

## Appendix B

### 2003 SURVEY DATA WEIGHTING PROCEDURES

The universe or the study population of the *2003 Hawaii Student Alcohol, Tobacco, and Other Drug Use Survey* consists of all students enrolled in grades 6 through 12 in public, private, and charter schools in Hawaii, excluding those on Ni`ihau and those enrolled in special schools, in 2003. Because the survey sample is not self-weighting, it is necessary to weight the sample to reduce possible biases. The objective of weighting the sample data is to improve the representativeness of the sample in terms of the size, distribution, and characteristics of the study population. The weighting procedure documented herein associates a weighting factor with each student respondent to effectively reflect the likelihood of sampling each sample element and to reduce bias caused by differential patterns of non-response. The sample is also adjusted to compensate for differing patterns of enrollment by grade, by school level (elementary vs. intermediate/high schools), by school type (public schools vs. private and charter schools), and by geographical level (school community, school district, county, and state).

#### UNIVERSE COMPILATION

The study population is compiled from various data sources. Table B-1 presents the data sources used in compiling the public school, charter school, and private school universe and Table B-2 shows the number of campuses by type and levels.

**TABLE B-1**  
**Study Universe and Data Sources**

Data Source		
Public School Universe	Private School Universe	Charter School Universe
1) School self-reported enrollment by class and grade, collected at the time of data collection	1) Hawaii Council of Private Schools (HCPS) 2003-2004 school enrollment report	1) School 2003-2004 charter school enrollment by grade and school, downloaded from the Hawaii DOE Web site
2) School 2003-2004 enrollment by gender, grade, and school (provided by the Hawaii Department of Education – DOE)	2) Phone contacts with private school principals	
3) School 2003-2004 public school enrollment by grade and school downloaded from the Hawaii DOE Web site		

**TABLE B-2  
Universe and Number of Campuses**

<b>Type</b>	<b>Number of Schools Containing Students in Grades 6-12</b>	<b>Elementary Schools</b>	<b>Intermediate/High Schools</b>
Public School	189	103	86
Charter School	23	5	18
Private School	108	11	97
Total	320	119	201

The numbers in Table B-2 are slightly different from that reported by the Hawaii Department of Education (DOE) and Hawaii Council of Private Schools (HCPS) for two reasons. First, Kualapu`u Elementary School, listed as a public conversion charter school by the DOE, is treated here as a regular public school as it had not been converted to a Public Charter School at the time the Survey was administered. Second, Horizons Academy of Maui, listed as a private special school by HCPS, is treated as a private regular school.

The ultimate purpose of the universe compilation is to compute the single grade enrollment estimates by public school, charter school, and private school. The compilation involves two stages. The first stage cleans primary data and merges the primary data with supplementary data sources to derive the best estimates. The second stage adjusts the derived estimates with the sample marginal whenever the estimates are smaller than the sample grade enrollments.

### **Stage 1**

**Public School Universe.** The school self-reported enrollment by class and grade collected during the time the survey was administered is the primary data source used in the compilation of the public school universe. Due to incomplete information in the primary data source, enrollment data reported by the Hawaii DOE is used either directly as a substitute or as an adjusting factor.

**Private School Universe.** The primary data source used in the compilation of the private school universe is the 2003-2004 Enrollment published by HCPS. Two corrections are made to the primary data file. First, some private schools reported only combined grade enrollments. School principals were contacted via phone to obtain the grade enrollment at the time the survey was administered or the current school year grade enrollments when the desired data were not available. The grade-combined enrollments are either replaced with the provided information or split with the current enrollment ratio by grade. In cases where information is still missing, the total was equally split across grades. Second, Horizons Academy of Maui was assigned to Maui County and treated as a private regular school.

**Charter School Universe.** The primary data source used in the compilation of the charter school universe is the 2003-2004 Charter School Enrollment published by the Hawaii HCPS.

**Universe Enrollment at the School District Secondary (SDSEC) Level.** Table B-3 illustrates the compilation of the non-public school universe at the SDSEC level, necessary to create community-level reports that include public, private, and charter school students.

**TABLE B-3**  
**Compilation of Non-Public School Universe at the SDSEC Level**

Step	Methodology	Input Data	Derived Data
1.	Age-progression method, assuming negligible death and migration	Census 2000 Population aged 7-16	Projected 2003 population aged 10-19
2.	Direct approximation	Census 2000 total population and number enrolled for population aged 10-19	Estimated 2003 enrollment rate for population aged 10-19
3.	Multiply projected population by the estimated enrollment rates	Projected 2003 population aged 10-19 & estimated 2003 enrollment rate for population aged 10-19	Projected 2003 enrollment for population aged 10-19
4.	Split the grade total with sample grade by imputed age proportion and aggregate the parts as the estimated total by age	<i>2003 Hawaii Student Alcohol, Tobacco, and Other Drug Use Survey Data (Grade by Age Distribution) &amp; 2003 grades 6-12 universe</i>	2003 school grade universe by age
5.	Constrain the Census 2000 derived projected 2003 enrollment for population aged 10-19 by the single age total in Year 2003 universe by age	Projected 2003 enrollment for population aged 10-19 & 2003 school grade universe by age	Projected 2003 enrollment II (adjusted for marginal)
6.	Multiple adjusted estimates by Age-to-Grade conversion derived from the sample	Age-to-Grade conversion table and projected 2003 Enrollment II	Projected 2003 enrollment by grade
7.	Redistribute projected 2003 enrollment by grade using the public school enrollment by SDSEC distribution (assumed to be the migration pattern)	Migration table and projected 2003 enrollment by grade	Projected 2003 grade enrollment adjusted for migration
8.	Subtract public grade enrollment by SDSEC from projected 2003 enrollment by grade adjusted for migration	Public grade enrollment by SDSEC and projected 2003 grade enrollment adjusted for migration	Projected 2003 enrollment by grade with migration adjustment for non-public school students

## Stage 2

Stage 2 involved combining all subsets compiled in Stage 1 and comparing grade and total enrollments with those calculated with the survey sample. Universe school grade enrollment value is replaced with that of the sample whenever the former is smaller than the sample value. Upon the replacement, the school total enrollment is re-calculated to reflect the changes.

## WEIGHTING SCHEMES

Despite the fact that grade class is the primary sampling unit in this survey, the sampling information is insufficient to calculate weights for this level. The grade class code could not be ascertained in certain data files making it impossible to join the universe enrollment with consent rates, missing rates, and sample distribution. Therefore, it is only possible to weight each sample element to reduce the differential sampling probability and non-response from the school grade onward. It is also a common practice to post-stratify the sample by significant socio-demographic factors, such as gender and ethnicity. However, neither is performed because of the lack of ethnic-grade-enrollment data, and a large number of respondents in the sample did not report their biological sex. There are a total of 2,436 cases where gender is not reported (1,575 enrolled in public schools and 861 in non-public schools). The following are schemes performed so that the sample, either by single grade or with grades combined, is represented in a less biased manner of the population at various geographical levels.

### **School Level Weight (Public, Private, and Charter Schools)**

**Grade Specific Weight.** Each sampled student of a specific grade in a sampled school is weighted by the inverse of the ratio of the sample size of that particular grade to the total grade enrollment in that school. This scheme can be expressed as the following formula:

$$W_{ij} = 1/P_{ij} = 1/ (n_{ij}/N_{ij}) = N_{ij}/n_{ij}$$

Where,

$W_{ij}$  = Grade specific weight for each student enrolled in grade  $j$  of school  $i$

$P_{ij}$  = Sample grade enrollment as a proportion of the universe grade enrollment in grade  $j$  of school  $i$

$n_{ij}$  = Total number of student sampled from grade  $j$  at school  $i$

$N_{ij}$  = Universe grade enrollment of grade  $j$  at school

The universe grade enrollment ( $N_{ij}$ ) is derived from the school reported enrollment, DOE Enrollment Report, HCPS 2003-2004 School Enrollment, and correspondence with private school principals. When not available, enrollment by grade is imputed with either 2004-2005 grade distribution or equal-split method (see Table B-3).

**Adjusted Grade Specific Weight.** Due to the fact that not all eligible grades in a school are sampled, the sum of grade specific weighted enrollment may not be equal to the total enrollment of that school. Therefore, each school grade specific weight is further adjusted in order to produce a total that would match with the total school enrollment of the universe.

$$W_{ij\_Adj} = W_{ij} * Y_i$$

Where,

$W_{ij\_Adj}$  = adjusted school grade specific weight for grade  $j$  of school  $i$

$Y_i$  = the inverse of missing rate at the school level for school  $i$

**Grade Combination Weight.** Not all schools have same number of grades and neither do they have identical grade enrollments. With different grades and different enrollments across grades, each school grade specific weight is further adjusted to make each school comparable. There are various approaches to achieve this. For example, one can use the grade specific weights to reflect the uniqueness of each school, or one can adjust each school using a hypothetical model or the distribution pattern at a higher geographical level (e.g., the state). The approach adopted here is the hypothetical model approach. It assumes statistically that each school has an equal grade enrollment to compensate for the differential grade distribution within and across each school.

$$W_{ij\_Combo} = W_{ij\_Adj} * (N_i/N_{ij}) * (1/G_i)$$

$$X_{ij} = N_i / (\sum W_{ij\_Adj} * n_{ij}) / G_i$$

Where,

$W_{ij\_Combo}$  = Grade-combined weight for grade  $j$  of school  $i$

$N_i$  = Total school enrollment at school

$W_{ij\_Adj}$  = adjusted school grade specific weight for grade  $j$  of school  $i$

$n_{ij}$  = Total number of student sampled from grade  $j$  at school  $i$

$G_i$  = number of grades sampled at school  $i$

### ***District Level Weight (Public School)***

**District Grade Specific Weight.** All public schools are divided into elementary and intermediate/high schools. Of these two types of schools, each unadjusted grade-specific weight is adjusted by the inverse of ratio of total grade enrollment of all sampled schools to that of all schools of a particular school type at the district level.

$$WDistrict_{ij} = W * N_{ij} / \sum S_{ij}$$

Where,

$WDistrict_{ij}$  = grade-specific weight for grade  $j$  at school district  $i$

$W$  = Unadjusted grade specific weight for each student

$N_{ij}$  = Total enrollment of grade  $j$  at district  $i$

$\sum S_{ij}$  = Total grade  $j$  enrollments of all schools sampled at district  $i$

*Appendix B*

**Adjusted District Grade Specific Weight.** In order to produce a weighted district total that would match with the district population, each district grade specific weight is further adjusted whenever any eligible grades is not sampled.

$$WDistrict_{ij\_Adj} = WDistrict_{ij} * Y_i$$

Where,

$WDistrict_{ij\_Adj}$  = Adjusted grade-specific weight for grade  $j$  at school district  $i$

$WDistrict_{ij}$  = Unadjusted grade-specific weight for grade  $j$  at school district  $i$

$Y_i$  = the inverse ratio of unadjusted grade-specific weighted sum to the total enrollment at district  $i$

**District Grade Combination Weight.** Because grade enrollment varies by district, each grade specific weight at the district level is further adjusted to make each school district comparable. Like the adjustment at the school level, the approach statistically adjusts each district to have an equal grade enrollment to compensate for the differential grade distribution within and across each district.

$$WDistrict_{ij\_Combo} = WDistrict_{ij\_Adj} * X_{ij}$$

$$X_{ij} = N_i / (\sum WDistrict_{ikj\_Adj} * n_{ij}) / G_i$$

Where,

$WDistrict_{ij}$  = Grade-combined weight for grade  $j$  at school district  $i$

$N_i$  = Total enrollment at school district  $i$

$n_{ij}$  = Total number of student sampled from grade  $j$  in school  $k$  at school district  $i$

$WDistrict_{ij\_Adj}$  = Adjusted grade-specific weight for grade  $j$  at school district  $i$

$G_i$  = number of grades sampled at school district  $i$

The district level weights for public school samples are self-weighting for the county level and the state level; therefore, no further adjustment is needed.

***School District Secondary (SDSEC) Level Weight (Public and Non-Public Schools)***

**Grade Specific.** All public and non-public schools are divided into elementary schools and non-elementary schools. Each school grade unadjusted weight is adjusted by the inverse of ratio of total grade enrollment of all sampled schools to that of all schools of a particular school type at the SDSEC level.

$$WSDSEC_{ij} = W * N_{ij} / \sum S_{ij}$$

Where,

$WSDSEC_{ij}$  = grade-specific weight for grade  $j$  at school complex  $i$

$W$  = Unadjusted grade specific school level weight for each student

$N_{ij}$  = Total enrollment of grade  $j$  at school complex  $i$

$\sum S_{ij}$  = Total grade  $j$  enrollments of all schools sampled at school complex  $i$

**Adjusted Grade Specific Weight.** In order to produce a weighted district total that would match with the SDSEC population, each SDSEC grade specific weight is further adjusted whenever any eligible grades is not sampled.

$$\text{WSDSEC}_{ij\_Adj} = \text{WSDSEC}_{ij} * Y_i$$

Where,

$\text{WSDSEC}_{ij\_Adj}$  = Adjusted grade-specific weight for grade  $j$  at school complex  $i$

$\text{WSDSEC}_{ij}$  = Unadjusted grade-specific weight for grade  $j$  at school complex  $i$

$Y_i$  = the inverse ratio of unadjusted grade-specific weighted sum to the total enrollment at school complex  $i$

**Grade Combination Weight.** Because each SDSEC has different grades and different enrollments across grades, to make each SDSEC comparable, each SDSEC grade specific weight is further adjusted to reflect the different grade enrollments between SDSECs. Like the adjustment at the school level, the approach statistically adjusts each district to have an equal grade enrollment to compensate for the differential grade distribution within and across each district.

$$\text{WSDSEC}_{ij\_Combo} = \text{WSDSEC}_{ij\_Adj} * X_{ij}$$

$$X_{ij} = N_i / (\sum \text{WSDSEC}_{ij\_Adj} * N_{ikj}) / G_i$$

Where,

$\text{WSDSEC}_{ij}$  = Grade-combined weight for grade  $j$  at school complex  $i$

$N_i$  = Total enrollment at school complex  $i$

$\text{WSDSEC}_{ij\_Adj}$  = Adjusted grade-specific weight for grade  $j$  at school complex  $i$

$N_{ikj}$  = Total number of student sampled from grade  $j$  in school  $k$  at school complex  $i$

$G_i$  = number of grades sampled at school complex  $i$

### **County Level Weight (Non-Public School Sample)**

**Grade Specific.** Each school unadjusted weight is adjusted by the inverse of ratio of total grade enrollment of all sampled schools to that of all schools at the county level.

$$\text{WCOUNTY}_{ij} = W * N_{ij} / \sum S_{ij}$$

Where,

$\text{WCOUNTY}_{ij}$  = grade-specific weight for grade  $j$  at county  $i$

$W$  = Unadjusted grade specific school level weight for each student

$N_{ij}$  = Total enrollment of grade  $j$  at county  $i$

$\sum S_{ij}$  = Total grade  $j$  enrollments of all schools sampled at county  $i$

*Appendix B*

**Adjusted Grade Specific Weight (Public and Non-Public Schools).** In order to produce a weighted public school county total that would match the county public school population, each county grade specific weight is further adjusted whenever any eligible grades are not sampled.

$$WCOUNTY_{ij\_Adj} = WCOUNTY_{ij} * Y_i$$

Where,

$WCOUNTY_{ij\_Adj}$  = Adjusted grade-specific weight for grade  $j$  at county  $i$

$WCOUNTY_{ij}$  = Unadjusted grade-specific weight for grade  $j$  at county  $i$

$Y_i$  = the inverse ratio of unadjusted grade-specific weighted sum to the total enrollment at county  $i$

**Grade Combination Weight.** Because each county has different grades and different enrollments across grade, to make each county comparable, each county grade specific weight is further adjusted to reflect the different grade enrollments between counties. There are various approaches to make the adjustment. The approach taken here assumes each county by school type has an equal enrollment for each grade.

$$WCOUNTY_{ij\_Combo} = WCOUNTY_{ij\_Adj} * X_{ij}$$

$$X_{ij} = N_i / (\sum WCOUNTY_{ij\_Adj} * n_{ikj}) / G_i$$

Where,

$WCOUNTY_{ij}$  = Grade-combined weight for grade  $j$  at county  $i$

$N_i$  = Total enrollment at county  $i$

$n_{ikj}$  = Total number of student sampled from grade  $j$  in school  $k$  at county  $i$

$WCOUNTY_{ij\_Adj}$  = Adjusted grade-specific weight for grade  $j$  at county  $i$

$G_i$  = number of grades sampled at county  $i$

The county level weights for non-public school samples are self-weighting for the state level; therefore, no further adjustment is needed.

## **APPROXIMATE WEIGHTED N-SIZES USED IN ANALYSES**

Table B-4 on the next page provides the approximate weighted n-sizes used in the analyses.

**TABLE B-4**  
**Approximate Weighted N-Sizes for 2003 Analyses**

	Grade Level						
	6th Grade	7th Grade	8th Grade	9th Grade	10th Grade	11th Grade	12th Grade
<b>Statewide:</b>	16,649	17,100	17,127	18,916	15,921	14,772	12,824
<b>School Type:</b>							
Public School	13,533	13,437	13,419	15,386	12,662	11,963	10,038
Private/Charter School	3,116	3,663	3,708	3,530	3,259	2,809	2,786
<b>Place of Residence:</b>							
City & County of Honolulu	11,636	11,970	11,932	13,326	10,917	10,060	8,829
Hawaii County	2,330	2,362	2,328	2,510	2,268	2,121	1,818
Kauai County	850	940	903	947	842	841	735
Maui County	1,819	1,861	1,973	2,155	1,850	1,755	1,446
<b>DOE County/District:</b>							
City & County of Honolulu (DOE)	9,525	9,239	9,169	10,603	8,387	7,711	6,462
Honolulu District	2,507	2,445	2,387	2,988	2,288	2,135	1,792
Central District	2,483	2,350	2,372	2,712	2,249	2,112	1,768
Leeward District	3,192	3,160	3,203	3,503	2,663	2,266	1,934
Windward District	1,343	1,284	1,207	1,400	1,187	1,198	968
Hawaii County/District	1,762	1,832	1,776	2,063	1,866	1,853	1,582
Kauai County/District	768	828	811	898	842	792	693
Maui County/District	1,478	1,538	1,663	1,822	1,567	1,607	1,301
<b>Sex:</b>							
Male	7,815	8,012	7,477	8,147	6,329	6,312	5,541
Female	7,839	7,751	8,068	8,840	7,969	7,086	6,274
<b>Ethnicity:</b>							
Chinese	687	705	741	827	643	690	657
Filipino	3,888	3,471	3,466	3,945	3,342	2,943	2,304
Japanese	2,454	2,471	2,500	2,524	2,312	2,200	2,110
Native Hawaiian	2,781	2,793	2,658	3,101	2,492	2,206	1,983
White	2,435	2,565	2,601	2,790	2,530	2,783	2,330

NOTES: *DOE County/District* only includes students who attend schools in the Department of Education school system. *Place of Residence* includes public, private, and charter school students who reside in the designated county.