. Overall, the relative errors decreased as sample size increased, and the relative errors differed for different products. Based on these results, the error of exposure factors derived from small sample sizes might be estimated quantitatively. Furthermore, researchers determine the survey sample size needed to obtain exposure factors. The inhalation and dermal exposure levels estimated by the 75<sup>th</sup> percentiles of the exposure factors in smaller samples were lower than the 95<sup>th</sup>-percentile exposure levels of the parent population for most CPs. Further study is needed to determine the suitable percentile to estimate exposure levels in high-exposure groups.

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# **Recommendation of suitable sample size of exposure factors in deterministic exposure assessment of consumer products**

생활화학용품 결정론적 노출평가를 위한  
표본 크기 별 노출계수 선정기준 검증

서울대학교 보건대학원  
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반 현 경

생활화학용품은 일상생활에서 편의를 위해 다양한 목적으로 사용되고 있다. 이러한 생활화학용품에는 인체에 유해한 화학물질이 들어있어 노출평가가 필요하다. 생활화학용품의 노출량을 추정하는 방법으로는 결정론적 방법과 확률론적 방법이 사용되고있다. 그 중 결정론적 노출평가를 위한 노출계수를 선정하는 기준이 모호하여 연구자들의 재량에 맡겨지고 있는 실정이다. 본 연구에서는 기존의 노출계수

조사자료를 활용하여 작은 표본크기에서 노출계수를 조사할 때 실제값과 얼마큼 차이가 나는지 정량적으로 제시하였다. 또한, 노출계수의 75분위수를 사용하여 추정된 노출량이 모집단의 고노출군의 노출량 값을 얼마큼 반영하는지 평가하였다.

화장품, 세정제, 소독제품으로 총 13 제품을 연구에 사용하였다. 3,333명을 대상으로 조사한 생활화학용품 노출계수를 반복샘플링 함으로써 10가지 작은 표본크기의 표본을 생성하였다. 각 분위수의 노출계수는 모집단의 같은 분위수와 비교하였다. 세 가지 노출계수의 75분위수와 95분위수로 계산한 노출량은 모집단의 노출량 분포와 비교하였다.

대부분의 제품에서 표본크기에 따른 노출계수의 상대적 오차는 표본크기가 커질수록 모집단의 해당 분위수와 가까워졌다. 각 제품에 따라서 상대적 오차의 변화가 다르게 나타났다. 표본크기가 50이하일 때에는 13제품 중 3 제품에서 노출계수의 75분위수가 모집단의 값과 10% 이내의 차이를 나타냈다. 표본크기가 100이하일 때에는 13제품 중 7 제품에서 노출계수의 75분위수가 모집단의 값과 10% 이내의 차이를 나타냈다. 대부분의 제품에서 세 가지 분위수 모두 75분위수로 표본의 노출을 추정된 값은 모집단 노출량의 95분위수보다 작게 계산되었다.

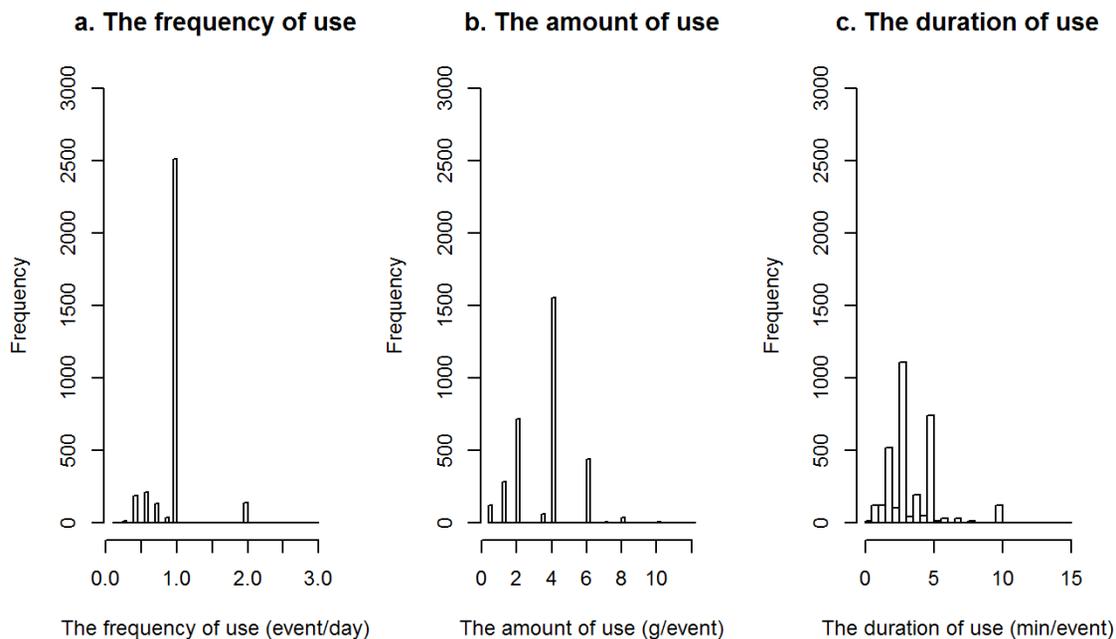
본 연구의 결과를 활용하여 기존에 조사된 노출계수가 표본크기에

따라 얼마큼의 오차를 가지고 있을 지 정량적으로 추정할 수 있다. 또한, 앞으로 노출계수를 조사할 때 표본크기를 결정하는 데에 참고할 수 있을 것이다. 기존의 연구들에서 결정론적 노출평가를 할 때에 노출계수의 75분위수를 사용하여 모집단의 고노출군의 노출량을 추정한다. 그러나, 노출계수의 75분위수로 노출량을 계산하면 모집단의 고노출군의 노출량을 과소평가할 수 있다. 앞으로 노출계수의 어떤 분위수를 선정해야 고노출군의 노출량을 추정할 수 있을지 평가가 필요하다.

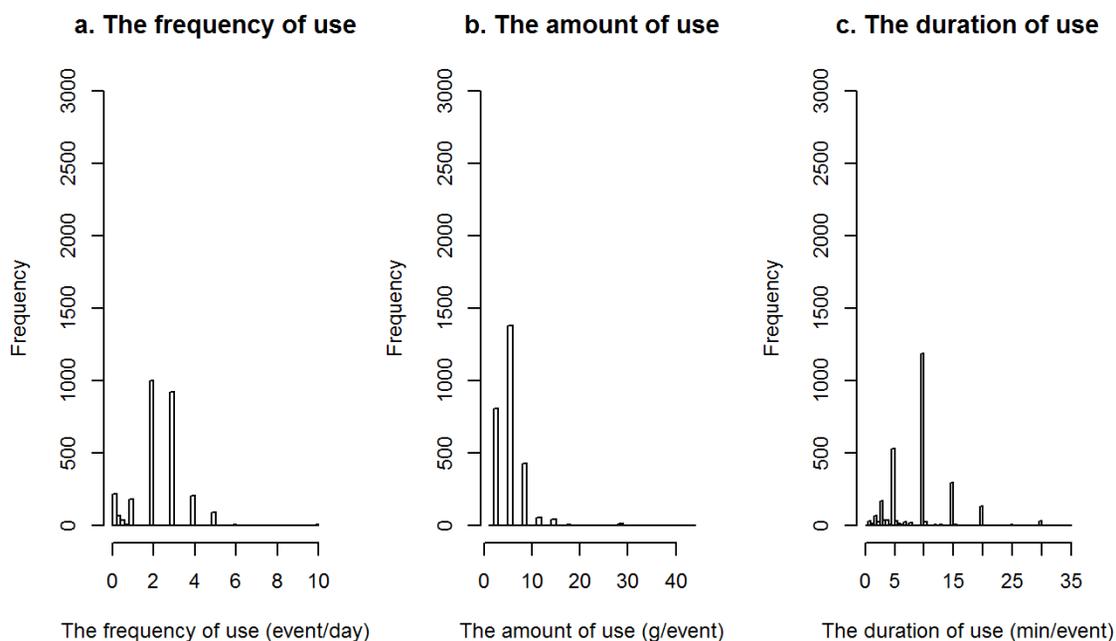
**주요어** : 결정론적 노출평가, 생활화학용품, 노출계수, 표본크기

**학번** : 2015-24052

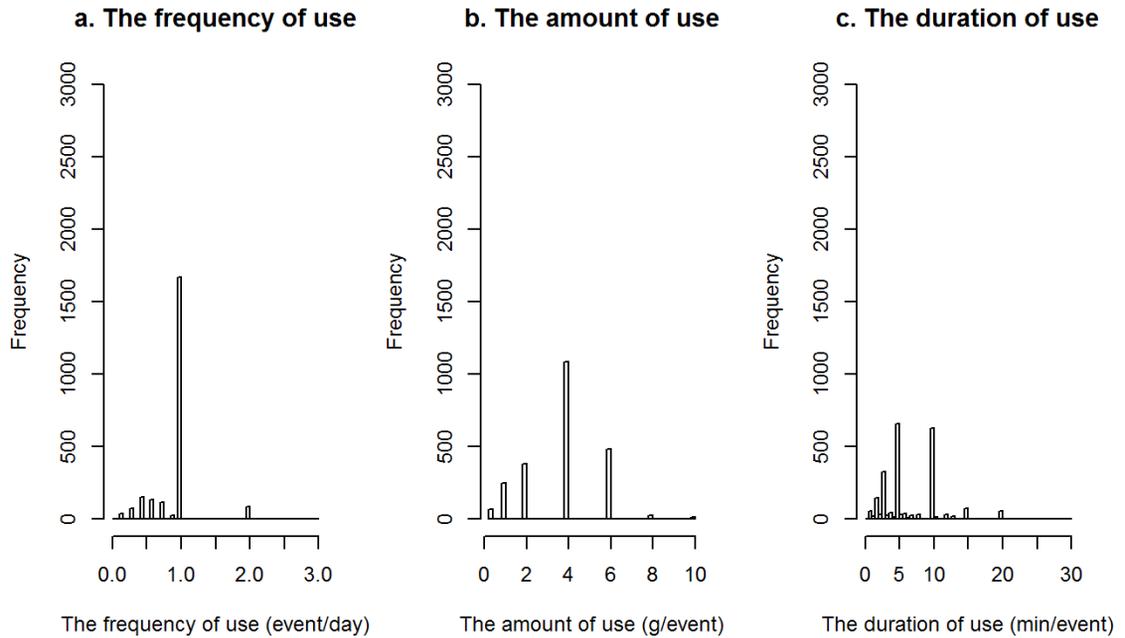
# Appendix



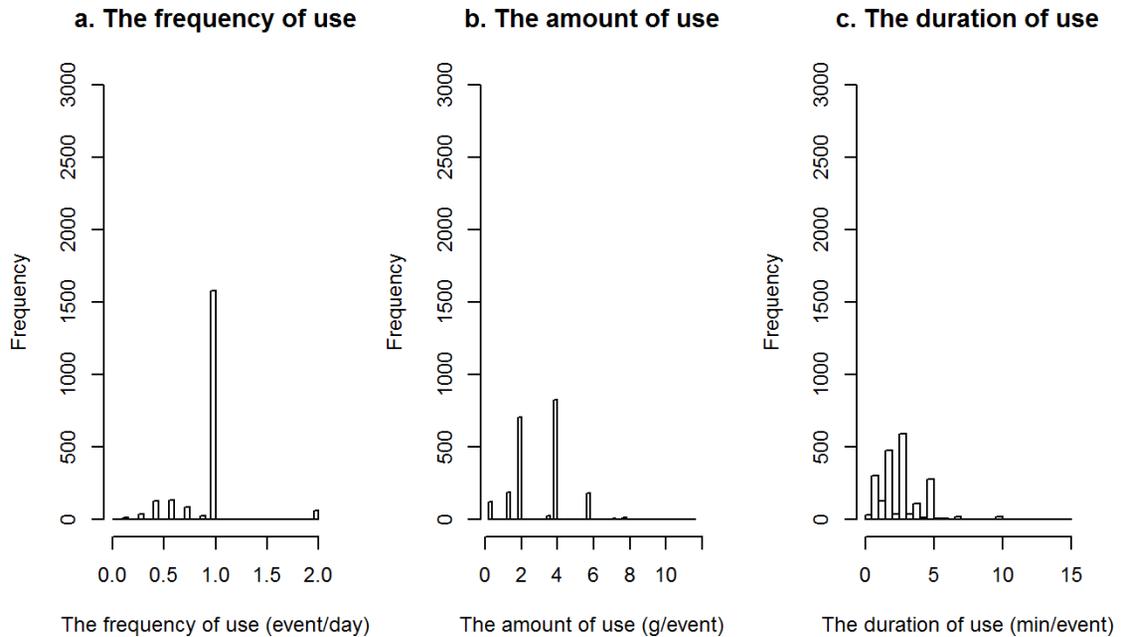
**Figure A1. Distributions of the three exposure factors of shampoo in the parent population.**



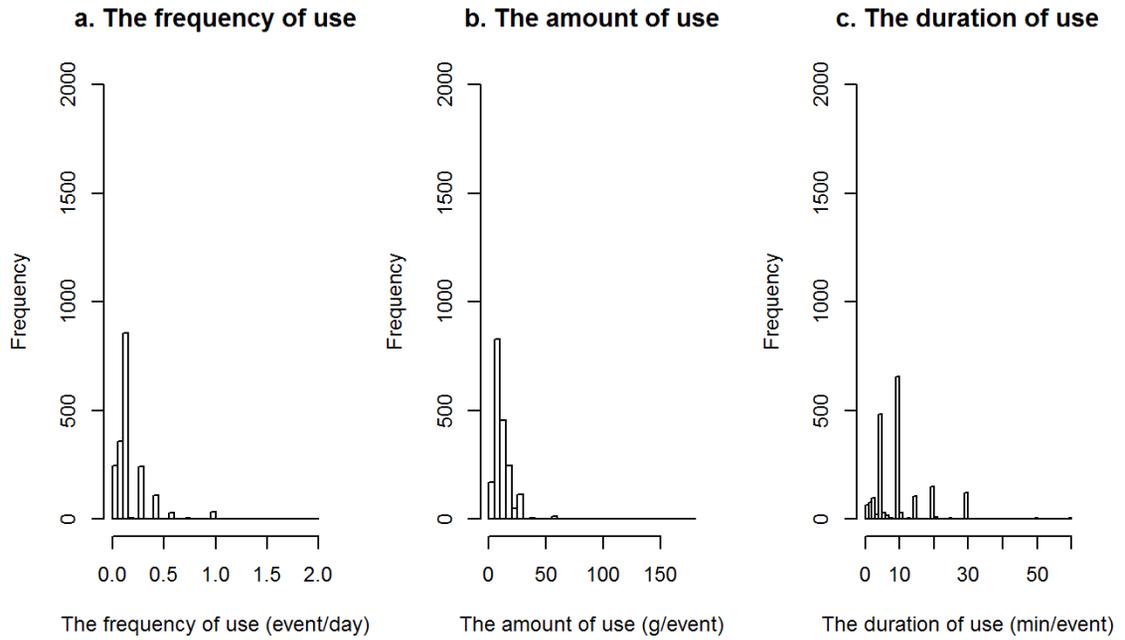
**Figure A2. Distributions of the three exposure factors of dishwasher detergent in the parent population.**



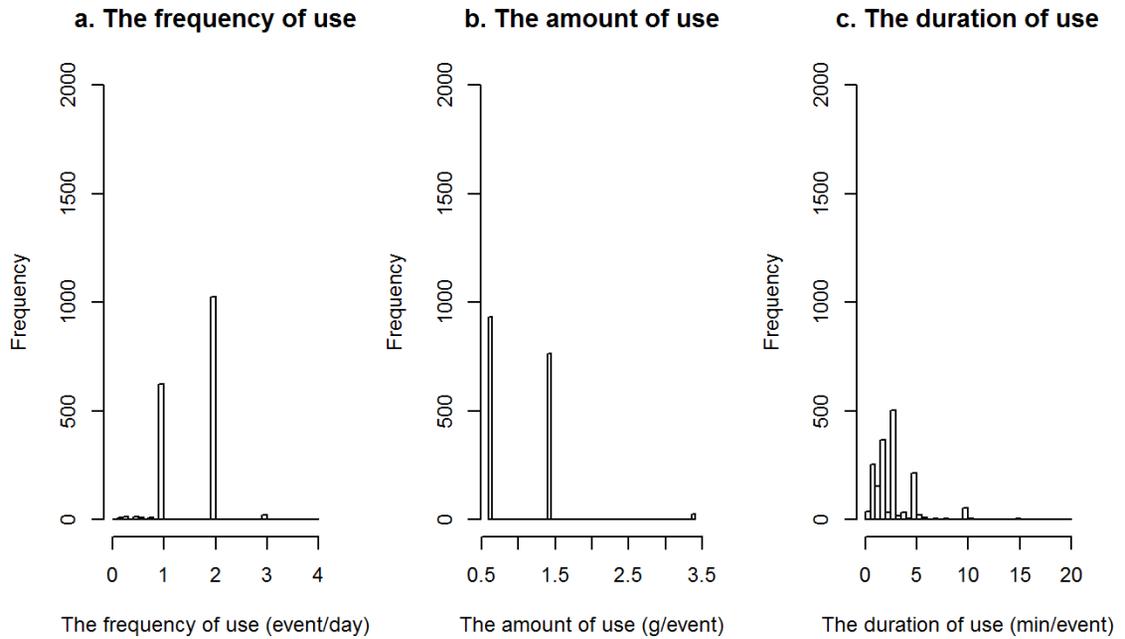
**Figure A3. Distributions of the three exposure factors of body wash in the parent population.**



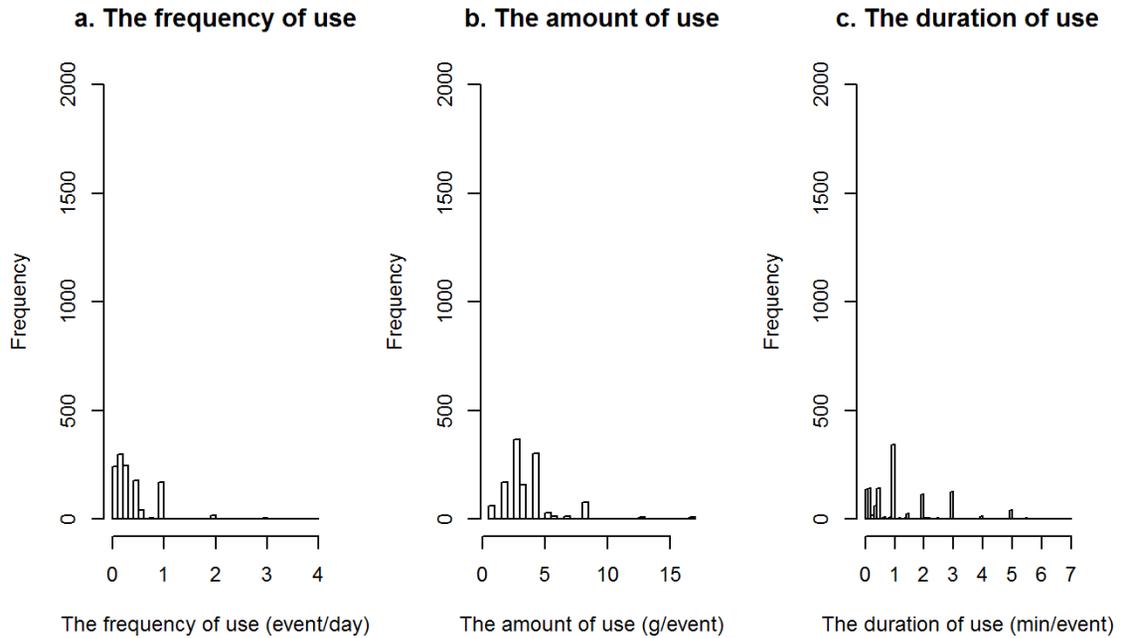
**Figure A4. Distributions of the three exposure factors of hair conditioner in the parent population.**



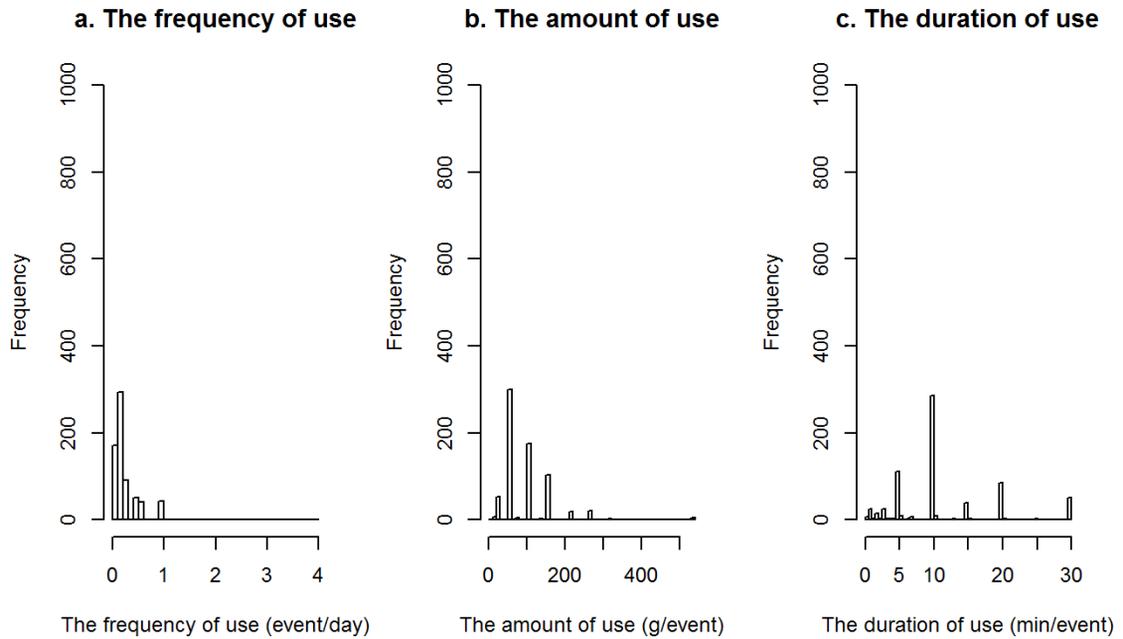
**Figure A5. Distributions of the three exposure factors of disinfectant in the parent population.**



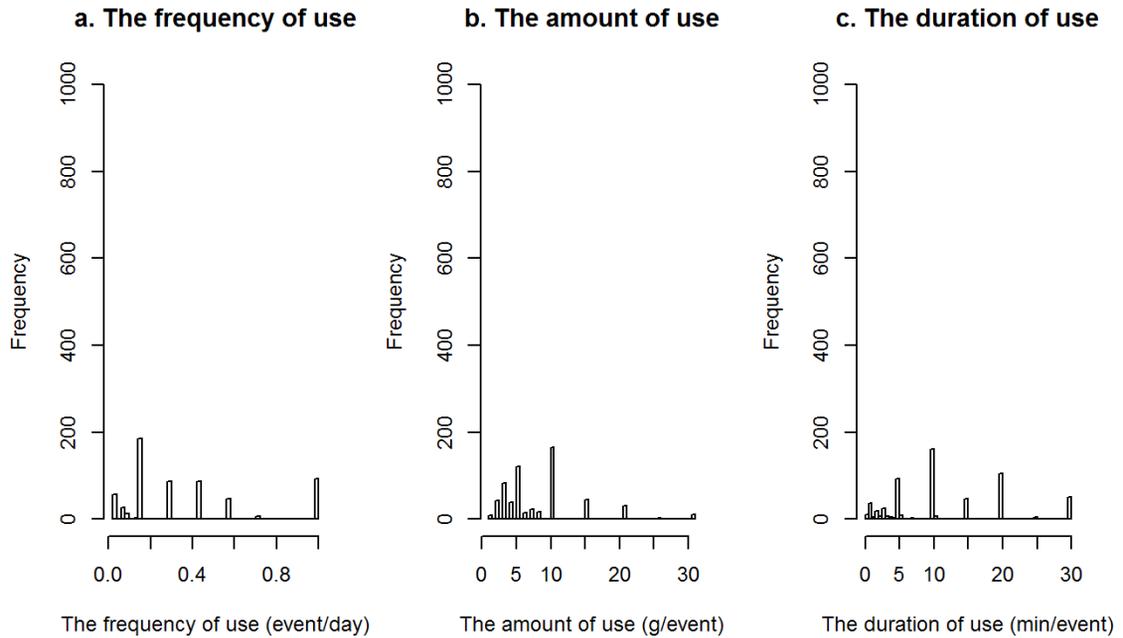
**Figure A6. Distributions of the three exposure factors of facial cleaner in the parent population.**



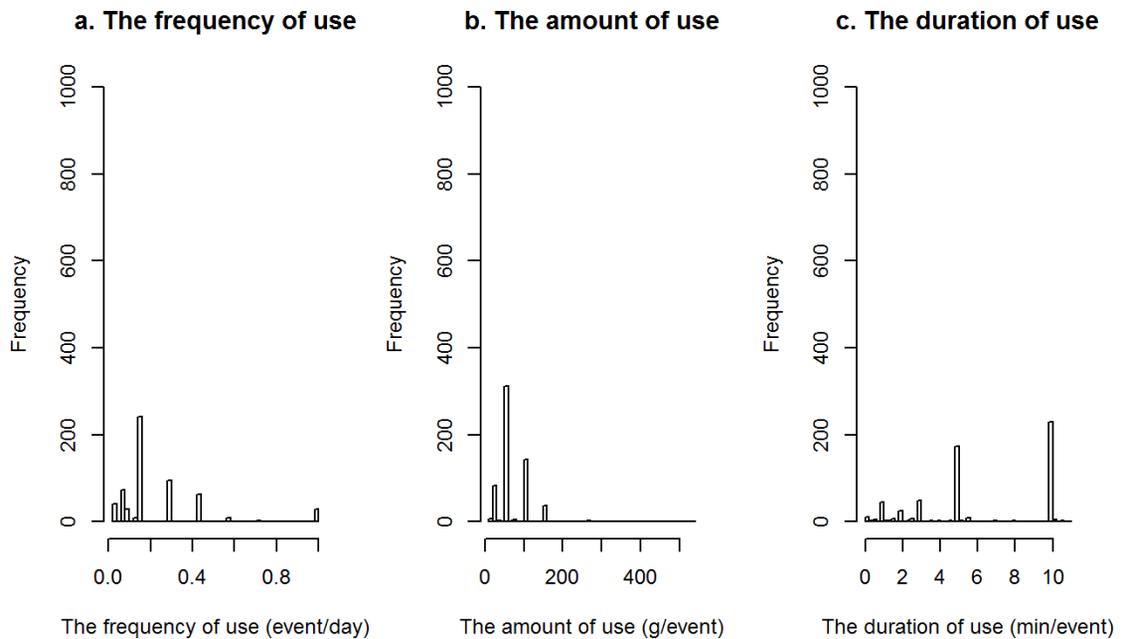
**Figure A7. Distributions of the three exposure factors of fabric deodorizer in the parent population.**



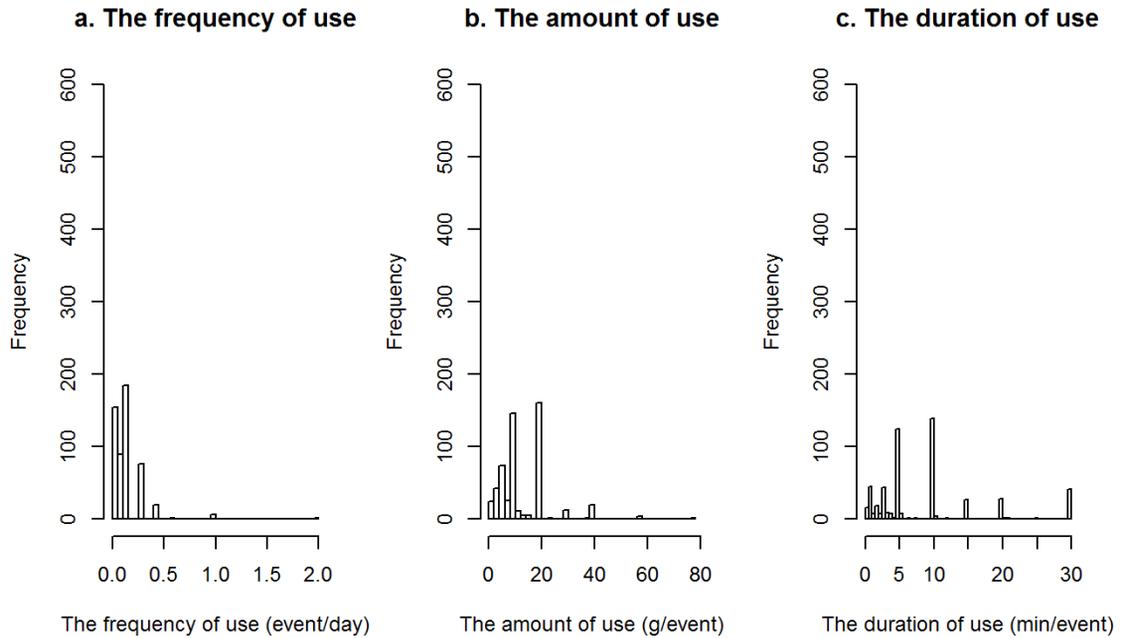
**Figure A8. Distributions of the three exposure factors of bottled bathroom cleaner in the parent population.**



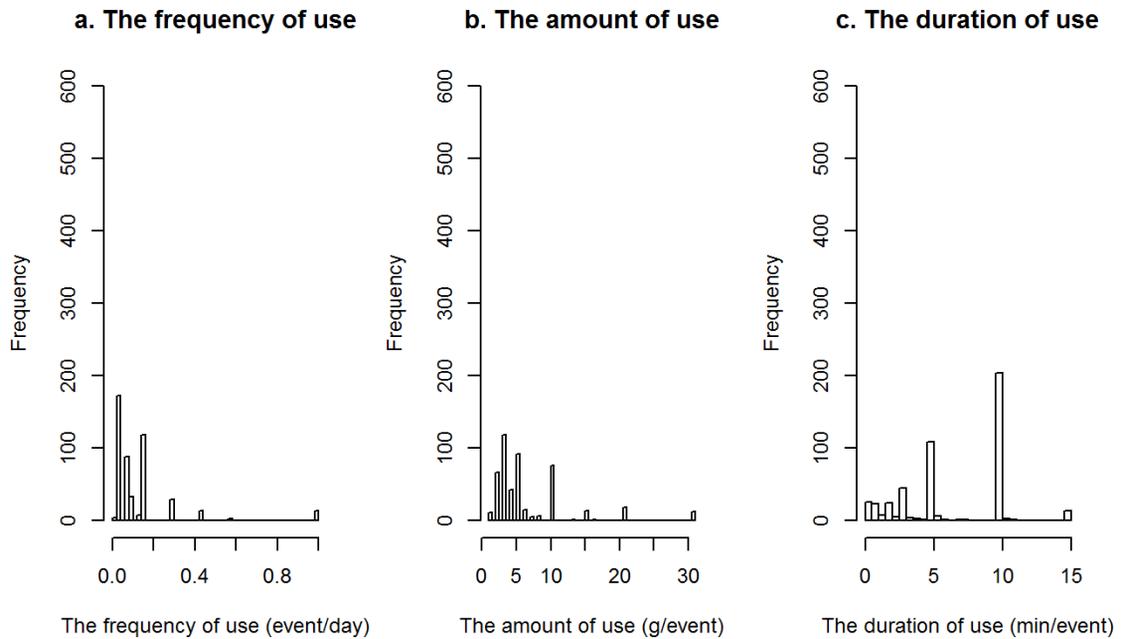
**Figure A9. Distributions of the three exposure factors of trigger-type bathroom cleaner in the parent population.**



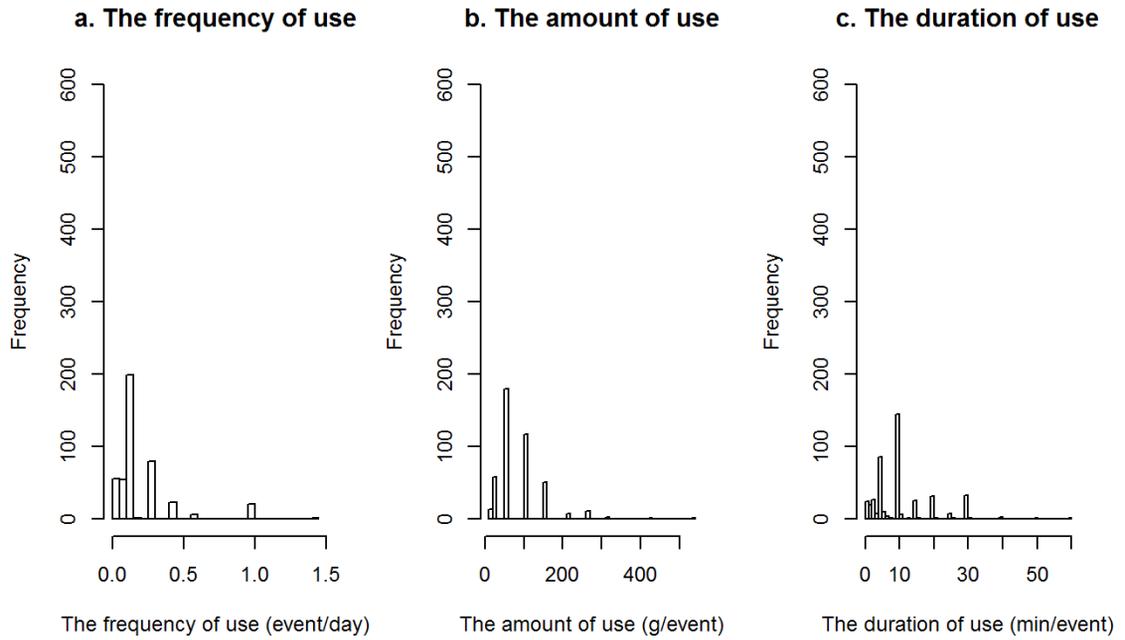
**Figure A10. Distributions of the three exposure factors of toilet rim cleaner in the parent population.**



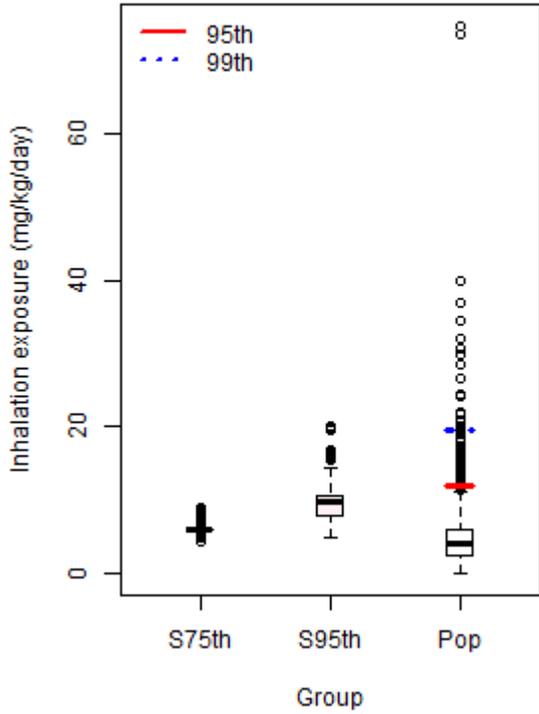
**Figure A11. Distributions of the three exposure factors of mold stain remover in the parent population.**



**Figure A12. Distributions of the three exposure factors of glass cleaner in the parent population.**

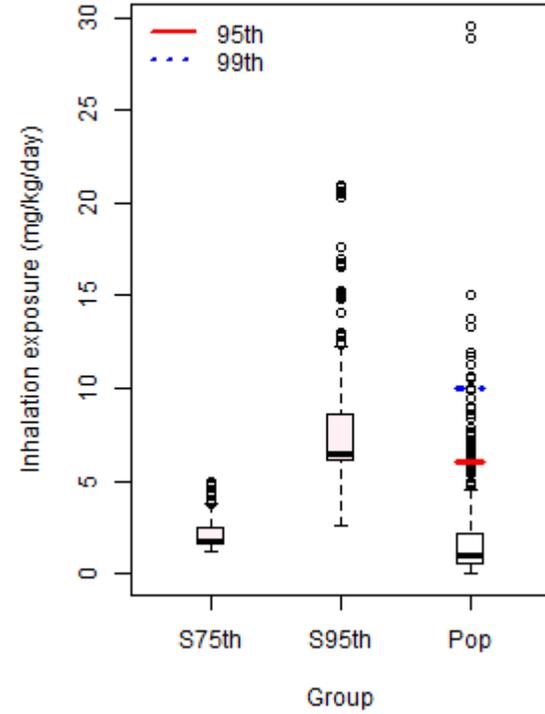


**Figure A13. Distributions of the three exposure factors of floor cleaner in the parent population.**



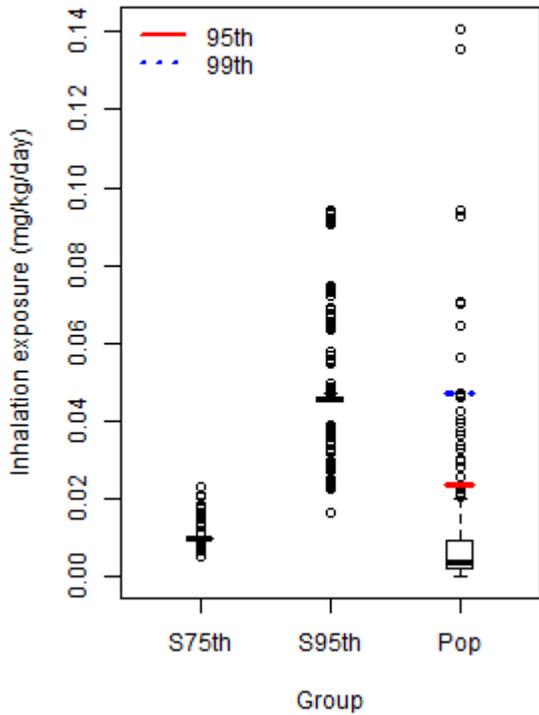
**Figure A14. Distributions of inhalation exposure of the small sample (N=100) and the parent population for dishwasher detergent.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



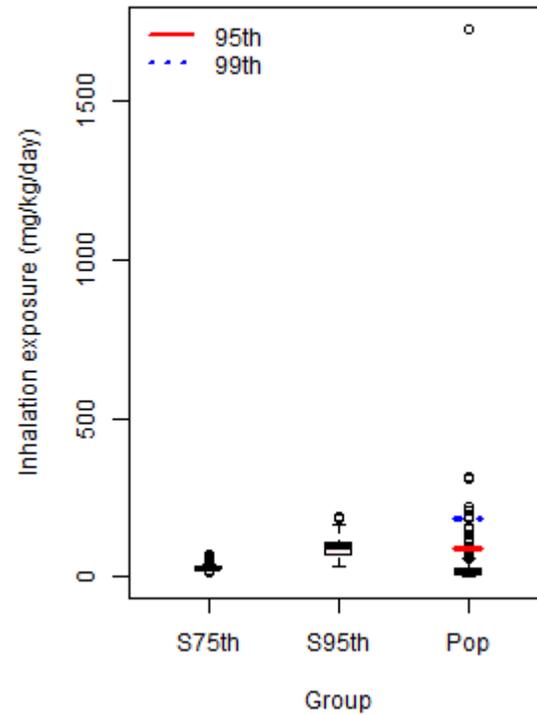
**Figure A15. Distributions of inhalation exposure of the small sample (N=100) and the parent population for disinfectant.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



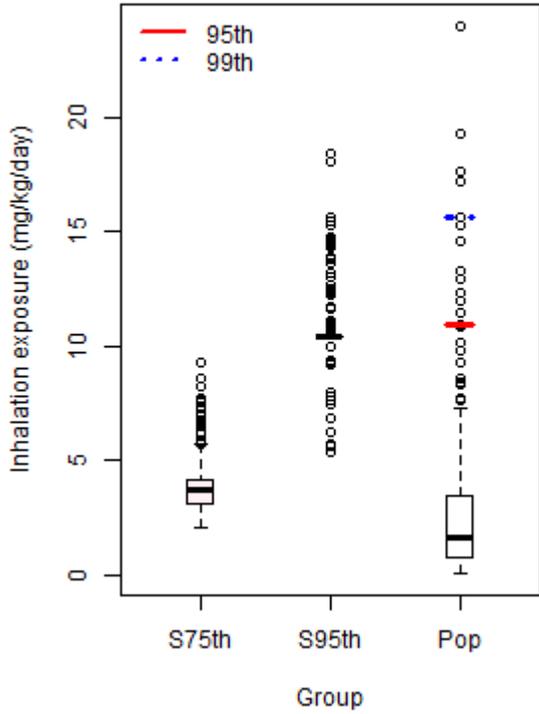
**Figure A16. Distributions of inhalation exposure of the small sample ( $N=100$ ) and the parent population for fabric deodorizer.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



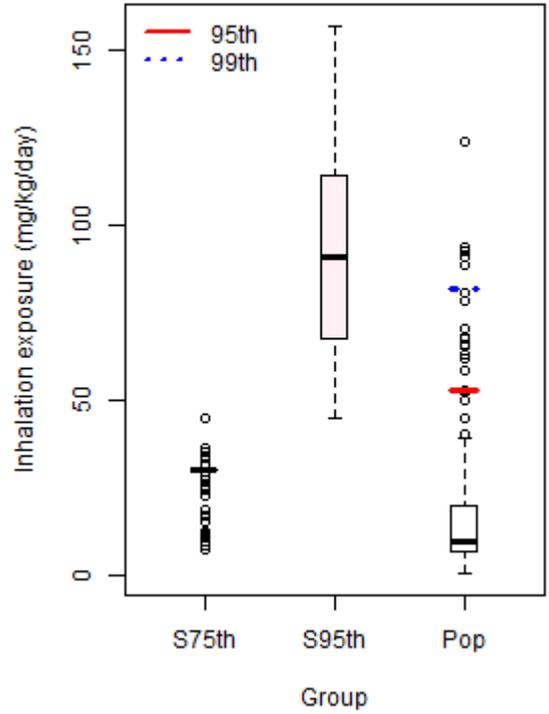
**Figure A17. Distributions of inhalation exposure of the small sample ( $N=100$ ) and the parent population for bottled bathroom cleaner.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



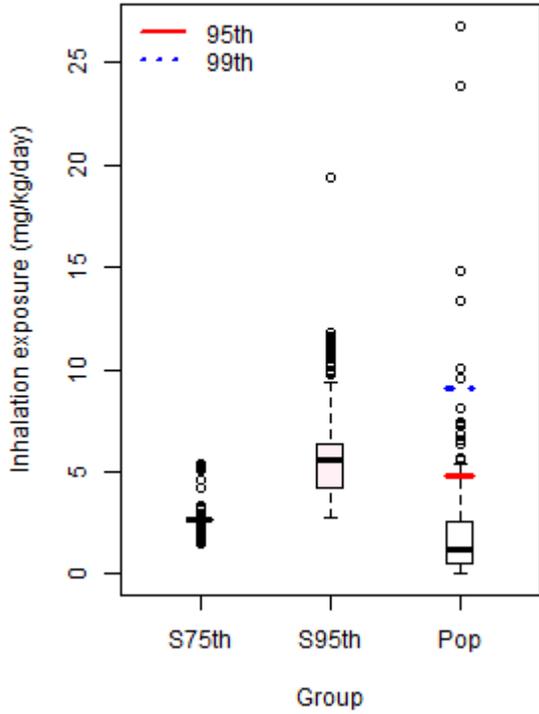
**Figure A18. Distributions of inhalation exposure of the small sample (N=100) and the parent population for trigger-type bathroom cleaner.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



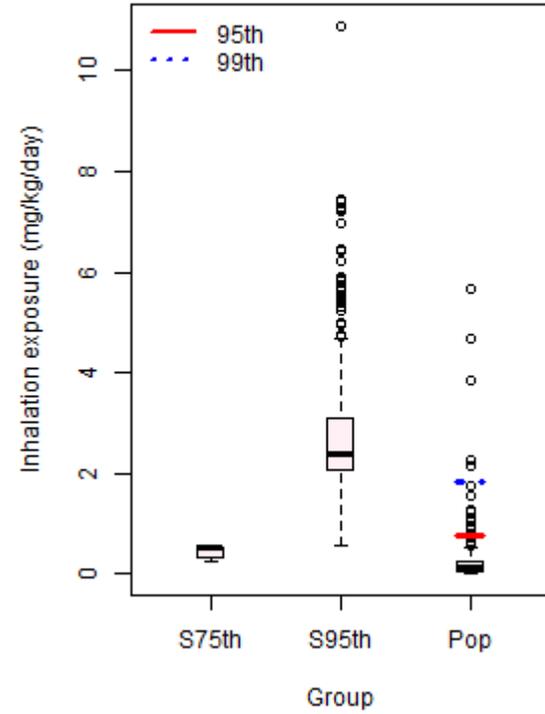
**Figure A19. Distributions of inhalation exposure of the small sample (N=100) and the parent population for toilet rim cleaner.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



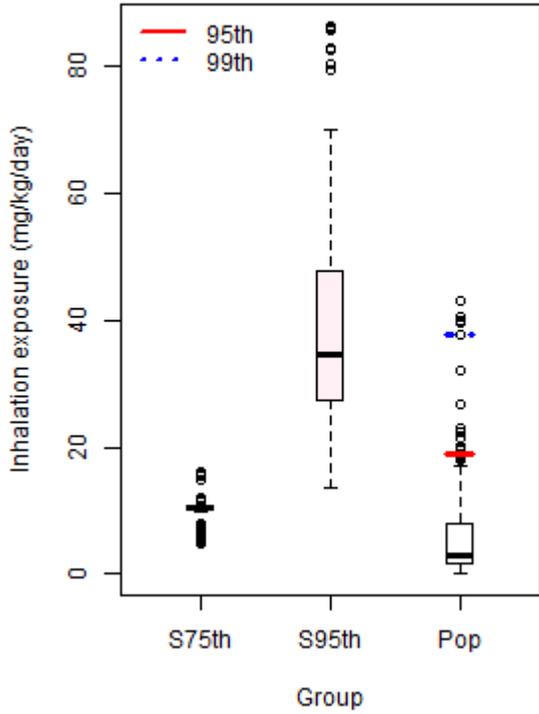
**Figure A20. Distributions of inhalation exposure of the small sample (N=100) and the parent population for mold stain remover.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



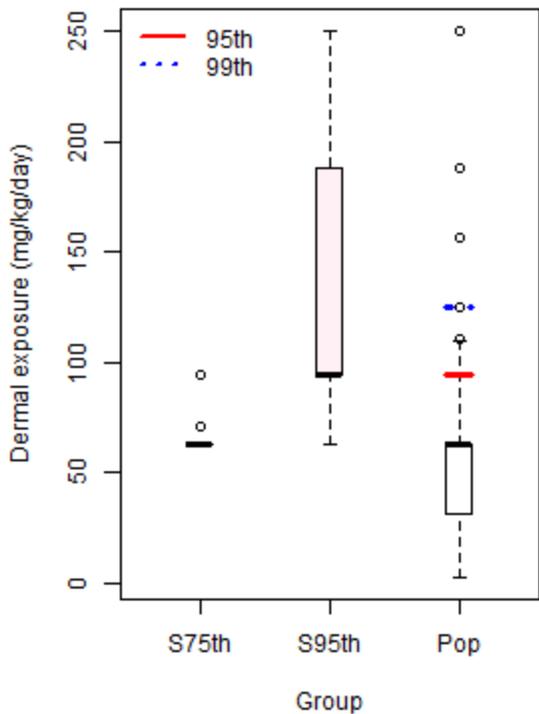
**Figure A21. Distributions of inhalation exposure of the small sample (N=100) and the parent population for glass cleaner.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



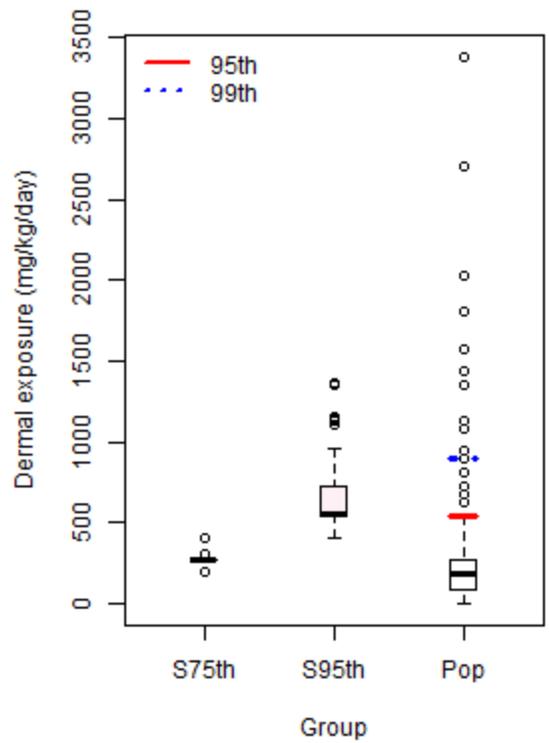
**Figure A22. Distributions of inhalation exposure of the small sample (N=100) and the parent population for floor cleaner.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



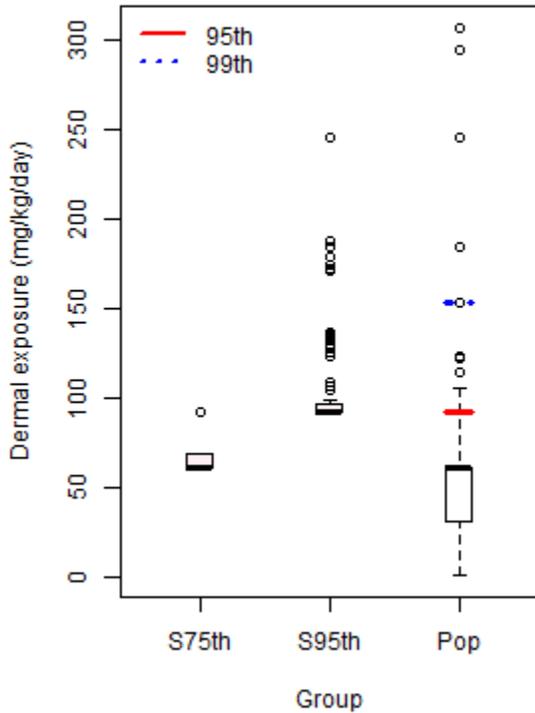
**Figure A23. Distributions of dermal exposure of the small sample (N=100) and the parent population for shampoo.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



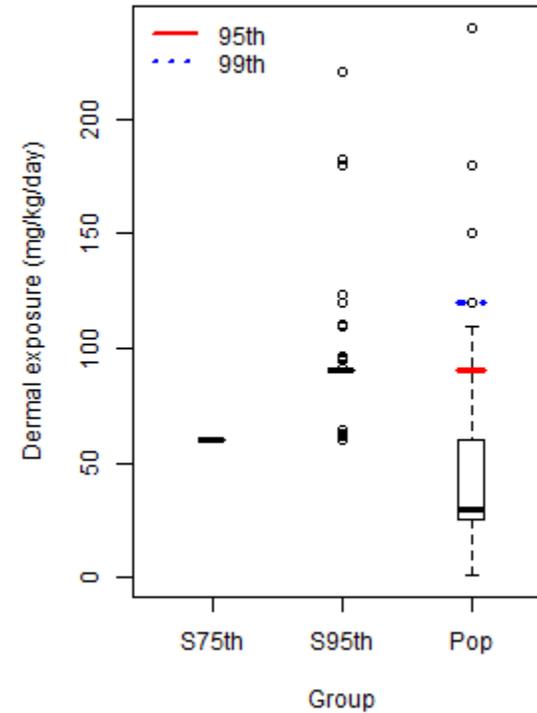
**Figure A24. Distributions of dermal exposure of the small sample (N=100) and the parent population for dishwasher detergent.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



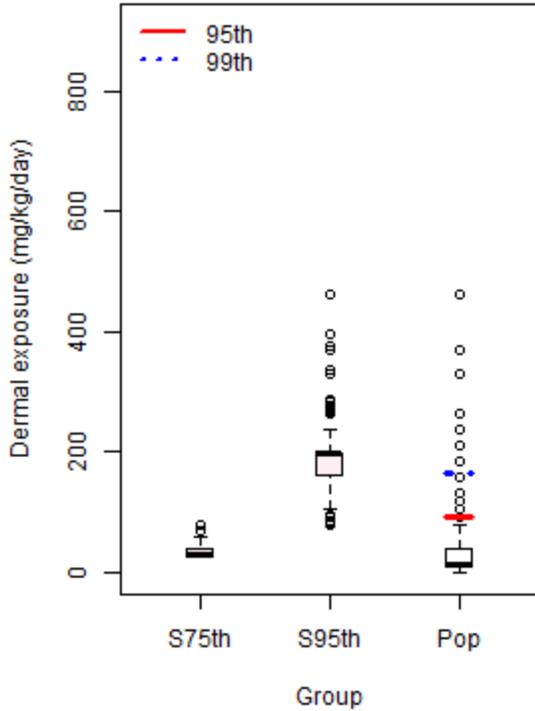
**Figure A25. Distributions of dermal exposure of the small sample ( $N=100$ ) and the parent population for body wash.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



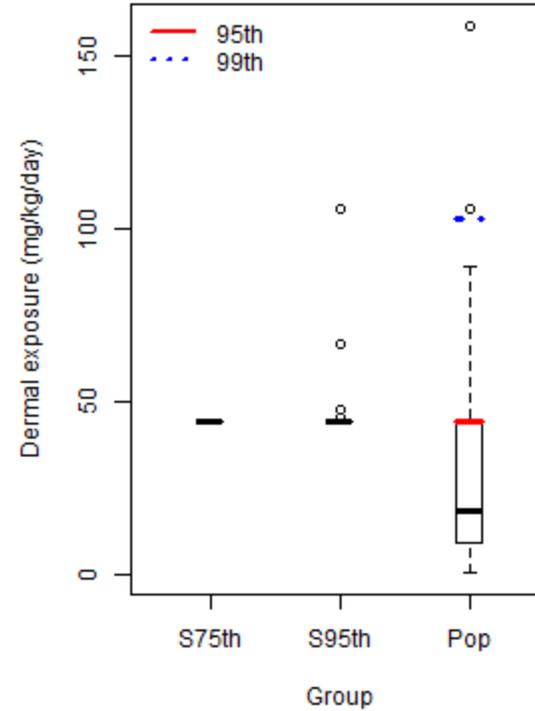
**Figure A26. Distributions of dermal exposure of the small sample ( $N=100$ ) and the parent population for hair conditioner.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



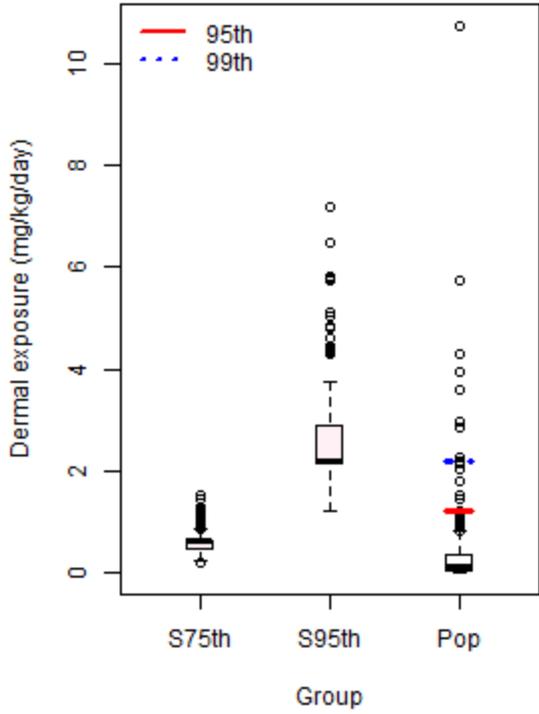
**Figure A27. Distributions of dermal exposure of the small sample ( $N=100$ ) and the parent population for indoor disinfectant.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



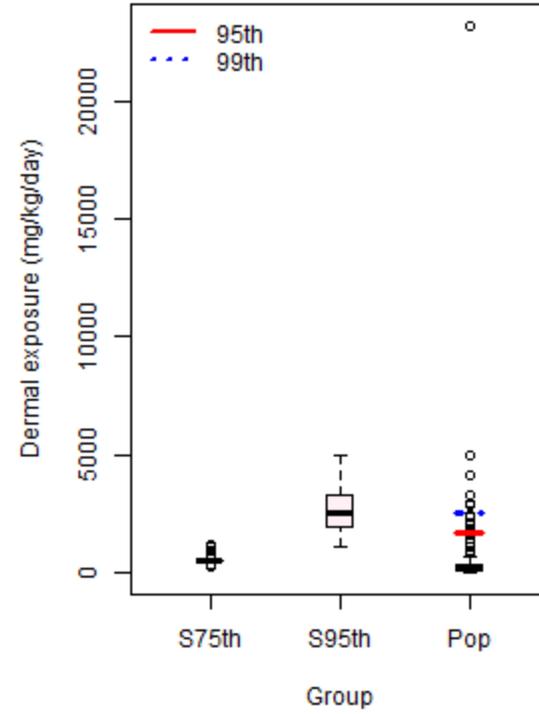
**Figure A28. Distributions of dermal exposure of the small sample ( $N=100$ ) and the parent population for facial cleanser.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



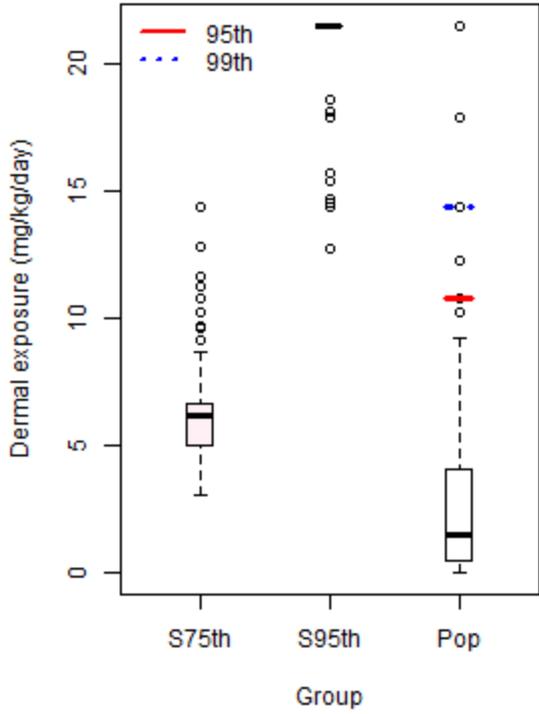
**Figure A29. Distributions of dermal exposure of the small sample ( $N=100$ ) and the parent population for fabric deodorizer.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



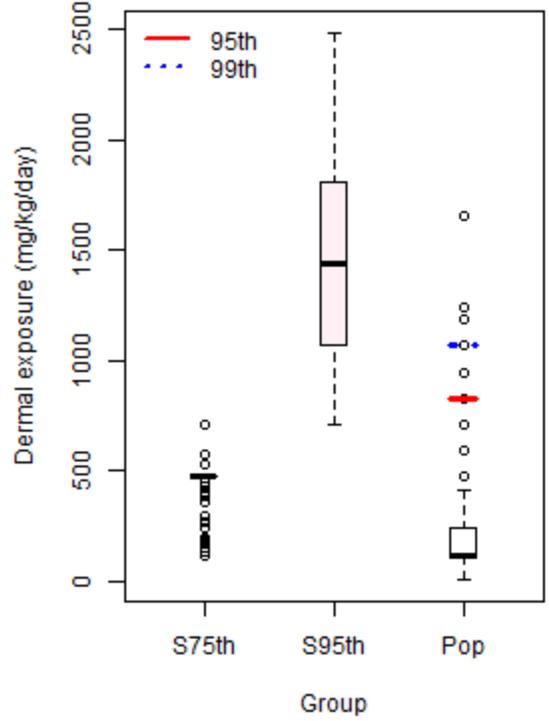
**Figure A30. Distributions of dermal exposure of the small sample ( $N=100$ ) and the parent population for bottled bathroom cleaner.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



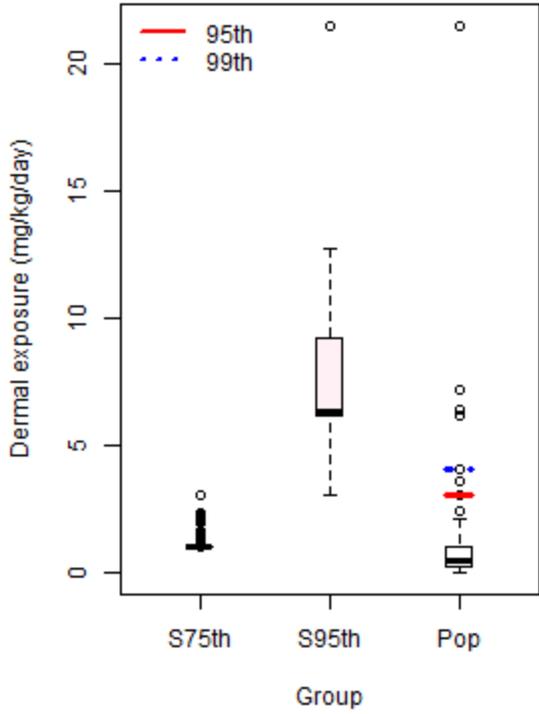
**Figure A31. Distributions of dermal exposure of the small sample (N=100) and the parent population for trigger-type bathroom cleaner.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



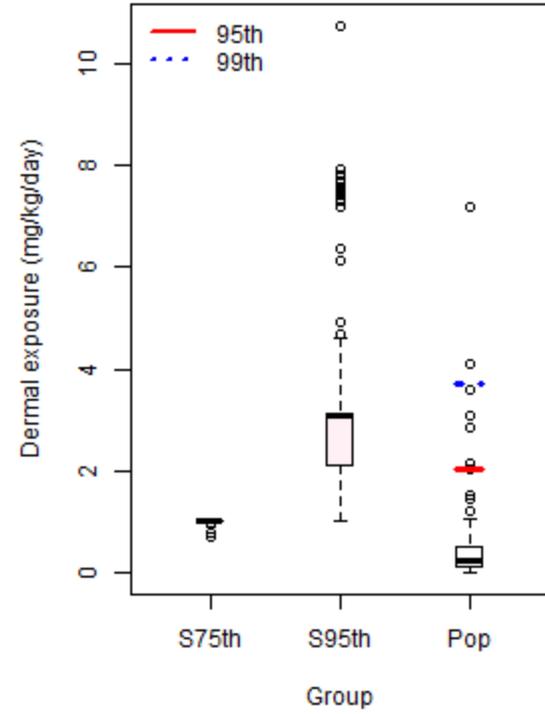
**Figure A32. Distributions of dermal exposure of the small sample (N=100) and the parent population for toilet rim cleaner.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



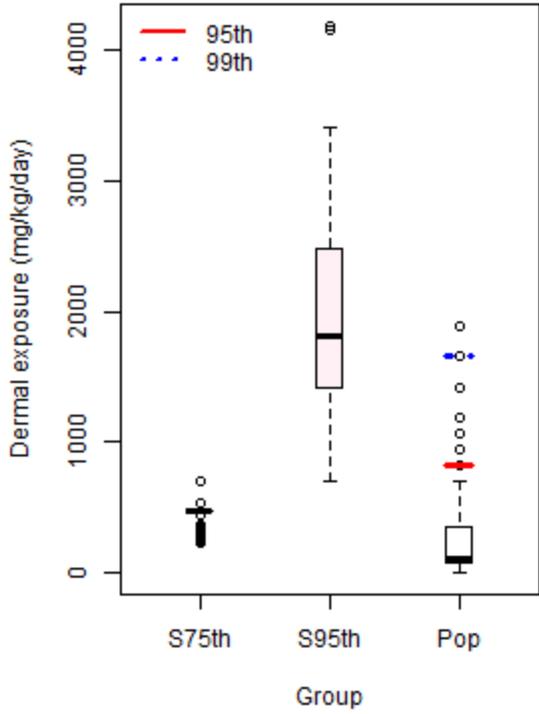
**Figure A33. Distributions of dermal exposure of the small sample (N=100) and the parent population for mold stain remover.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



**Figure A34. Distributions of dermal exposure of the small sample (N=100) and the parent population for glass cleaner.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.



**Figure A35. Distributions of dermal exposure of the small sample (N=100) and the parent population for floor cleaner.**

Abbreviations: S75th and S95th, exposure levels estimated by the 75th and 95th percentiles of exposure factors with sample size of 100, respectively. Pop, exposure level of the parent population. The solid and dotted lines indicate the 95th and 99th percentiles of the exposure level in the parent population, respectively.