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EFFECT OF RACE AND ETHNICITY CLASSIFICATION ON SURVEY ESTIMATES: ANOMALY OF THE WEIGHTED TOTALS OF AMERICAN INDIANS AND ALASKA NATIVES

Sunghee Lee, PhD, Delight E. Satter, MPH, and Ninez A. Ponce, PhD

Abstract: Racial classification is a paramount concern in data collection and analysis for American Indians and Alaska Natives (AI/ANs) and has far-reaching implications in health research. We examine how different racial classifications affect survey weights and consequently change health-related indicators for the AI/AN population in California. Using a very large random population-based sample of AI/ANs, we compared the impact of three weighting strategies on counts and rates of selected health indicators. We found that different weights examined in this study did not change the percentage estimates of health-related variables for AI/ANs, but did influence the population total estimates dramatically. In survey data, different racial classifications and tabulations of AI/ANs could yield discrepancies in weighted estimates for the AI/AN population. Policy makers need to be aware that the choice of racial classification schemes for this racial-political group can generally influence the data they use for decision making.

INTRODUCTION

Racial classification is a paramount concern in data collection and analysis for American Indians and Alaska Natives (AI/ANs) and has far-reaching implications in health research. This article evaluates how different race/ethnicity-based survey weights affect health-related estimates for the AI/AN population in California. We first consider how variations in classifying and tabulating racial and ethnic groups affect the development of survey weights for the AI/AN sample in a population-based survey, propose a new weighting method, and then evaluate how these weights impact the rates and counts of important indicators of health status, health behaviors, utilization, and access to healthcare for the AI/AN population.

Scientific surveys employ probability samples to ensure that a given survey represents the population of interest with known nonzero probabilities (Kish, 1966; Cochran, 1977; Särndal, Swesson, & Wretman, 1992). Each unit in the sample carries its selection probability derived from the sampling procedure. The inverse of the selection probability serves as the "base weight." Simply speaking, the weight is the number of population units that a particular sample represents in a particular survey, and the sum of weights is equal to the population size.

Due to operational glitches arising in survey practice (such as nonresponse), the theoretical statistical representativeness of the sample becomes dampened. In order to compensate, the base weights are rescaled through an adjustment process. There are a number of approaches one might consider for this adjustment (Kalton & Flores-Cervantes, 2003). Typically, adjustment factors are calculated by controlling for some sample characteristics to match the known population distribution, and are applied to the base weights to create "final weights." By applying the final weights in the estimation, survey estimates are expected to approximate the population quantities (Tompkins & Kim, 2007).

Race and Ethnicity in Survey Weighting

Weighting adjustment is a key process in preparing survey data, and race and ethnicity are important common variables controlled for in the weighting adjustment, as survey results are often presented by their subgroups. In most survey practice, small racial and ethnic categories are lumped together in weighting. For example, the National Health Interview Survey (NHIS) uses the categories Hispanic, non-Hispanic Black, and non-Hispanic other race (Botman, Moore, Moriarity, & Parsons, 2000). Because the non-Hispanic other race category includes multiple race/ethnicity groups, it is possible that the individual proportion of these groups may be distorted in the weighting process.

Race/Ethnicity Data Collection and Classification in the United States

Race/ethnicity data play an important role in research. Health research, in particular, analyzes survey data using race/ethnicity as an independent variable, because this information serves as a proxy for unmeasured social factors (Mays, Ponce, Washington, & Cochran, 2003) and an indicator of health disparities and health care access (Winker, 2004), as well as an independent effect from other demographic and socioeconomic characteristics (Swift, 2002).

Race/ethnicity is a construct far more complex than one would expect in demographically diverse societies like the U.S. The change of race/ethnicity measurement in the federal government is well documented (Burhansstipanov & Satter, 2000; Mays et al., 2003). Problems associated with

measuring the race of Hispanic/Latino populations in the 1990 U.S. Census, and other issues, led the U.S. Office of Management and Budget (OMB) to release new Statistical Policy Directive No. 15 (U.S. OMB 1995, 1997). The main changes are: (1) the ethnicity question precedes the race question; (2) there are now five race categories: White, Black, American Indian or Alaska Native (AI/AN), Native Hawaiian or Other Pacific Islander (NHPI), and Asian (Asian and Pacific Islander became separate categories, unlike the previous definition); (3) the "some other race" category no longer exists; and (4) people can identify with more than one race group described above. These changes were reflected in the 2000 U.S. Census data collection, with the OMB-approved exception that the Census questionnaire also provided the "some other race" category. Roughly speaking, the 2000 U.S. Census raw data provide the total number of people in the population identifying with Hispanic/Latino ethnicity and each of the following six race variables: NHPI, AI/AN, Asian, Black or African American, White, and some other race. The sum of the race counts exceeds the total population counts, because 2.4% of the population chose more than one race in Census SF-1 Table P7. Given the complexity of the collected data and the need to summarize the information into a single variable with mutually exclusive categories, the U.S. Census Bureau (2002) released a modified race data summary file assigning individuals in the "some other race" category into one of the OMB race categories.

It should be noted that it is common for persons in the U.S. to use race/ethnicity terms without understanding their meanings, origins, or current implications (Cruz-Jansen, 2002). It has long been stated by the federal government that the racial and ethnic classification standards for the U.S. are not based in science, but are responses to expressed needs of politicians (Forbes, 1990; U.S. OMB 1997). Nonetheless, racial categories and counts based on the OMB guidelines are the major organizing tool for public health data (Tashiro, 2002).

The AI/AN Population

The AI/AN population, the only federally recognized political minority in the U.S., is increasing at about 1.8% a year, not including tribes gaining federal recognition. According to the 2000 U.S. Census, 4.1 million (1.5%) adults in the U.S. are AI/AN or AI/AN in combination with one or more other races (Ogunwole, 2002). The number of residents who reported as AI/AN in combination with one or more races increased 110% between the 1990 and 2000 U.S. Censuses, while the number of residents who reported as AI/AN alone increased 26%. More AI/ANs (627,562 people in 2000) live in California than any other state in the U.S. (Ogunwole). There are more federally recognized tribes in California (107) than any state except Alaska, as well as numerous non-federally recognized tribes.

NEW CONTRIBUTION

The fundamental data issue we explore is the potential discrepancy of weighted estimates of health-related variables for the AI/AN population that results from different racial classification and tabulation of AI/ANs in preparing and using survey data. If the weights alter the estimates substantially, the weighting schemes should be subject to reconsideration. Using a very large population-based sample of AI/ANs, this is, to our knowledge, the first article to examine the impact of racial classification on survey weights and the consequences of different weights on AI/AN health data. Our new contribution is to inform health researchers who use population-based survey data when studying different racial and ethnic groups, particularly the AI/AN population, of the importance of understanding how the survey weights are created and for what they can and cannot account.

DATA AND METHODS

This study used data from the 2001 California Health Interview Survey (CHIS), a statewide random-digit dial telephone survey assessing the health of California's general population. The sample was drawn by geographically stratifying the state, mostly at the county level so that reliable county-level estimates could be obtained. As the largest state health survey in the U.S., CHIS also has the ability to provide accurate data on the AI/AN population due to modifications made at different development stages (including survey design, interviewer training protocol, and sampling). The survey instrument has been through extensive cultural and linguistic review and adaptation (Ponce et al., 2004). The format of race/ethnicity questions follows that of the 2000 U.S. Census, as respondents may report more than one race. These questions were specifically designed to avoid problems faced by other surveys collecting AI/AN data. Persons who answered as AI/AN on any race question were asked to further identify their tribal affiliation(s), whether they are an enrolled member of a tribe, and in which tribe(s) they were enrolled. The data allow us to distinguish individuals from California tribes and non-California tribes, as well as those without tribal affiliations. CHIS 2001 oversampled AI/ANs, yielding the largest sample of AI/AN for a population-based cross-sectional data collection in U.S. history, a total of almost 4,000 AI/AN individuals (Yen & Satter, 2002). The interviewers received an in-person cultural competency training about the unique cultural and linguistic issues that can arise when interviewing AI/ANs. The cultural competency training materials were incorporated into the standard interviewer training protocol for subsequent administrations of CHIS (Satter, Veiga-Ermert, Burhansstipanov, Pena, & Restivo, 2005).

In weighting the CHIS data, the base weights were adjusted through 10 stages (CHIS, 2005). The last stage was a statistical adjustment process called ratio-raking which controls the marginal distributions of the raking variables (Deming & Stephen, 1940). Eleven dimensions of demographic and socio-economic variables and their cross-classifications shown in the Appendix were controlled in this stage.

There was a significant change in raking process between CHIS 2001 and 2003: Instead of the Census SF-1 data, the California Department of Finance (CA DOF) Population Projections (P-1) for 2003 were used as the external source for control totals. This was done because there were no other sources for intercensal population data for all counties. (For example, the American Community Survey collects data only from selected counties for a given year.) The change in the control source resulted in a change in classification of the raking race/ethnicity variable. The 2001 method controlled the following seven "any mention" (AM, hereafter) race/ethnicity variables separately, as in the 2000 U.S. Census questionnaire: whether or not one is Hispanic/Latino, Black, White, AI/AN, NHPI, Asian, or some other race. At the time, neither the CA DOF projections nor U.S. Census data based on the 1997 OMB Notice "Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity" were available.

The revised weighting used one race/ethnicity variable following the CA DOF projections pursuant to the 1997 OMB classification. The variable assigned people to one of the following mutually exclusive categories: Latino, non-Latino (NL) White, NL Black, NL Asian, NL AI/AN, NL NHPI, and NL multirace (CA DOF, 2004). In order to keep the data consistent across years, CHIS 2001 data were reweighted using the revised method with the CA DOF 2001 projections.

In addition to these existing weights, this study proposes another set of weights produced by controlling for both the multiple AM race variables and the single CA DOF race variable. Instead of creating weights from the base weights, we started with the existing revised weights and re-adjusted them using both the Census SF-1 data and CA DOF P-1 population projections for different racial and ethnic groups. The proposed weight will be discussed after comparing the original and revised weights described above.

RESULTS

Discrepancy in Weighted Totals for AI/ANs

Overall, the weight revision does not appear to have a major impact on proportions across all racial and ethnic groups in Table 1. The original weighted totals for AM race variables match their control totals from the Census SF-1, and the revised weighted totals for the CA DOF race variable match the control totals from the DOF P-1. The slight decrease in weighted totals compared to the

actual population control is due to the fact that the CHIS target population excludes people in group quarters while control totals include them. When comparing the original and revised weighted totals by race/ethnicity, there seems to be a problem with the AI/AN estimates. Both AM AI/ANs and NL AI/ANs show large discrepancies: The revised weighted total for AM AI/ANs is nearly double the original one (611,468 vs. 1,287,600), and that for NL AI/ANs is nearly quadruple (52,433 vs. 209,385).

Table 1
Race and Ethnicity Distribution in the 2001 California Health Interview Survey

	Unweighted Total		Original Weighted Total		Revised Weighted Total		Control Total[1]	
	Count	%	Count	%	Count	%	Count	%
Census Race/Ethnicity							Census SF-1	
AM Latino[2]	18,872	25.6	10,774,044	32.6	11,380,586	33.6	10,966,556	32.2
AM White	53,359	72.3	20,984,429	63.5	20,489,598	60.4	21,490,973	63.1
AM Black	4,320	5.9	2,370,085	7.2	2,492,683	7.4	2,513,041	7.4
AM Asian	6,113	8.3	4,092,122	12.4	4,232,701	12.5	4,155,685	12.2
AM AI/AN	3,990	5.4	611,468	1.9	1,287,600	3.8	627,562	1.8
AM NHOPI	592	0.8	215,878	0.7	278,552	0.8	221,458	0.7
AM Other	9,806	13.3	6,447,609	19.5	6,256,902	18.5	6,575,625	19.3
DOF Race/Ethnicity							CA DOF P-1	
Latino	18,872	25.6	10,774,044	32.6	11,380,586	33.6	11,082,985	32.6
NL White	42,652	57.8	15,931,533	48.2	15,603,435	46.0	16,047,989	47.1
NL Black	3,272	4.4	1,770,685	5.4	2,141,059	6.3	2,222,816	6.5
NL Asian	4,917	6.7	3,232,261	9.8	3,800,472	11.2	3,746,292	11.0
NL AI/AN[3]	540	0.7	53,325	0.2	210,296	0.6	192,753	0.6
NL NHOPI	237	0.3	62,261	0.2	113,932	0.3	111,200	0.3
NL Multirace	3,327	4.5	1,223,094	3.7	661,355	2.0	639,163	1.9
Total	73,917	100.0	33,050,816	100.0	33,911,135	100.0	34,043,198	100.0

[1] Control totals include the group quarter population for presentation purposes. These numbers are modified in the weighting procedure to exclude those populations, because the CHIS target population excludes them.

[2] AM indicates "any mention." Therefore, the sum of all AM race categories exceeds 100% of the sample.

[3] This includes 3 people who were reclassified because they reported single other race only.

The reasons for the discrepancies are twofold: the unweighted sample distribution and the difference in the race/ethnicity classification methods between the Census SF-1 and the CA DOF P-1. Let us first examine how the original weights were constructed. The sample included 3,990 AM AI/ANs across adults, adolescents, and children (5.4% of the total sample). This proportion was much larger than the proportion of AM AI/ANs (1.9%) in the control totals, Census SF-1. Therefore, these AM AI/ANs were assigned smaller weights than their counterparts in raking. Accordingly, when the original weights were applied, the weighted total of AM AI/ANs matched the population total from the Census SF-1.

In creating the CA DOF race/ethnicity variable with AM variables, 1,288 of the AM AI/ANs were classified as Latinos, and 2,165 as NL multirace individuals; only 537 people were retained as NL AI/ANs. In fact, the left column of Table 2 shows that, among these 3,990 AM AI/ANs, two thirds were also reported as AM White, and slightly less than one third were, in fact, AM Latinos. Because these AM Latinos are a subset of AM AI/ANs, the smaller weights on AM AI/ANs than their counterparts in the original weighting had been carried over for the NL AI/AN group of the CA DOF race classification. For this reason, when the weighted total was calculated for NL AI/ANs using the original weight, it appeared as if there were only 52,433 NL AI/ANs, when the true population total is 192,753.

Table 2
Self-Reported Race Variables (n=3,990)

Census Race/Ethnicity		DOF Race/Ethnicity	
AM AI/AN	3,990	NL AI/AN	537
AM Latino	1,288	Latino	1,288
AM White	2,376	NL White	0
AM Black	372	NL Black	0
AM Asian	75	NL Asian	0
AM NHOPI	32	NL NHOPI	0
AM Other	7	NL Multirace	2,165
		Total	3,990

In addition, the revised raking used the CA DOF race variable instead of AM race variables for control totals. When NL AI/ANs were examined, their proportion in the sample was their population proportion (0.7% vs. 0.6%). However, Table 2 shows that a large proportion of AM AI/ANs were Latinos, whose sample proportion was smaller than the population proportions (see Table 1), indicating that weights for Latinos were larger than for non-Latinos. Therefore, when all AM AI/ANs were combined, their weighted total became larger than it should have been. While these revised weights made the weighted total for NL AI/ANs comparable to the CA DOF control total (210,296 vs. 192,753), they produced far larger estimates for AM AI/ANs than the original

weighted total and the population counts (1,287,600 vs. 611,468/627,562). This discrepancy occurs because AM AI/ANs included not only 537 NL AI/AN respondents but also 1,288 Latinos and 2,165 NL multirace individuals in the CA DOF classification (see Table 2). The discrepancy in the unweighted distribution resides in the dynamics of racial and ethnicity classification and the complexity of combining the multiple AM race/ethnicity variables into one single variable as described above.

Proposed Adjustment

A possible way to reconcile this discrepancy is to control for both the multiple U.S. Census AM race variables and the single CA DOF race variable, unlike the previous two methods that controlled for only one of these two. The methodology of the proposed weighting itself is essentially the same as that of the previous weighting described in CHIS (2005); the only difference is that both race definitions are included in the adjustment. Population control totals presented in the far right column of Table 3 were used in calculating weights so that all weighted race/ethnicity estimates would match their respective population totals well. The results of the proposed weight are shown in Table 3.

The original weighted total of AM AI/AN matches the Census SF-1 figure for AM AI/AN very well, but the NL AI/AN total fails to match the CA DOF P-1 total. In a similar fashion, the revised weighted total of NL AI/AN matches the CA DOF P-1 figure, but the AM AI/AN total is very far from the Census SF-1 total. These findings are to be expected, as only one racial/ethnicity classification is controlled in these two weighting schemes. However, the proposed weighted totals of both AM AI/AN and NL AI/AN are closer to the Census SF-1 and the CA DOF P-1 control totals simultaneously, unlike the original and revised weight methods, where the weighted totals matched the control totals of one of the two racial/ethnicity classifications. This is because both classifications are controlled in the proposed weighting. Although the proposed weighting is not perfect, it shows an improvement over the other two weighting methods. It is clear that the proposed weights provide better estimates than the other two weights, as differences examined in NL AI/ANs using the original weights, and in AM AI/ANs using the revised weights, were mitigated. The weighted totals for both AM AI/ANs and NL AI/ANs using the proposed weights were reasonably close to both control totals. This was especially true for AM AI/ANs.

One caveat of the proposed weights is that they distort the distribution of the NL NHPI group. The reason for this distortion may be found in NL NHPIs' small proportion in the population (0.3%) and their sample size (237). The proposed method may be subject to more measurement error as group size decreases.

Table 3
Control Totals

	Original Weight		Revised Weight		Proposed Weight		Control Total	
	Count	%	Count	%	Count	%	Count	%
Census Race/Ethnicity								
AM Latino	10,774,044	32.6	11,380,586	33.6	11,033,116	32.6	10,979,341	32.4
AM White	20,984,429	63.5	20,489,598	60.4	21,419,884	63.2	21,516,027	63.4
AM Black	2,370,085	7.2	2,492,683	7.4	2,508,154	7.4	2,515,971	7.4
AM Asian	4,092,122	12.4	4,232,701	12.5	4,152,713	12.3	4,160,530	12.3
AM AI/AN	611,468	1.9	1,287,600	3.8	620,477	1.8	628,294	1.9
AM NHOPI	215,878	0.7	278,552	0.8	213,900	0.6	221,716	0.7
AM Other	6,447,609	19.5	6,256,902	18.5	6,487,148	19.1	6,583,291	19.4
DOF Race/Ethnicity								
Latino	10,774,044	32.6	11,380,586	33.6	11,033,116	32.6	11,039,991	32.6
NL White	15,931,533	48.2	15,603,435	46.0	16,102,044	47.5	15,985,735	47.1
NL Black	1,770,685	5.4	2,141,059	6.3	2,153,849	6.4	2,214,193	6.5
NL Asian	3,232,261	9.8	3,800,472	11.2	3,671,415	10.8	3,731,759	11.0
NL AI/AN	53,325	0.2	210,296	0.6	131,661	0.4	192,005	0.6
NL NHOPI	62,261	0.2	113,932	0.3	50,425	0.1	110,769	0.3
NL Multirace	1,223,094	3.7	661,355	2.0	752,993	2.2	636,684	1.9
Total	33,050,816	100.0	33,911,135	100.0	33,895,502	100.0	33,911,135	100.0

Impact of Different Weights for the AI/AN Population

Percentage and total estimates of selected general health variables were calculated using the three weights described previously. Because research on AI/AN health may use different definitions of AI/AN, this study examines the estimates for AM AI/ANs and NL AI/ANs with the purpose of showing the importance of classifying the target study population by race/ethnicity.

Across the column in Table 4, the percentage estimates did not appear to differ substantially by weighting schemes. Asthma prevalence rates for AM AI/AN adults appeared to have the largest differences among the three types of weights, with estimates of 19.5%, 15.2%, and 17.8%. As calculation of the 95% confidence intervals follows p + (se(p)*1.96) where p is the estimated proportion, and se(p) is its standard error, one may easily calculate confidence intervals using information from Table 4. For example, when examining 95% confidence intervals of the three estimates above, they all overlapped; i.e., 95% CI of asthma prevalence for AI/ANs using original weight = 19.5% + (1.2%*1.96). However, it should be noted that determining the significance of

differences using confidence intervals is a convenient yet deficient approach (Schenker & Gentleman, 2001). The weighted totals, on the other hand, differed considerably by weighting schemes. For example, the number of currently insured NL AI/AN adults could be projected anywhere from 31,297 with original weights to 130,136 with revised weights, while the proposed weight produced an estimated total of 82,689 insured NL AI/ANs. This result is not surprising because the population totals for NL AI/AN using these three weights diverged substantially in value (53,325; 210,296; and 131,661). In addition to the characteristics in Table 4, 20 other variables were also examined (results not shown). The findings for these variables were consistent with Table 4: The percentage estimates did not differ by weights, but the weighted totals did.

Table 4
CHIS 2001 Estimates of Health-Related Variables for the AI/AN Population Using Different Weights

	Original Weight			Revised Weight			Proposed Weight		
	Weighted Total	(%)	SE (%)	Weighted Total	(%)	SE (%)	Weighted Total	(%)	SE (%)
General health: Fair, Poor									
AM AI/AN	89,569	21.4	1.1	187,395	22.9	1.4	88,428	22.8	1.5
NL AI/AN	8,952	24.5	2.6	37,918	24.9	2.9	23,402	24.3	2.9
Arthritis									
AM AI/AN	112,468	26.9	1.1	198,327	24.2	1.3	106,974	27.6	1.6
NL AI/AN	10,982	30.1	2.7	46,862	30.7	3.1	28,873	30.0	3.1
Asthma									
AM AI/AN	81,522	19.5	1.2	124,393	15.2	1.0	69,153	17.8	1.4
NL AI/AN	7,708	21.2	2.6	34,728	22.8	3.0	21,243	22.1	3.0
Diabetes									
AM AI/AN	30,828	7.4	0.6	63,869	7.8	0.8	30,172	7.8	0.8
NL AI/AN	3,700	10.2	1.7	14,543	9.6	1.8	9,104	9.5	1.8
Hypertension									
AM AI/AN	105,411	25.2	1.1	183,000	22.4	1.2	92,480	23.9	1.3
NL AI/AN	10,476	28.8	2.8	44,632	29.4	3.0	28,115	29.3	3.1
Consume fruits and vegetables at least five times a day									
AM AI/AN	203,484	49.9	1.4	391,252	49.0	1.6	180,199	47.5	1.7
NL AI/AN	16,063	44.9	3.3	65,589	43.8	3.5	40,727	43.0	3.6
Overweight									
AM AI/AN	253,120	61.8	1.4	502,496	62.9	1.6	238,857	63.1	1.6
NL AI/AN	22,893	63.7	3.4	98,926	66.1	3.3	60,720	64.1	3.7

continued on next page

Table 4, Continued
CHIS 2001 Estimates of Health-Related Variables for the AI/AN Population Using Different Weights

	Original Weight			Revised Weight			Proposed Weight		
	Weighted Total	(%)	SE (%)	Weighted Total	(%)	SE (%)	Weighted Total	(%)	SE (%)
Food security among Federal poverty level 200% or below									
AM AI/AN	99,283	64.5	2.0	238,812	65.9	2.4	101,166	65.6	2.3
NL AI/AN	10,440	67.3	4.2	41,364	67.7	4.6	27,781	69.7	4.7
Drank any alcoholic beverage in past month									
AM AI/AN	239,749	57.3	1.3	472,431	57.7	1.6	225,065	58.0	1.6
NL AI/AN	19,517	53.5	3.2	80,046	52.5	3.5	49,570	51.4	3.7
Binge drinking among those who had alcoholic beverage in past month									
AM AI/AN	84,378	20.2	1.2	182,400	22.4	1.4	87,638	22.7	1.8
NL AI/AN	7,218	20.1	2.6	29,749	19.9	2.7	18,197	19.2	2.7
Current smoker									
AM AI/AN	113,153	27.0	1.2	215,877	26.3	1.4	109,279	28.2	1.7
NL AI/AN	12,030	33.0	2.9	49,619	32.5	3.1	30,352	31.5	3.1
Currently insured									
AM AI/AN	346,079	82.7	1.1	651,971	79.6	1.4	316,456	81.6	1.3
NL AI/AN	31,297	85.7	2.0	130,136	85.3	2.2	82,689	85.8	2.1
Insured all past 12 months									
AM AI/AN	274,626	73.4	1.3	521,209	70.4	1.6	247,301	71.2	1.8
NL AI/AN	23,949	76.6	2.9	104,211	77.7	2.9	66,016	78.3	2.9
Covered by Indian Health Service									
AM AI/AN	16,645	4.3	0.5	42,355	5.9	0.7	22,933	6.6	0.7
NL AI/AN	7,553	22.4	2.5	27,401	19.0	2.6	16,761	19.0	2.5
Delays or not getting medical test/treatment in past 12 months									
AM AI/AN	44,143	10.6	0.8	74,377	9.1	0.8	36,181	9.3	0.9
NL AI/AN	3,410	9.3	1.6	15,001	9.8	1.8	9,176	9.5	1.8
Discriminated against in receiving health care in past 12 months									
AM AI/AN	36,727	8.9	0.7	65,256	8.1	0.8	36,457	9.5	1.3
NL AI/AN	3,274	9.1	1.8	14,899	9.9	2.1	9,113	9.5	2.1

CONCLUSION

Race/ethnicity, one of the most important weighting variables in survey data, can be classified in many different ways, and choice of classification impacts the public health statistics for AI/ANs. Different weights examined in this study did not change the percentage estimates of health-related variables for AI/ANs but did influence the weighted totals. Although one type of

race/ethnicity variable is controlled, if others are not, it is possible that the estimated population totals for uncontrolled variables could diverge from the true population counts.

It is reasonable to assume that a similar pattern may emerge for other small racial groups, such as NHPI. Weights created for these groups might not be as stable as weights for other groups because of their small proportions in the population, small sample sizes, the complexity in measuring race/ethnicity and the dynamics in its classification, and the availability of the data for weighting control totals. This instability was shown in the proposed weights—as the precision for AI/ANs improved, there was a negative effect on NL NHPI. For small racial and ethnic groups, a reasonable strategy might be to take the percentage estimates from the survey and multiply them by their known population totals from external sources such as the U.S. Census or official intercensal population statistics to estimate weighted counts.

It has been shown that classification and tabulation rules can affect both counts and predictors of health status, risks, and health needs of some populations by race/ethnicity (Mays et al., 2003). In addition, variants in classification and tabulation can potentially affect the rarest population groups in weighting survey data. In California, AI/ANs are greatly affected: California is home to the largest population of AI/ANs in the U.S., but overall AI/ANs are one of the smallest populations in this diverse state. As survey data are widely used for policy planning purposes, policy makers need to be aware that the choice of racial tabulation for weighting variables affects the data they use for decision making. Ideally, the race/ethnicity variables used in analyses will be consistent with variables controlled in weighting, and account for vulnerable and small populations. AI/ANs as a racial minority—and the only U.S. federally recognized political minority—are underrepresented in public health data collection systems. Imprecise estimates caused by inconsistency between the race/ethnicity variables being analyzed and the variables controlled in the weighting could cause policy makers to overlook the health needs of this racial-political group and result in serious resource misallocations in public health.

Sunghee Lee, PhD
UCLA Center for Health Policy Research,
UCLA Department of Biostatistics
10960 Wilshire Blvd., Suite 1550
Los Angeles, CA 90025
Phone: 310/794-2399

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Appendix
Original and Revised CHIS 2001 Ratio-Raking Dimensions

Control Geography	Control Variable	
	Original Ratio-Raking	Revised Ratio-Raking
Stratum	1. Age x Sex 2. Age	1. LA SPA, Alameda county 2. Age x Sex 3. Age 4. Race2 x Age
Collapsed Stratum	3. Any mention Latino x Age 4. Any mention African American x Age 5. Any mention White x Age	
Region		5. DOF Race
State	6. Any mention Other race x Age 7. Any mention NHOPI [1] x Age 8. Any mention AI/AN [2] x Age 9. Any mention Asian x Age 10. Age x Sex 11. Nontelephone adjustment [4] combining AFDC (Aid to Families with Dependent Children) participation, # of child, # of adults, and Race1	6. DOF Race x Age 7. Age x Sex 8. Asian group [3] x Age 9. Education 10. # of adult 11. Nontelephone adjustment combining household tenure, # of adults and education level

Source: CHIS Technical Report – Revised California Health Interview Survey 2001 Weights available at http://www.chis.ucla.edu/pdf/reweight_technical_chis01.pdf

[1] Native Hawaiian Other Pacific Islander

[2] American Indian/Alaska Native

[3] Non-Latino Chinese, Non-Latino Korean, Non-Latino Filipino, Non-Latino Vietnamese, Other, or Non-Asian

[4] Nontelephone adjustment dimension for 2001 revised ratio-raking is the same as its counterpart in 2001 original ratio-raking

Note: Race 1: See Appendix in CHIS Technical Report – Revised California Health Interview Survey 2001 Weights

Race 2: Latino, Non-Latino White, Non-Latino African American, Non-Latino Asian, Non-Latino American Indian and Alaska Native, Non-Latino Native Hawaiian/other Pacific Islander, Non-Latino multiple race

Scientific surveys employ probability samples to ensure that a given survey represents the population of interest with known nonzero probabilities (Kish, 1966; Cochran, 1977; Särndal, Swesson, & Wretman, 1992). Each unit in the sample carries its selection probability derived from the sampling procedure. The inverse of the selection probability serves as the "base weight." Simply speaking, the weight is the number of population units that a particular sample represents in a particular survey, and the sum of weights is equal to the population size.

Due to operational glitches arising in survey practice (such as nonresponse), the theoretical statistical representativeness of the sample becomes dampened. In order to compensate, the base weights are rescaled through an adjustment process. There are a number of approaches one might consider for this adjustment (Kalton & Flores-Cervantes, 2003). Typically, adjustment factors are calculated by controlling for some sample characteristics to match the known population distribution, and are applied to the base weights to create "final weights." By applying the final weights in the estimation, survey estimates are expected to approximate the population quantities (Tompkins & Kim, 2007).

Race and Ethnicity in Survey Weighting

Weighting adjustment is a key process in preparing survey data, and race and ethnicity are important common variables controlled for in the weighting adjustment, as survey results are often presented by their subgroups. In most survey practice, small racial and ethnic categories are lumped together in weighting. For example, the National Health Interview Survey (NHIS) uses the categories Hispanic, non-Hispanic Black, and non-Hispanic other race (Botman, Moore, Moriarity, & Parsons, 2000). Because the non-Hispanic other race category includes multiple race/ethnicity groups, it is possible that the individual proportion of these groups may be distorted in the weighting process.

Race/Ethnicity Data Collection and Classification in the United States

Race/ethnicity data play an important role in research. Health research, in particular, analyzes survey data using race/ethnicity as an independent variable, because this information serves as a proxy for unmeasured social factors (Mays, Ponce, Washington, & Cochran, 2003) and an indicator of health disparities and health care access (Winker, 2004), as well as an independent effect from other demographic and socioeconomic characteristics (Swift, 2002).

Race/ethnicity is a construct far more complex than one would expect in demographically diverse societies like the U.S. The change of race/ethnicity measurement in the federal government is well documented (Burhansstipanov & Satter, 2000; Mays et al., 2003). Problems associated with

measuring the race of Hispanic/Latino populations in the 1990 U.S. Census, and other issues, led the U.S. Office of Management and Budget (OMB) to release new Statistical Policy Directive No. 15 (U.S. OMB 1995, 1997). The main changes are: (1) the ethnicity question precedes the race question; (2) there are now five race categories: White, Black, American Indian or Alaska Native (AI/AN), Native Hawaiian or Other Pacific Islander (NHPI), and Asian (Asian and Pacific Islander became separate categories, unlike the previous definition); (3) the "some other race" category no longer exists; and (4) people can identify with more than one race group described above. These changes were reflected in the 2000 U.S. Census data collection, with the OMB-approved exception that the Census questionnaire also provided the "some other race" category. Roughly speaking, the 2000 U.S. Census raw data provide the total number of people in the population identifying with Hispanic/Latino ethnicity and each of the following six race variables: NHPI, AI/AN, Asian, Black or African American, White, and some other race. The sum of the race counts exceeds the total population counts, because 2.4% of the population chose more than one race in Census SF-1 Table P7. Given the complexity of the collected data and the need to summarize the information into a single variable with mutually exclusive categories, the U.S. Census Bureau (2002) released a modified race data summary file assigning individuals in the "some other race" category into one of the OMB race categories.

It should be noted that it is common for persons in the U.S. to use race/ethnicity terms without understanding their meanings, origins, or current implications (Cruz-Jansen, 2002). It has long been stated by the federal government that the racial and ethnic classification standards for the U.S. are not based in science, but are responses to expressed needs of politicians (Forbes, 1990; U.S. OMB 1997). Nonetheless, racial categories and counts based on the OMB guidelines are the major organizing tool for public health data (Tashiro, 2002).

The AI/AN Population

The AI/AN population, the only federally recognized political minority in the U.S., is increasing at about 1.8% a year, not including tribes gaining federal recognition. According to the 2000 U.S. Census, 4.1 million (1.5%) adults in the U.S. are AI/AN or AI/AN in combination with one or more other races (Ogunwole, 2002). The number of residents who reported as AI/AN in combination with one or more races increased 110% between the 1990 and 2000 U.S. Censuses, while the number of residents who reported as AI/AN alone increased 26%. More AI/ANs (627,562 people in 2000) live in California than any other state in the U.S. (Ogunwole). There are more federally recognized tribes in California (107) than any state except Alaska, as well as numerous non-federally recognized tribes.

NEW CONTRIBUTION

The fundamental data issue we explore is the potential discrepancy of weighted estimates of health-related variables for the AI/AN population that results from different racial classification and tabulation of AI/ANs in preparing and using survey data. If the weights alter the estimates substantially, the weighting schemes should be subject to reconsideration. Using a very large population-based sample of AI/ANs, this is, to our knowledge, the first article to examine the impact of racial classification on survey weights and the consequences of different weights on AI/AN health data. Our new contribution is to inform health researchers who use population-based survey data when studying different racial and ethnic groups, particularly the AI/AN population, of the importance of understanding how the survey weights are created and for what they can and cannot account.

DATA AND METHODS

This study used data from the 2001 California Health Interview Survey (CHIS), a statewide random-digit dial telephone survey assessing the health of California's general population. The sample was drawn by geographically stratifying the state, mostly at the county level so that reliable county-level estimates could be obtained. As the largest state health survey in the U.S., CHIS also has the ability to provide accurate data on the AI/AN population due to modifications made at different development stages (including survey design, interviewer training protocol, and sampling). The survey instrument has been through extensive cultural and linguistic review and adaptation (Ponce et al., 2004). The format of race/ethnicity questions follows that of the 2000 U.S. Census, as respondents may report more than one race. These questions were specifically designed to avoid problems faced by other surveys collecting AI/AN data. Persons who answered as AI/AN on any race question were asked to further identify their tribal affiliation(s), whether they are an enrolled member of a tribe, and in which tribe(s) they were enrolled. The data allow us to distinguish individuals from California tribes and non-California tribes, as well as those without tribal affiliations. CHIS 2001 oversampled AI/ANs, yielding the largest sample of AI/AN for a population-based cross-sectional data collection in U.S. history, a total of almost 4,000 AI/AN individuals (Yen & Satter, 2002). The interviewers received an in-person cultural competency training about the unique cultural and linguistic issues that can arise when interviewing AI/ANs. The cultural competency training materials were incorporated into the standard interviewer training protocol for subsequent administrations of CHIS (Satter, Veiga-Ermert, Burhansstipanov, Pena, & Restivo, 2005).

In weighting the CHIS data, the base weights were adjusted through 10 stages (CHIS, 2005). The last stage was a statistical adjustment process called ratio-raking which controls the marginal distributions of the raking variables (Deming & Stephen, 1940). Eleven dimensions of demographic and socio-economic variables and their cross-classifications shown in the Appendix were controlled in this stage.

There was a significant change in raking process between CHIS 2001 and 2003: Instead of the Census SF-1 data, the California Department of Finance (CA DOF) Population Projections (P-1) for 2003 were used as the external source for control totals. This was done because there were no other sources for intercensal population data for all counties. (For example, the American Community Survey collects data only from selected counties for a given year.) The change in the control source resulted in a change in classification of the raking race/ethnicity variable. The 2001 method controlled the following seven "any mention" (AM, hereafter) race/ethnicity variables separately, as in the 2000 U.S. Census questionnaire: whether or not one is Hispanic/Latino, Black, White, AI/AN, NHPI, Asian, or some other race. At the time, neither the CA DOF projections nor U.S. Census data based on the 1997 OMB Notice "Revisions to the Standards for the Classification of Federal Data on Race and Ethnicity" were available.

The revised weighting used one race/ethnicity variable following the CA DOF projections pursuant to the 1997 OMB classification. The variable assigned people to one of the following mutually exclusive categories: Latino, non-Latino (NL) White, NL Black, NL Asian, NL AI/AN, NL NHPI, and NL multirace (CA DOF, 2004). In order to keep the data consistent across years, CHIS 2001 data were reweighted using the revised method with the CA DOF 2001 projections.

In addition to these existing weights, this study proposes another set of weights produced by controlling for both the multiple AM race variables and the single CA DOF race variable. Instead of creating weights from the base weights, we started with the existing revised weights and re-adjusted them using both the Census SF-1 data and CA DOF P-1 population projections for different racial and ethnic groups. The proposed weight will be discussed after comparing the original and revised weights described above.

RESULTS

Discrepancy in Weighted Totals for AI/ANs

Overall, the weight revision does not appear to have a major impact on proportions across all racial and ethnic groups in Table 1. The original weighted totals for AM race variables match their control totals from the Census SF-1, and the revised weighted totals for the CA DOF race variable match the control totals from the DOF P-1. The slight decrease in weighted totals compared to the

actual population control is due to the fact that the CHIS target population excludes people in group quarters while control totals include them. When comparing the original and revised weighted totals by race/ethnicity, there seems to be a problem with the AI/AN estimates. Both AM AI/ANs and NL AI/ANs show large discrepancies: The revised weighted total for AM AI/ANs is nearly double the original one (611,468 vs. 1,287,600), and that for NL AI/ANs is nearly quadruple (52,433 vs. 209,385).

Table 1
Race and Ethnicity Distribution in the 2001 California Health Interview Survey

	Unweighted Total		Original Weighted Total		Revised Weighted Total		Control Total[1]	
	Count	%	Count	%	Count	%	Count	%
Census Race/Ethnicity							Census SF-1	
AM Latino[2]	18,872	25.6	10,774,044	32.6	11,380,586	33.6	10,966,556	32.2
AM White	53,359	72.3	20,984,429	63.5	20,489,598	60.4	21,490,973	63.1
AM Black	4,320	5.9	2,370,085	7.2	2,492,683	7.4	2,513,041	7.4
AM Asian	6,113	8.3	4,092,122	12.4	4,232,701	12.5	4,155,685	12.2
AM AI/AN	3,990	5.4	611,468	1.9	1,287,600	3.8	627,562	1.8
AM NHOPI	592	0.8	215,878	0.7	278,552	0.8	221,458	0.7
AM Other	9,806	13.3	6,447,609	19.5	6,256,902	18.5	6,575,625	19.3
DOF Race/Ethnicity							CA DOF P-1	
Latino	18,872	25.6	10,774,044	32.6	11,380,586	33.6	11,082,985	32.6
NL White	42,652	57.8	15,931,533	48.2	15,603,435	46.0	16,047,989	47.1
NL Black	3,272	4.4	1,770,685	5.4	2,141,059	6.3	2,222,816	6.5
NL Asian	4,917	6.7	3,232,261	9.8	3,800,472	11.2	3,746,292	11.0
NL AI/AN[3]	540	0.7	53,325	0.2	210,296	0.6	192,753	0.6
NL NHOPI	237	0.3	62,261	0.2	113,932	0.3	111,200	0.3
NL Multirace	3,327	4.5	1,223,094	3.7	661,355	2.0	639,163	1.9
Total	73,917	100.0	33,050,816	100.0	33,911,135	100.0	34,043,198	100.0

[1] Control totals include the group quarter population for presentation purposes. These numbers are modified in the weighting procedure to exclude those populations, because the CHIS target population excludes them.

[2] AM indicates "any mention." Therefore, the sum of all AM race categories exceeds 100% of the sample.

[3] This includes 3 people who were reclassified because they reported single other race only.

The reasons for the discrepancies are twofold: the unweighted sample distribution and the difference in the race/ethnicity classification methods between the Census SF-1 and the CA DOF P-1. Let us first examine how the original weights were constructed. The sample included 3,990 AM AI/ANs across adults, adolescents, and children (5.4% of the total sample). This proportion was much larger than the proportion of AM AI/ANs (1.9%) in the control totals, Census SF-1. Therefore, these AM AI/ANs were assigned smaller weights than their counterparts in raking. Accordingly, when the original weights were applied, the weighted total of AM AI/ANs matched the population total from the Census SF-1.

In creating the CA DOF race/ethnicity variable with AM variables, 1,288 of the AM AI/ANs were classified as Latinos, and 2,165 as NL multirace individuals; only 537 people were retained as NL AI/ANs. In fact, the left column of Table 2 shows that, among these 3,990 AM AI/ANs, two thirds were also reported as AM White, and slightly less than one third were, in fact, AM Latinos. Because these AM Latinos are a subset of AM AI/ANs, the smaller weights on AM AI/ANs than their counterparts in the original weighting had been carried over for the NL AI/AN group of the CA DOF race classification. For this reason, when the weighted total was calculated for NL AI/ANs using the original weight, it appeared as if there were only 52,433 NL AI/ANs, when the true population total is 192,753.

Table 2
Self-Reported Race Variables (n=3,990)

Census Race/Ethnicity		DOF Race/Ethnicity	
AM AI/AN	3,990	NL AI/AN	537
AM Latino	1,288	Latino	1,288
AM White	2,376	NL White	0
AM Black	372	NL Black	0
AM Asian	75	NL Asian	0
AM NHOPI	32	NL NHOPI	0
AM Other	7	NL Multirace	2,165
		Total	3,990

In addition, the revised raking used the CA DOF race variable instead of AM race variables for control totals. When NL AI/ANs were examined, their proportion in the sample was their population proportion (0.7% vs. 0.6%). However, Table 2 shows that a large proportion of AM AI/ANs were Latinos, whose sample proportion was smaller than the population proportions (see Table 1), indicating that weights for Latinos were larger than for non-Latinos. Therefore, when all AM AI/ANs were combined, their weighted total became larger than it should have been. While these revised weights made the weighted total for NL AI/ANs comparable to the CA DOF control total (210,296 vs. 192,753), they produced far larger estimates for AM AI/ANs than the original

weighted total and the population counts (1,287,600 vs. 611,468/627,562). This discrepancy occurs because AM AI/ANs included not only 537 NL AI/AN respondents but also 1,288 Latinos and 2,165 NL multirace individuals in the CA DOF classification (see Table 2). The discrepancy in the unweighted distribution resides in the dynamics of racial and ethnicity classification and the complexity of combining the multiple AM race/ethnicity variables into one single variable as described above.

Proposed Adjustment

A possible way to reconcile this discrepancy is to control for both the multiple U.S. Census AM race variables and the single CA DOF race variable, unlike the previous two methods that controlled for only one of these two. The methodology of the proposed weighting itself is essentially the same as that of the previous weighting described in CHIS (2005); the only difference is that both race definitions are included in the adjustment. Population control totals presented in the far right column of Table 3 were used in calculating weights so that all weighted race/ethnicity estimates would match their respective population totals well. The results of the proposed weight are shown in Table 3.

The original weighted total of AM AI/AN matches the Census SF-1 figure for AM AI/AN very well, but the NL AI/AN total fails to match the CA DOF P-1 total. In a similar fashion, the revised weighted total of NL AI/AN matches the CA DOF P-1 figure, but the AM AI/AN total is very far from the Census SF-1 total. These findings are to be expected, as only one racial/ethnicity classification is controlled in these two weighting schemes. However, the proposed weighted totals of both AM AI/AN and NL AI/AN are closer to the Census SF-1 and the CA DOF P-1 control totals simultaneously, unlike the original and revised weight methods, where the weighted totals matched the control totals of one of the two racial/ethnicity classifications. This is because both classifications are controlled in the proposed weighting. Although the proposed weighting is not perfect, it shows an improvement over the other two weighting methods. It is clear that the proposed weights provide better estimates than the other two weights, as differences examined in NL AI/ANs using the original weights, and in AM AI/ANs using the revised weights, were mitigated. The weighted totals for both AM AI/ANs and NL AI/ANs using the proposed weights were reasonably close to both control totals. This was especially true for AM AI/ANs.

One caveat of the proposed weights is that they distort the distribution of the NL NHPI group. The reason for this distortion may be found in NL NHPIs' small proportion in the population (0.3%) and their sample size (237). The proposed method may be subject to more measurement error as group size decreases.

Table 3
Control Totals

	Original Weight		Revised Weight		Proposed Weight		Control Total	
	Count	%	Count	%	Count	%	Count	%
Census Race/Ethnicity								
AM Latino	10,774,044	32.6	11,380,586	33.6	11,033,116	32.6	10,979,341	32.4
AM White	20,984,429	63.5	20,489,598	60.4	21,419,884	63.2	21,516,027	63.4
AM Black	2,370,085	7.2	2,492,683	7.4	2,508,154	7.4	2,515,971	7.4
AM Asian	4,092,122	12.4	4,232,701	12.5	4,152,713	12.3	4,160,530	12.3
AM AI/AN	611,468	1.9	1,287,600	3.8	620,477	1.8	628,294	1.9
AM NHOPI	215,878	0.7	278,552	0.8	213,900	0.6	221,716	0.7
AM Other	6,447,609	19.5	6,256,902	18.5	6,487,148	19.1	6,583,291	19.4
DOF Race/Ethnicity								
Latino	10,774,044	32.6	11,380,586	33.6	11,033,116	32.6	11,039,991	32.6
NL White	15,931,533	48.2	15,603,435	46.0	16,102,044	47.5	15,985,735	47.1
NL Black	1,770,685	5.4	2,141,059	6.3	2,153,849	6.4	2,214,193	6.5
NL Asian	3,232,261	9.8	3,800,472	11.2	3,671,415	10.8	3,731,759	11.0
NL AI/AN	53,325	0.2	210,296	0.6	131,661	0.4	192,005	0.6
NL NHOPI	62,261	0.2	113,932	0.3	50,425	0.1	110,769	0.3
NL Multirace	1,223,094	3.7	661,355	2.0	752,993	2.2	636,684	1.9
Total	33,050,816	100.0	33,911,135	100.0	33,895,502	100.0	33,911,135	100.0

Impact of Different Weights for the AI/AN Population

Percentage and total estimates of selected general health variables were calculated using the three weights described previously. Because research on AI/AN health may use different definitions of AI/AN, this study examines the estimates for AM AI/ANs and NL AI/ANs with the purpose of showing the importance of classifying the target study population by race/ethnicity.

Across the column in Table 4, the percentage estimates did not appear to differ substantially by weighting schemes. Asthma prevalence rates for AM AI/AN adults appeared to have the largest differences among the three types of weights, with estimates of 19.5%, 15.2%, and 17.8%. As calculation of the 95% confidence intervals follows p + (se(p)*1.96) where p is the estimated proportion, and se(p) is its standard error, one may easily calculate confidence intervals using information from Table 4. For example, when examining 95% confidence intervals of the three estimates above, they all overlapped; i.e., 95% CI of asthma prevalence for AI/ANs using original weight = 19.5% + (1.2%*1.96). However, it should be noted that determining the significance of

differences using confidence intervals is a convenient yet deficient approach (Schenker & Gentleman, 2001). The weighted totals, on the other hand, differed considerably by weighting schemes. For example, the number of currently insured NL AI/AN adults could be projected anywhere from 31,297 with original weights to 130,136 with revised weights, while the proposed weight produced an estimated total of 82,689 insured NL AI/ANs. This result is not surprising because the population totals for NL AI/AN using these three weights diverged substantially in value (53,325; 210,296; and 131,661). In addition to the characteristics in Table 4, 20 other variables were also examined (results not shown). The findings for these variables were consistent with Table 4: The percentage estimates did not differ by weights, but the weighted totals did.

Table 4
CHIS 2001 Estimates of Health-Related Variables for the AI/AN Population Using Different Weights

	Original Weight			Revised Weight			Proposed Weight		
	Weighted Total	(%)	SE (%)	Weighted Total	(%)	SE (%)	Weighted Total	(%)	SE (%)
General health: Fair, Poor									
AM AI/AN	89,569	21.4	1.1	187,395	22.9	1.4	88,428	22.8	1.5
NL AI/AN	8,952	24.5	2.6	37,918	24.9	2.9	23,402	24.3	2.9
Arthritis									
AM AI/AN	112,468	26.9	1.1	198,327	24.2	1.3	106,974	27.6	1.6
NL AI/AN	10,982	30.1	2.7	46,862	30.7	3.1	28,873	30.0	3.1
Asthma									
AM AI/AN	81,522	19.5	1.2	124,393	15.2	1.0	69,153	17.8	1.4
NL AI/AN	7,708	21.2	2.6	34,728	22.8	3.0	21,243	22.1	3.0
Diabetes									
AM AI/AN	30,828	7.4	0.6	63,869	7.8	0.8	30,172	7.8	0.8
NL AI/AN	3,700	10.2	1.7	14,543	9.6	1.8	9,104	9.5	1.8
Hypertension									
AM AI/AN	105,411	25.2	1.1	183,000	22.4	1.2	92,480	23.9	1.3
NL AI/AN	10,476	28.8	2.8	44,632	29.4	3.0	28,115	29.3	3.1
Consume fruits and vegetables at least five times a day									
AM AI/AN	203,484	49.9	1.4	391,252	49.0	1.6	180,199	47.5	1.7
NL AI/AN	16,063	44.9	3.3	65,589	43.8	3.5	40,727	43.0	3.6
Overweight									
AM AI/AN	253,120	61.8	1.4	502,496	62.9	1.6	238,857	63.1	1.6
NL AI/AN	22,893	63.7	3.4	98,926	66.1	3.3	60,720	64.1	3.7

continued on next page

Table 4, Continued
CHIS 2001 Estimates of Health-Related Variables for the AI/AN Population Using Different Weights

	Original Weight			Revised Weight			Proposed Weight		
	Weighted Total	(%)	SE (%)	Weighted Total	(%)	SE (%)	Weighted Total	(%)	SE (%)
Food security among Federal poverty level 200% or below									
AM AI/AN	99,283	64.5	2.0	238,812	65.9	2.4	101,166	65.6	2.3
NL AI/AN	10,440	67.3	4.2	41,364	67.7	4.6	27,781	69.7	4.7
Drank any alcoholic beverage in past month									
AM AI/AN	239,749	57.3	1.3	472,431	57.7	1.6	225,065	58.0	1.6
NL AI/AN	19,517	53.5	3.2	80,046	52.5	3.5	49,570	51.4	3.7
Binge drinking among those who had alcoholic beverage in past month									
AM AI/AN	84,378	20.2	1.2	182,400	22.4	1.4	87,638	22.7	1.8
NL AI/AN	7,218	20.1	2.6	29,749	19.9	2.7	18,197	19.2	2.7
Current smoker									
AM AI/AN	113,153	27.0	1.2	215,877	26.3	1.4	109,279	28.2	1.7
NL AI/AN	12,030	33.0	2.9	49,619	32.5	3.1	30,352	31.5	3.1
Currently insured									
AM AI/AN	346,079	82.7	1.1	651,971	79.6	1.4	316,456	81.6	1.3
NL AI/AN	31,297	85.7	2.0	130,136	85.3	2.2	82,689	85.8	2.1
Insured all past 12 months									
AM AI/AN	274,626	73.4	1.3	521,209	70.4	1.6	247,301	71.2	1.8
NL AI/AN	23,949	76.6	2.9	104,211	77.7	2.9	66,016	78.3	2.9
Covered by Indian Health Service									
AM AI/AN	16,645	4.3	0.5	42,355	5.9	0.7	22,933	6.6	0.7
NL AI/AN	7,553	22.4	2.5	27,401	19.0	2.6	16,761	19.0	2.5
Delays or not getting medical test/treatment in past 12 months									
AM AI/AN	44,143	10.6	0.8	74,377	9.1	0.8	36,181	9.3	0.9
NL AI/AN	3,410	9.3	1.6	15,001	9.8	1.8	9,176	9.5	1.8
Discriminated against in receiving health care in past 12 months									
AM AI/AN	36,727	8.9	0.7	65,256	8.1	0.8	36,457	9.5	1.3
NL AI/AN	3,274	9.1	1.8	14,899	9.9	2.1	9,113	9.5	2.1

CONCLUSION

Race/ethnicity, one of the most important weighting variables in survey data, can be classified in many different ways, and choice of classification impacts the public health statistics for AI/ANs. Different weights examined in this study did not change the percentage estimates of health-related variables for AI/ANs but did influence the weighted totals. Although one type of

race/ethnicity variable is controlled, if others are not, it is possible that the estimated population totals for uncontrolled variables could diverge from the true population counts.

It is reasonable to assume that a similar pattern may emerge for other small racial groups, such as NHPI. Weights created for these groups might not be as stable as weights for other groups because of their small proportions in the population, small sample sizes, the complexity in measuring race/ethnicity and the dynamics in its classification, and the availability of the data for weighting control totals. This instability was shown in the proposed weights—as the precision for AI/ANs improved, there was a negative effect on NL NHPI. For small racial and ethnic groups, a reasonable strategy might be to take the percentage estimates from the survey and multiply them by their known population totals from external sources such as the U.S. Census or official intercensal population statistics to estimate weighted counts.

It has been shown that classification and tabulation rules can affect both counts and predictors of health status, risks, and health needs of some populations by race/ethnicity (Mays et al., 2003). In addition, variants in classification and tabulation can potentially affect the rarest population groups in weighting survey data. In California, AI/ANs are greatly affected: California is home to the largest population of AI/ANs in the U.S., but overall AI/ANs are one of the smallest populations in this diverse state. As survey data are widely used for policy planning purposes, policy makers need to be aware that the choice of racial tabulation for weighting variables affects the data they use for decision making. Ideally, the race/ethnicity variables used in analyses will be consistent with variables controlled in weighting, and account for vulnerable and small populations. AI/ANs as a racial minority—and the only U.S. federally recognized political minority—are underrepresented in public health data collection systems. Imprecise estimates caused by inconsistency between the race/ethnicity variables being analyzed and the variables controlled in the weighting could cause policy makers to overlook the health needs of this racial-political group and result in serious resource misallocations in public health.

Sunghee Lee, PhD
UCLA Center for Health Policy Research,
UCLA Department of Biostatistics
10960 Wilshire Blvd., Suite 1550
Los Angeles, CA 90025
Phone: 310/794-2399

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Appendix
Original and Revised CHIS 2001 Ratio-Raking Dimensions

Control Geography	Control Variable	
	Original Ratio-Raking	Revised Ratio-Raking
Stratum	1. Age x Sex 2. Age	1. LA SPA, Alameda county 2. Age x Sex 3. Age 4. Race2 x Age
Collapsed Stratum	3. Any mention Latino x Age 4. Any mention African American x Age 5. Any mention White x Age	
Region		5. DOF Race
State	6. Any mention Other race x Age 7. Any mention NHOPI [1] x Age 8. Any mention AI/AN [2] x Age 9. Any mention Asian x Age 10. Age x Sex 11. Nontelephone adjustment [4] combining AFDC (Aid to Families with Dependent Children) participation, # of child, # of adults, and Race1	6. DOF Race x Age 7. Age x Sex 8. Asian group [3] x Age 9. Education 10. # of adult 11. Nontelephone adjustment combining household tenure, # of adults and education level

Source: CHIS Technical Report – Revised California Health Interview Survey 2001 Weights available at http://www.chis.ucla.edu/pdf/reweight_technical_chis01.pdf

[1] Native Hawaiian Other Pacific Islander

[2] American Indian/Alaska Native

[3] Non-Latino Chinese, Non-Latino Korean, Non-Latino Filipino, Non-Latino Vietnamese, Other, or Non-Asian

[4] Nontelephone adjustment dimension for 2001 revised ratio-raking is the same as its counterpart in 2001 original ratio-raking

Note: Race 1: See Appendix in CHIS Technical Report – Revised California Health Interview Survey 2001 Weights

Race 2: Latino, Non-Latino White, Non-Latino African American, Non-Latino Asian, Non-Latino American Indian and Alaska Native, Non-Latino Native Hawaiian/other Pacific Islander, Non-Latino multiple race

DEPRESSED AFFECT AND HISTORICAL LOSS AMONG NORTH AMERICAN INDIGENOUS ADOLESCENTS

Les B. Whitbeck, PhD, Melissa L. Walls, PhD, Kurt D. Johnson, BA,
Allan D. Morrisseau, BA, and Cindy M. McDougall

Abstract: This study reports on the prevalence and correlates of perceived historical loss among 459 North American Indigenous adolescents aged 11-13 years from the northern Midwest of the United States and central Canada. The adolescents reported daily or more thoughts of historical loss at rates similar to their female caretakers. Confirmatory factor analysis indicated that our measure of perceived historical loss and the Center for Epidemiologic Studies Depression scale were separate but related constructs. Regression analysis indicated that, even when controlling for family factors, perceived discrimination, and proximal negative life events, perceived historical loss had independent effects on adolescent's depressive symptoms. The construct of historical loss is discussed in terms of Indigenous ethnic cleansing and life course theory.

For the past several years there has been considerable interest in the potential long-term emotional consequences of the ethnic cleansing of Indigenous people in North America. Variously conceptualized as "intergenerational posttraumatic stress disorder" (Duran & Duran, 1995); "historical trauma," and "historical grief" (Brave Heart, 1998; 1999a, b; Brave Heart and DeBruyn, 1998), conferences, workshops, and therapeutic approaches have proliferated as the concept resonated among many Indigenous people (see Evans-Campbell, 2008 for a recent review). These early theoretical arguments led to our attempts to measure the prevalence of perceived historical loss and associated emotional responses to it. We found that one-fifth to one-third of Indigenous adults reported thoughts pertaining to historical loss daily or several times a day, and that these thoughts have negative emotional consequences (Whitbeck, Adams, Hoyt, & Chen, 2004).

Yet, as with any new concept, there are many aspects that remain unclear. Early conceptualizations have been diffuse, enumerating a wide range of internalizing and externalizing psychological symptoms and insufficiently distinguishing between the confounding factors of proximal versus distal causes. For example, it is difficult to disentangle the proximal emotional

effects of chronic economic disadvantage, discrimination, severe health and mental health disparities, and high mortality rates from the long-term emotional consequences of genocide and ethnic cleansing. This investigation is particularly challenging because of the high rates of trauma exposure among American Indian (AI) people. Manson and colleagues (2005) report that more than two-thirds of AI adults have experienced at least one traumatic event which is "at the upper end of the wide range previously reported among other populations" (p. 857). These current conditions may be the result of historical causes, but the origins of the symptoms may be attributable to contemporary experiences.

More important, perhaps, is the nature of the construct itself. Because historical loss connotes grief, trauma, and sadness, there has been concern that the concept is merely a cultural expression of depressed affect. That is, "historical loss" is not a separate construct from depressive symptoms; rather, it simply reflects existing negative affect among some Indigenous adolescents and adults. The research reported here is an incremental step towards understanding the characteristics of historical loss, the prevalence of thoughts about historical loss among adolescents, and correlates of historical loss. We hypothesize that growing up in a cultural context of reminders of ethnic cleansing may contribute to adolescent depression and demoralization, which in turn contribute to negative developmental outcomes such as early-onset alcohol and drug use, school leaving, and the high suicide rates found in some Indigenous communities.

Loss and Trauma Across Generations

Although there is some evidence of intergenerational transmission of trauma across one generation (Yehuda, Schmeider, Giller, Siever, & Binder-Byrnes, 1998; Yehuda, Schmeider, Weinberger, Binder-Byrnes, & Duvdevani, 1998) we don't know for how many generations this effect may persist. The ethnic cleansing of North American Indigenous people took place over a period of several centuries culminating with military defeat in the battles of the late 1800s and the subsequent relocation to what amounted to penal colonies (Brave Heart, 1998; 1999a, b; Brave Heart & DeBruyn, 1998; Duran & Duran, 1995). There they were starved, neglected, and forbidden to practice their traditional means of survival and spiritual traditions. As part of a government policy of forced assimilation, their children were taken from them and reeducated in settings that ignored kinship patterns, punished the use of traditional language, and sought to replace traditional religious beliefs with Christianity. There has been no specific end to government policies of assimilation, no acknowledgement of ethnic cleansing or apology for it from the U.S. government. The Canadian parliament has issued a formal apology to former students in Canadian boarding schools (Apology, 2008), and the Canadian government has provided monetary reparations to First Nations people for its policies of child removal to boarding schools.

Placement of children in boarding schools in the U.S. and Canada persisted into the 1950s. European encroachment on tribal lands continues in the U.S. with special Department of Interior long-term leases for European farmers on reservations well below market value. There remain enormous disparities in medical care, housing, education, and employment on many reservations. Indigenous people are subject to discrimination and disrespect not tolerated for other minorities in the U.S. Indeed, the name of the professional football team for our nation's capital is the "Redskins."

In summary, the historical losses experienced by North American Indigenous people are not "historical" in the sense that they happened long ago and a new life has begun. Rather, they are "historical" in that they originated long ago and have persisted. The reminders of historical loss remain ever present, represented by economic disadvantage on rural reservations, national disrespect, discrimination, and a sense of continual erosion of traditional cultures.

Growing Up in the Context of Historical Loss

From the life course developmental perspective, historical periods and social location shape life trajectories by influencing the occurrence and timing of major life transitions such as completing one's education, marriage, entry into the work force, and career trajectories. They also contribute to shaping values, beliefs, and personality characteristics. For example, coming of age during the Great Depression influenced young people to be frugal, hardworking, and distrusting of the future (Elder, 1974). Elder's work with adolescents from the Great Depression indicates that boys from deprived households "were less likely to be hopeful, self-directed, and confident about their future" than those from non-deprived households (Elder & Caspi, 1987; p. 34). Adolescent life trajectories develop their own momentum or "continuity" as life events and decisions influence the probability of subsequent events or block later opportunities (Caspi & Bem, 1990). We believe that cultural contexts shape adolescent lives in much the same ways as do historical periods.

Growing up on a reservation/reserve represents a unique developmental context historically and socially. For Indigenous nations lucky enough not to be completely removed from their home territories, reservations/reserves represent the remnant "homeland." However, this "homeland" often occupies the least productive, least desirable area of what was once their vast territory. As a social context, reservations/reserves are at once a symbol of what was and the representation of what has occurred. The land represents a revered past, yet the histories of some reservations/reserves are filled with stories of epidemics, corrupt government agents, food shortages, and repression. Simply living on reservations/reserves can be a reminder of ethnic cleansing, broken promises, continual encroachment on tribal lands, and continuing pressures of assimilation. At the same time, reservations/reserves may be a refuge from discrimination and the land a symbol of the living culture. They hold sacred places, and remain the repository of cultural knowledge.

This ambivalence about life on reservations/reserves is best expressed in the words of the people themselves. As part of a larger longitudinal study (of which this research is also a part), we conducted several focus groups with elders and service providers who lived on various participating reservations and reserves (see Method section for a discussion of the focus group procedures). A service provider on one of the reserves told us:

> . . .well there's a host of things that we need you know to, economics, unemployment situation in reserves. It's horrible. But, you know we want to live in our reserves, this is our home. And we even have to like these, these reserves are the only lands that we have left and we want to keep them. We want these, to keep our communities but we desperately need jobs and stuff like that. (Focus Group, Male service provider, August 2005)

There is simultaneously the love of the land and the appreciation of its symbolic meaning for the culture as it once was and the contrasting sadness and anger over the economic deprivation that exists in the contemporary culture.

> It [contact with Europeans/relocation/forced removal] was a disconnection of what we had with the land. We've been looking at the poverty, the environment that we're living in today. We did not create the poverty in our community. We did not choose to be born in this community. And the lack of economic opportunity, this community has created the anxiety, the depression, the hope and the addiction of drugs in this community. We did not choose you know for our families to be dysfunctional here in this community and other communities because what was taught to us was nothing less than dysfunction. (Focus Group, Male Elder, August, 2005)

Although there is enormous variation across nations, the social conditions on some reservations/reserves indicate they have never fully recovered economically or socially from military defeat and relocation. Health and social problems endemic to reservation/reserve life have been well documented (Indian Health Services, 2001; Sandefur, Rindfus, & Cohen, 1996). Reservation/reserve Indigenous adolescents are often exposed to chronic economic disadvantage (Gregory, Abello, & Johnson, 1996; Trosper, 1996), discrimination (Whitbeck, Hoyt, McMorris, Chen, & Stubben, 2001), educational disadvantage resulting in high dropout rates (Chavers, 1991; Swisher & Hoisch, 1992); high rates of alcohol and drug use among adults and adolescents (May, 1994; Substance Abuse and Mental Health Services Administration, 2003), violence (Bachman, 1992), and for some, high rates

of youth suicide (Garroutte et al., 2003; May et al., 2002). We believe that these social conditions, while exerting direct effects on child outcomes, also serve as chronic reminders of ethnic cleansing and historical loss that have independent demoralizing effects on adults and children.

Evidence of Perceived Historical Loss among Indigenous Adults

We have reported evidence of perceived historical loss among Indigenous adults (Whitbeck, Adams et al., 2004). Nearly one-fifth (18.2%) of Indigenous parents/caretakers of children aged 10-12 years thought daily or several times per day about loss of land. An additional 10.1% had such thoughts weekly. More than one-third (36.3%) thought daily or several times per day about loss of traditional language. Similarly, one-third (33.4%) thought daily or several times per day about loss of traditional spirituality. This number increases to more than one-half (54.8%) when those who had such thoughts at least on a weekly basis are taken into consideration. One-third (33.7%) thought daily or more about losing their culture; one-half (48.1%) thought of this at least weekly. Alcoholism was very much on everyone's mind. Only 7.5% "never" thought of it. Almost one-half (45.9%) thought of it daily or more; two-thirds (63.5%) thought of it at least weekly. Loss of respect for elders was also frequently thought of. Sixty-five percent of the respondents thought about this at least weekly; 37.5%, daily or more. Loss due to early deaths was thought of daily or more by 33.2% of the respondents and at least weekly by 54.5% of the respondents. Finally, loss of respect by children for traditional ways was thought of daily or more by 35.2% of the adults, and weekly or more by 52.8% of the adults.

These persistent thoughts of historical loss appear to have emotional and behavioral consequences. They are associated with alcohol abuse, anger, and symptoms of internalization among adults (Whitbeck, Adams et al., 2004). If historical loss is much on the minds of their caretakers, we were concerned about the potential impact of perceived historical loss on the development of their adolescent offspring.

Investigating Characteristics, Prevalence, and Consequences of Historical Loss among Indigenous Adolescents

This research had three goals. The first was to investigate the prevalence of perceptions of historical loss among adolescents aged 11-13 years. Second, we wanted to distinguish our construct of "historical loss" from depressive symptoms to be certain that the former was not simply a cultural measure of depressive symptoms but a separate (though related) construct. If the construct was indeed separate from depressive symptoms, our third goal was to explore correlates of historical loss when taking into account other factors known to affect adolescent outcomes.

Historical Loss and Depressive Symptoms: Are They Separate Constructs?

First, we needed to test our hypothesis that historical loss represents a construct separate from depressed affect. To do this, we ran a series of confirmatory factor analyses to investigate the potential overlap of the Center for Epidemiological Studies Depression Scale (CESD; Radloff, 1977) and our adolescent historical loss scale. The CESD has been used with Indigenous adolescents; the factor structure has been compared with that used for non-Indigenous adolescents, and the measure has been validated for adolescents from Indigenous cultures by comparing it to two other measures of depressive symptoms (Beals, Manson, Keane, & Dick, 1991; Manson, Ackerson, Dick, Barón, & Fleming, 1990; Thrane, Whitbeck, Hoyt, & Shelley, 2004).

Emotional and Behavioral Correlates of Perceived Historical Loss

To investigate adolescent emotional correlates of perceived historical loss we hypothesized that, when taking into account measures of family structure, family financial strain, perceived family warmth and supportiveness, parent/caretaker's perceived historical loss, and adolescent perceptions of discrimination, adolescent perceived historical loss would be associated with depressive symptoms. To provide a stringent test of the strength of historical loss on depressive symptoms, we added contemporary family and child negative life events into the model after historical loss to take into account proximate influences on emotions and behaviors.

METHOD

These data were collected as part of a longitudinal lagged sequential study currently underway on four AI reservations in the Northern Midwest and four Canadian First Nations reserves. Three of the Canadian reserves are classified as "remote" in that they are located at considerable distances from even small towns and are accessed by non-paved roads, by boat, over ice in winter, or by airplane. The reserves and reservations included in this sample share a common cultural tradition and language with minor regional variations in dialects. The sample is representative of one the most populous Indigenous cultures in the United States and Canada. The long-range purpose of the longitudinal study is to identify culturally specific resilience and risk factors that affect children's well-being and to then use the information to guide the development of culturally based interventions.

The project was designed in partnership with the participating reservations and reserves. Prior to the application funding, the research team was invited to work on these reservations/reserves, and tribal resolutions were obtained. As part of our agreement to work together, the researchers promised that participating reservations/reserves would be kept confidential in published reports. On each participating reservation/reserve, an advisory board was appointed by the tribal council. The advisory boards were responsible for providing advice on handling difficult personnel problems,

providing advice on questionnaire development, helping to develop culturally specific measures, reading reports to ensure respectful writing, and assuring that published reports protected the identity of the respondents and the culture. Upon advisory board approval of the questionnaires, the study procedures and questionnaires were submitted for review by the university Institutional Review Board for approval.

All participating staff on the reservations were approved by the advisory board and were either tribal members or, in a few cases, non-members who were spouses of tribal members. To ensure quality of data collection, all the interviewers underwent special training that included practice interviews and feedback sessions regarding interview quality. In addition, all of the interviewers completed a required human subjects protection training that emphasized the importance of confidentiality and taught procedures to maintain the confidentiality of data.

Prior to this project, each tribe provided us with a list of families of enrolled children aged 10-12 years who lived on or near (within 50 miles) the reservation or reserve. We attempted to contact all families with a child of interest within the specified age range. Families were recruited with a personal visit by an Indigenous interviewer, at which time the project was explained to them. (Note: Two non-Indian spouses of enrolled tribal members were employed among more than 30 Indigenous interviewers). The parents were then presented with a traditional gift and invited to participate. If they agreed to be interviewed, each family member received $40 for their time when the interviews were completed. This recruitment procedure resulted in an overall baseline response rate of 79%. Subsequent retention rates were 95% for Wave 2 and 93% for Wave 3 of data collection.

The data included in this study are from Wave 3 of data collection, the first year the adolescents were asked about perceived historical loss. Among the locations included in the project, all of the reservations/reserves but one U.S. reservation and one Canadian reserve elected to include items pertaining to adolescent historical loss as part of their Wave 3 site questionnaires, reducing the sample to three U.S. reservations and three Canadian reserves. Because so few male caretakers agreed to participate in the study, only female caretakers were included in these analyses. Based on these conditions, the final sample size for these analyses was 459 Indigenous adolescents and their adult female caretakers.

As part of the study, focus groups were conducted on five of the reservations and reserves between 2005 and 2006 as part of an ongoing suicide prevention initiative (Whitbeck & Walls, 2006). Advisory board members from each site agreed to recruit participants for 2 separate focus group sessions at each reserve: The first group included community elders, and the second included mental health service providers who worked in the community. A total of 10 focus groups were planned and completed. Upon recruitment, participants were provided with a brochure containing project information, the goals of the focus groups, and the basic content of our planned discussions. Our

recruitment goals included 10 elders and 12 service providers per site, with an even split by gender; this goal was generally met at each site, with the exception of one or two recruited members being replaced, not being able to attend, or, in some cases, including additional interested community members. All focus groups were co-facilitated by two Indigenous project members.

Prior to each discussion, participants were provided with IRB-approved informed consent forms and were given both written and verbal descriptions of the project, a list of risks and benefits of participation (including confidentiality and audio-taping procedures), and information on their right to remove themselves from the discussions at any time without consequence. In addition, participants were informed that the audio tapes resulting from the group discussions would be returned to their advisory boards upon completion of transcription and data analysis. Signed consent forms were obtained from all participants prior to each discussion. Two quotations from these focus groups are used in the introduction of the paper to illustrate our point regarding emotional ties to reservations and reserves.

Measures

Adolescent Measures

Adolescent age was a continuous measure of the target adolescent's age on his/her last birthday. *Adolescent gender* was a dummy variable indicator coded such that 0 = male and 1 = female.

The *adolescent historical loss scale* was adapted from the adult version of the measure discussed in the Adult Female Caretaker Measures section that follows (Whitbeck, Adams, et al., 2004). It excludes two items that specifically reference adult roles/situations. The response categories were the same as those in the adult version. The 10-item adolescent historical loss scale had high internal consistency (Cronbach's alpha = .91).

Family *warmth and supportiveness* was measured by a six-item scale of adolescent reported responses to statements regarding warm and supporting acts by members of their family (adapted from Conger, Conger, Elder, Lorenz, et al., 1992). Items in this scale include the following: How often 1) "can you talk to someone in your family when you have a problem and figure out how to deal with it?" 2) "do family members let you know they are pleased when you do what you are supposed to do?" 3) "do you get asked what you think before decisions are made about family activities?" 4) "do you talk to someone in your family about things that bother you?" 5) "does someone in your family let you know that they are proud of you (when you do something good)?" 6) "does someone

in your family tell you they are disappointed when you don't follow the rules?" Responses to these items were coded so that higher scores indicate higher levels of perceived warmth and support (0 = *never*; 1 = *sometimes*; 2 = *always*). Cronbach's alpha for this measure was .69.

Adolescent perceived *discrimination* was measured by a 10-item mean-scored scale (Whitbeck, et al., 2004). The adolescents were asked to report the number of times they had experienced negative or unfair treatment because of their ethnicity. Examples of questions in this measure include being insulted, being hassled by police, being ignored or left out of other kids' activities, having been yelled at with racial slurs or racial insults, having been physically threatened, having been treated differently by teachers. Response categories ranged from 0 = *never* to 2 = *many times*, with higher scores indicative of higher perceived discrimination. Cronbach's alpha for this scale was .80.

Adolescent *depressive symptoms* were measured using the CESD (Radloff, 1977). The CESD is a self-reported depression scale that asks respondents to indicate the number of days during the past week that they had experienced a range of emotions or feelings. Response categories range from 0 = *1 day* to 4 = *5-7 days*, with positive emotion items reverse coded so that higher scores indicate higher levels of depressive symptoms. As noted earlier, the CESD has been validated for and often is used with Indigenous adolescents (Beals et al., 1991; Manson et al., 1990; Thrane et al., 2004). Cronbach's alpha for the CESD in this sample = .86.

Family and child *stressful life events* were measured by a checklist of life events experienced and reported by the adolescents, as well as a checklist of life events reported by the caretaker adults pertaining to events experienced within the adolescents' families. Caretaker and adolescent reports of stressful life events were combined to provide an exhaustive list of negative life events experienced in the family that could affect adolescent depressive symptoms. Our assumption was that negative events affecting the caretaker would also have an effect on the child. Items included such things as: "Did anyone in your home have a serious drinking problem?" "Was anyone in your family violent toward another family member?" Did a close relative commit suicide?" "Did your (caretaker) get engaged or married?" and so on. Examples of adolescent statements of events include: "Did you move to a different house?" "Did a pet die?" "Did you fail a class at school?" "Did you begin using drugs?" and so on. The sum of 'yes' responses to a total of 29 adolescent events and 32 adult-reported events were combined for the final life events scale.

Adult Female Caretaker Measures

Single mother households also were indicated by a dummy variable where households headed by single mother were coded 1 and all other household arrangements (i.e. live-in partners, grandparents, extended family members, etc) were coded 0.

The *adult historical loss scale* was made up of 12 items, each of which lists a type of loss identified by focus group participants and advisory board members on three reservations/reserves (Whitbeck, Adams et al., 2004). The questions asked how often the respondent thought about a particular type of loss. Response categories were 1 = *several times a day*, 2 = *daily*, 3 = *weekly*, 4 = *monthly*, 5 = *yearly or at special times*, and 6 = *never*. This scale had high internal reliability, with a Cronbach's alpha coefficient of .93.

Family financial strain was measured by adult responses to questions regarding their family's financial situation (Conger et al., 1992). Respondents stated whether they strongly agreed, agreed, disagreed, or strongly disagreed with the following statements: "My family has enough money to" (1) "afford the kind of home we need"; (2) "afford the kind of clothing we need"; (3) "afford the kind of food we need"; and (4) "afford the kind of medical care we need." Two additional questions assessed financial strain during the past twelve months: (1) "How much difficulty have you had paying your bills?" and (2) "Generally, at the end of each month [how much money] did you end up with?" Response categories were 0-3, with a higher score indicating higher financial strain. Cronbach's alpha for this measure was .84.

RESULTS

Prevalence of Perceived Historical Loss among Adolescents and Adult Female Caretakers

We were surprised to find that, in some instances, the adolescents were more likely than the adults to report thinking of historical loss daily or several times per day (Table 1).

Table 1
Frequency of Adolescent and Adult Female Caretaker Self-Reported Thoughts of Historical Loss

	Several Times a Day		Daily		Weekly		Monthly		Yearly or Only at Special Times		Never	
	Youth	Adults	Youth	Adults	Youth	Adults	Youth	Adults	Youth	Adults	Youth	Adults
The loss of our land	6.4%	2.2%	14.1%	10.2%	13.0%	13.2%	13.4%	19.0%	18.5%	38.9%	34.6%	16.5%
The loss of our language*	7.2%	4.7%	15.8%	19.7%	15.4%	16.4%	16.3%	23.4%	13.8%	26.6%	31.4%	9.2%
Losing our traditional spiritual ways*	4.5%	3.7%	14.5%	20.0%	12.5%	16.5%	21.6%	24.7%	14.8%	25.7%	32.0%	9.5%

continued on next page

Table 1, Continued
Frequency of Adolescent and Adult Female Caretaker Self-Reported Thoughts of Historical Loss

	Several Times a Day		Daily		Weekly		Monthly		Yearly or Only at Special Times		Never	
	Youth	Adults	Youth	Adults	Youth	Adults	Youth	Adults	Youth	Adults	Youth	Adults
The loss of our family ties because of boarding/ residential schools	4.2%	1.8%	8.2%	7.6%	8.4%	6.8%	14.0%	10.6%	11.7%	29.3%	53.6%	43.9%
The loss of families from the reservation/ reserve to government relocation*	2.3%	1.3%	9.5%	5.8%	10.4%	6.0%	13.2%	13.6%	14.8%	28.7%	49.7%	44.6%
The loss of self-respect from poor treatment by government officials*	3.3%	3.0%	8.4%	11.8%	9.6%	9.5%	15.9%	17.6%	11.9%	29.1%	50.9%	28.9%
The loss of trust in Whites from broken treaties	3.9%	3.0%	10.9%	11.8%	9.3%	9.8%	14.8%	15.6%	15.0%	34.7%	46.1%	25.1%
Losing our culture*	6.2%	5.7%	14.4%	20.1%	14.6%	16.6%	19.5%	26.3%	14.9%	23.3%	30.4%	7.9%
The losses from the effects of alcoholism on our people*	7.8%	9.7%	16.3%	26.6%	17.9%	25.6%	17.7%	18.6%	12.6%	14.9%	27.6%	4.7%
Loss of our people through early death*	7.2%	4.0%	16.2%	19.9%	16.6%	20.6%	18.2%	26.6%	15.9%	21.4%	25.9%	7.5%
Loss of respect by our children and grandchildren for elders	-	5.7%	-	26.9%	-	26.9%	-	19.5%	-	11.7%	-	9.2%
Loss of respect by our children for traditional ways	-	3.5%	-	21.9%	-	22.6%	-	23.4%	-	18.4%	-	10.2%

* Loss item is significantly different between youth and adult reporters ($p<.05$).

For example, 20.5% of the adolescents reported daily or more thoughts about loss of land compared to 12.4% of their adult female caretakers. In most cases, the adolescent and caretaker reports of daily or more thoughts were quite similar, ranging from approximately 10% to 25% among the adolescents and from approximately 7% to 36% among the adults. The adolescents were

most likely (20% or more) to have daily or more thoughts about loss of land, loss of language, loss of traditional spiritual ways, loss of culture, losses due to alcoholism, losses from early death, and loss of respect for elders. The adult caretakers were most likely to have persistent thoughts (20% or more) about loss of language, loss of traditional spiritual ways, loss of culture, losses due to alcoholism, losses due to early death, and loss of respect for elders. It is noteworthy that, although adolescents were about as likely as adults to have daily or more thoughts about historical loss, they also were much more likely than adults to report "never" thinking about them.

Confirmatory Factor Analyses

To test the structure of the CESD, adolescent historical loss, and their potential overlap, we ran a series of confirmatory factor analyses (CFAs) in Mplus version 3.11 (Muthén & Muthén, 2004). The fit of each of model was evaluated by several goodness-of-fit indices. Because $\chi 2$ statistic is greatly influenced by sample size and can lead to inappropriate model rejection (Kline, 2005), we also provide CFI and RMSEA estimates for each model. RMSEA estimates less than or equal to .08 (Browne & Cudeck, 1993) and CFI values of .95 or higher (Hu & Bentler, 1999) provide general cutoffs for our assessments of model fit.

Instead of excluding the limited number of cases with missing information (i.e., listwise deletion), modern data estimation techniques allow the use of complete data and provide more precise parameter estimates with less strict assumptions concerning causes of missing data (Enders & Bandalos, 2001). Those cases or variables missing any data were imputed within these analyses using maximum likelihood (ML).

ML estimation attempts to select those values that maximize the likelihood that a particular parameter estimate would occur in a given population (Allison, 2002; Enders, 2005). ML parameter estimates are valuable in that they are considered both consistent and efficient when applied to larger sample sizes (Enders).

CESD Confirmatory Factor Analysis

The factor structure of the CESD has been shown to vary depending upon demographic information (i.e., age, racial or ethnic group) related to the sample under study (Somervell, Beals, Kinzie, Broehnlein, & Manson, 1993). Among AIs, the CESD has been shown to have good internal consistency (Thrane et al., 2004), and has been presented in terms of two-, three-, and four-factor models within CFAs (see Somervell et al.). One widely documented structure of the CESD includes four separate factors: interpersonal items (i.e., people unfriendly), somatic items (i.e., poor appetite, restless sleep), negative affect items (i.e., depressed, bothered), and reverse-coded positive affect

items (i.e., happy, enjoyed life; Perreira, Deeb-Sossa, Harris, & Bollen, 2005; Somervell et al.). Based on this previous literature, we tested a CFA in which each of these four factors was allowed to load on a single depressive symptoms latent construct. Results of this analysis produced adequate model fit ($\chi 2 = 7.28$; $p = .03$; CFI = .99; RMSEA = .077). Despite this, the factor loading for the positive affect items was only .38, whereas the remaining factor loadings ranged from .54 to .94. Thus, we chose to conduct a CFA excluding the positive affect measures, resulting in a three-factor just identified (CFI = 1; RMSEA = .00) CESD latent construct utilized in all subsequent CFAs.

Historical Loss Confirmatory Factor Analysis

Our next goal was to investigate a confirmatory factor model based on the adolescent historical loss items. We know of no previously published literature that explores the empirical structure of historical loss among adolescents; thus, we followed advice provided to us by an anonymous reviewer and utilized a split-sample method of factor analysis to aid us in our search for an acceptable CFA for this novel measure.

To begin, we randomly divided our sample in half. The first random half of cases was used to conduct an exploratory factor analysis that yielded two distinct factors. The first factor (Factor 1) relates to governmental and institutional policies and practices including loss of land, loss of family ties because of boarding schools, loss due to government relocation, broken treaties, and poor treatment by government officials. The second factor (Factor 2) highlights items in the measure capturing more personal and cultural losses, including loss of language and spiritual ways, and loss of people to early death and via the effects of alcoholism. These two distinct factors thus seemed to cluster items together in meaningful ways, illustrating good face validity. Because a subsequent two-factor CFA is under-identified, we fixed the metric of both loadings to one to permit estimation of the CFA model using the second random half of the sample. We then replicated the two factor model using our full sample. Standardized factor loadings were acceptable (Factor 1 $\beta = .94$; Factor 2 $\beta = .87$), and this final 2-factor CFA of the adolescent historical loss measure was used in the following CFAs.

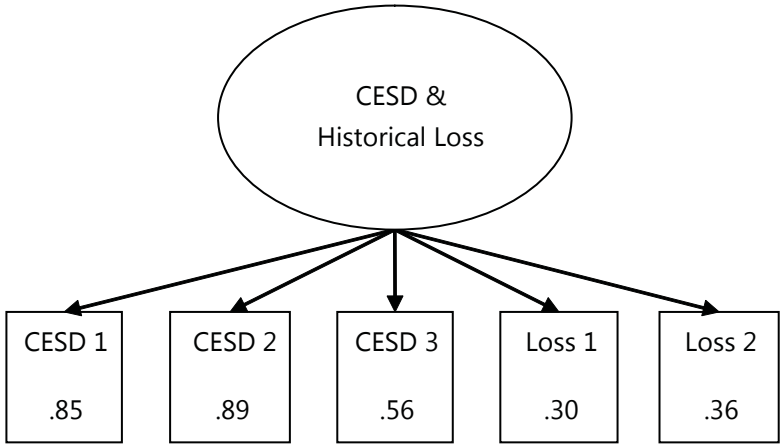
The Structure(s) of the CESD and Historical Loss

To examine the potential for CESD and historical loss as indicators of a shared construct (i.e., depressive symptoms), we tested a CFA in which all 3 CESD factors and both historical loss factors were allowed to load together on a single latent construct. Results of this single construct

model are illustrated in Figure 1 and reveal that the model did not fit the data well (CFI = .58; RMSEA = .43). In addition, the two historical loss factors produced weak standardized loadings, especially relative to those illustrated for CESD-specific indicators.

Figure 1

Standardized Maximum Likelihood Estimates of CFA with CESD and Historical Loss as a Single Construct



χ^2 = 430.675; df = 5; p>.05

CFI = .58

RMSEA = .43

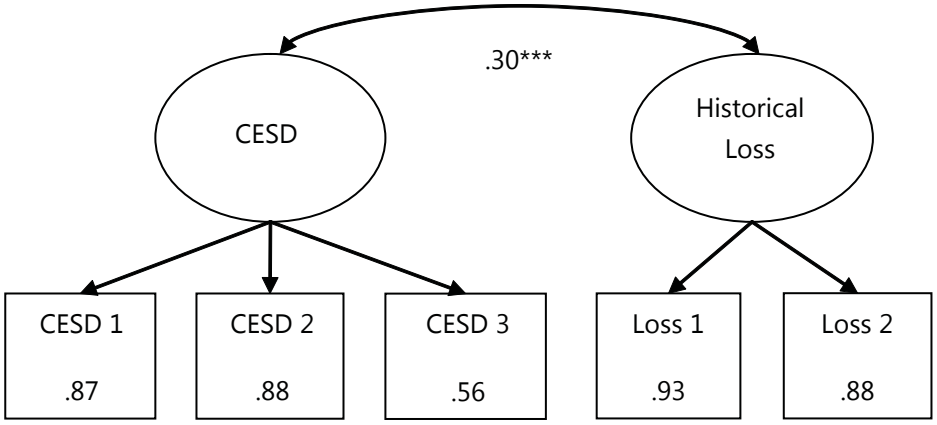
Next, we ran a CFA in which CESD and historical loss are presented as two separated but correlated latent constructs. Results in Figure 2 illustrate that this model was a noticeably better fit to the data compared to the previous single construct model (CFI = .98; RMSEA = .099 with a CI of .06 - .14). In addition, the correlation between historical loss and CESD was moderate (.30, p < .001), suggesting that the two latent factors were similar, but not duplicate measures of a single underlying construct.

Examining the Relative Effects of Historical Loss on CESD

Having determined that CESD and historical loss were related but separate constructs, our next goal was to examine the relative influence of historical loss on adolescent depressive symptoms when a number of factors known to relate to depressive symptoms were also included in single ordinary least squares regression model.

Figure 2

Standardized Maximum Likelihood Estimates of CFA with CESD and Historical Loss as Separate Correlated Constructs



χ^2 = 27.164; df = 5; p>.05

CFI = .98

RMSEA = .099

Bivariate correlations

Among the control variables, adolescents in remote locations reported lower levels of historical loss, depressive symptoms, and negative life events, and had adult female caretakers who were also less likely than caretakers in non-remote sites to report historical loss (Table 2). Being older was positively associated with perceived discrimination. Being female was associated with having an adult female caretaker who reported lower levels of historical loss, as well greater levels of adolescent depressive symptoms and adult warmth and support. Homes with greater adult-reported financial strain were associated with greater reports of adult female historical loss and adolescent depressive symptoms and negatively associated with adult warmth and support.

Adolescent reports of adult warmth and supportiveness were negatively associated with adolescent depressive symptoms. Adult female historical loss was moderately and positively related to adolescent losses and was also positively associated with negative family events. The remaining constructs—adolescent historical loss, perceived discrimination, depressive symptoms, and family life events—were all positively and significantly correlated with one another.

Table 2
Bivariate Correlations and Descriptive Statistics

	1	2	3	4	5	6	7	8	9	10	11
1. Youth Age	1										
2. Gender (Female = 1)	-.08	1									
3. Single Mom	.03	.03	1								
4. Financial Strain	-.03	.02	.11*	1							
5. Remote Location	-.02	.04	.06	.06	1						
6. Youth Report: Adult Warmth and Support	-.02	.11*	-.02	- .10*	- .07	1					
7. Female Adult Historical Loss	-.01	- .11*	.01	.13*	- .10*	- .04	1				
8. Adolescent Historical Loss	-.02	- .02	.06	.06	- .22***	.02	.18***	1			
9. Youth Discrimination	.14**	- .004	-.01	.10*	- .01	.03	.00	.29***	1		
10. Youth CESD	.03	.14**	.03	.14**	- .14**	- .29***	.07	.26***	.29***	1	
11. Youth and Family Stressful Life Events	.07	.03	.08	.13**	- .24**	- .02	.24***	.33***	.31***	.30***	1
Mean/%	13.03	51.0%	22.7%	1.30	13.0%	1.33	1.98	1.63	.17	12.73	15.82

* $p<.05$
** $p<.01$
*** $p<.001$

Multivariate analysis

Ordinary least squares regression was used to investigate the relative strength of historical loss on adolescent depressive symptoms when controlling for other known correlates of adolescent depression (Table 3). After entering the control variables in Model 1, we entered family influence variables first (caretaker warmth and supportiveness and caretaker historical loss) to account for family influences. Next, we entered the three adolescent variables individually: first discrimination, which we have shown to be associated with depressive symptoms (Whitbeck et al., 2001); then historical loss, to see if historical loss had effects on depressive symptoms with discrimination in the model. We then added family negative life events in the final model to provide a very stringent test of our hypothesis. We expected that more proximal negative life events would reduce the effects of historical perceptions to nonsignificance.

Table 3
OLS Regression Coefficients for Youth CESD (N = 459)

Variables Regressed on Youth CESD Scores												
	Model 1		**Model 2**		**Model 3**		**Model 4**		**Model 5**		**Model 6**	
	B	β	B	β	B	β	B	β	B	β	B	β
Youth Age	.38	.04	.35	.04	-.06	-.01	.05	.01	-.01	-.001	.02	.002
Youth Gender (Female = 1)	2.19	.15**	3.12	.19***	3.12	.19***	3.12	.19***	2.93	.18***	2.89	.17***
Single Mom	.45	.02	.39	.02	.59	.03	.31	.02	.06	.003	.13	.01
Financial Strain	1.93	.14**	1.45	.11*	1.01	.07	.96	.07	.82	.06	.89	.07
Remote Location	-3.84	-.15**	-4.13	-.17***	-4.11	-.16***	-3.29	-.13***	-2.45	-.10*	-1.14	-.05
Youth Report: Adult Warmth and Support			-7.22	-.30***	-7.51	-.31***	-7.53	-.32***	-7.45	-.31***	-7.28	-.31***
Female Adult Historical Loss			.36	.04	.39	.05	.21	.03	-.04	-.004	-.06	-.01
Adolescent Historical Loss							1.02	.26***	.87	.14**	.68	.11*
Family and Child Stressful Life Events									.18	.15**	.18	.15**
Remote X Adolescent Historical Loss											2.12	.12*
Constant	4.40		13.91		18.58		16.14		15.08		14.94	
R^2	.06		.15		.24		.26		.27		.28	

* $p<.05$
** $p<.01$
*** $p<.001$

In Model 1 and throughout all subsequent regression equations, being female was associated with greater depressive symptoms (β = .15; $p < .01$). Adult reports of financial strain were also positively associated with adolescent depressive symptoms, but dropped from statistical significance in Model 3 when parental warmth and supportiveness was included in the analysis. Across all models (except when living in a remote location was included as an interaction term in Model 6), living on a geographically remote Canadian reserve was significantly and negatively associated with adolescent depressive symptoms (β = -.15; $p < .01$, Model 1).

We added adult caretaker-related variables to the analysis in Model 2. Adolescent reports of adult warmth and supportiveness were negatively related to depressive symptoms ($\beta = -.30$; $p < .001$), even after the inclusion of the remaining independent variables in subsequent models. Adult female caretaker reports of historical loss were not significantly related to adolescent depressive symptoms.

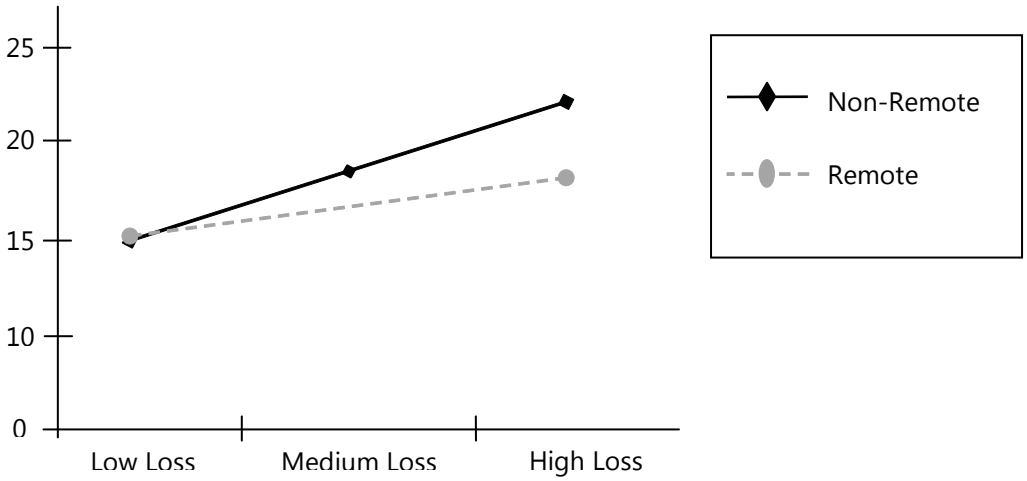
In Model 3, adolescent reports of perceived discrimination were positively and significantly related to depressive symptoms ($\beta = .29$; $p < .001$). The significant positive effect persisted throughout the remaining models in the analysis.

Adolescent historical loss was included in Model 4 and had a significant positive effect on depressive symptoms ($\beta = .16$; $p < .001$). This effect was weakened slightly but remained significant ($\beta = .14$; $p < .01$) after the inclusion of the family life events scale in Model 5 and an interaction term in Model 6.

We checked for potential multiplicative interactions in the regression equations. Importantly, experiencing contemporary negative life events did not moderate the effects of historical loss on depressive symptoms. The only significant multiplicative interaction term was that between adolescent historical loss and remote geographic location (included in Model 6). The interaction term was statistically significant ($\beta = .14$; $p < .05$) and is illustrated in Figure 3. The interaction indicates that the effects of historical loss on adolescent depressive symptoms vary by geographic location. Although those living in all locations experienced an increase in depressive symptoms due to historical loss, the effect was much stronger for adolescents living in geographically isolated and remote Canadian First Nations reserves. Even though remote adolescents tended to report lower levels of depressive symptoms in Models 1-5 of the regression analyses, the experience of historical loss puts them at a greater risk for depressive symptoms compared to their less remote counterparts on U.S. reservations.

Figure 3

Depressive Symptoms by Levels of Historical Loss and Geographic Location



DISCUSSION

These results provide evidence that historical loss stemming from the ethnic cleansing of North American Indigenous people is already much on the minds of about one-fifth of adolescents aged 11-13 years. The rates of daily or more thoughts pertaining to historical loss were similar to and sometimes exceeded those of their female caretakers. Moreover, CFA indicated that our measure of perceived historical loss was a separate construct, moderately associated with depressive symptoms. In fact, the measure was quite robust. Even when controlling for more proximate stressful life experiences and other correlates of adolescent depressive symptoms, historical loss remained statistically significant.

Much has been written about the consequences of Indigenous ethnic cleansing. It has been characterized as a "soul wound" (Duran & Duran, 1995) and an "unspeakable sadness" (Wishart, 1994). Although reservation/reserve service providers, elders, and tribal leaders have understood these persisting demoralizing effects for decades, researchers are just now beginning to take seriously the lasting effects of cultural catastrophes as potential stressors. Indeed, only in the past decade has discrimination been recognized as an important source of stress that functions similarly to other psychological stressors (Dion, Dion, & Pak, 1992; Thompson, 1991; Williams, Spencer, & Jackson, 1999). Kessler and colleagues (1999) rank it with major negative life events such as the death of a loved one, divorce, and job loss (Kessler et al., p. 227). They suggest that "the conjunction of high prevalence and strong impact would mean that discrimination is among the most important of all the stressful experiences that have been implicated as causes of mental health problems" (Kessler et al., p. 224).

We believe that perceived historical loss creates stress in much the same ways as perceived discrimination. Indeed, in earlier studies, this measure of historical loss mediated the effects of perceived discrimination on adult alcohol abuse (Whitbeck, Chen, Hoyt, & Adams, 2004). Historical loss correlates with perceived discrimination for both adolescents (r = .27, see Table 1) and adults (r = .29; Whitbeck, Chen et al., 2004, Table 1, p. 413). The association between perceived historical loss and depressive symptoms among Indigenous adolescents is congruent with those found for depressive symptoms among Indigenous adults (Whitbeck, Adams, et al., 2004).

These results indicate that historical loss is a separate construct from depressive symptoms and that it is embedded in the experiences of people who have experienced ethnic cleansing. Historical loss reflects a response to a profound denial of a culture's right to exist and the attempt to eradicate cultural identity. These findings also suggest that the effects of historical loss may have early demoralizing effects on the development of adolescents.

Cultural contexts of development

The life course development perspective can take into account historical and social contexts that are unique to the experiences of specific cultures. Regardless of what our history books tell us, the histories of Indigenous people are certainly not those of immigrant North Americans, nor are the resulting social milieus in which Indigenous children grow up. Indigenous people are embedded in a much different historical context than that of the dominant culture, one filled with defeat, relocation, isolation, removal of children, and broken promises that shape beliefs about opportunity and even perceived safety in the larger society. These culturally distinct historical and social contexts shape every aspect of development from gestational risk to family functioning. They are associated with adolescents' perceived life chances and aspirations, and pose culturally specific risk and protective factors.

However, if Indigenous historical contexts have unique risks within the framework of the dominant society, they also have special protective factors embedded within them. Just as perceptions of losses have persisted across time, traditional spirituality, traditional practices, and cultural identity have been shown to be protective factors for Indigenous children and adults. There is accumulating evidence that traditional spirituality and practices are associated with alcohol cessation (Torres-Stone et al., 2006) and are negatively related to depressive symptoms (Whitbeck, McMorris, Hoyt, Stubben, & LaFromboise, 2002) and suicidal behaviors (Garroutte et al., 2003) among adults, and that they are associated with academic success, self-esteem, and prosocial behaviors among adolescents (LaFromboise, Hoyt, Oliver, & Whitbeck, 2006; Whitbeck, Hoyt, Stubben, & LaFromboise, 2001).

Cautions and limitations

These findings introduce novel concepts, specific cultural interpretations, and new measures into the discussion of potential stressors for Indigenous adolescents. Although they are intriguing, they should be regarded with appropriate caution. For example, our measure of historical loss is new. The findings and measurement characteristics (see Whitbeck, Adams, et al. 2004), particularly in regard to adolescents, should be replicated and examined with other Indigenous people with attention to validity and reliability. There is also the concern that all of the items in the historical loss measure are negatively worded, which may induce concurrent negative thinking in subsequent items. Also, these results are from a single culture and may not be generalizable across the diversity of North American Indigenous nations. Furthermore, even though our data are from several sites, they reflect the attitudes and behaviors of people who live on or near rural and remote reservations and reserves. They may not represent urban Indigenous people even from the same cultural background.

Time, subject burden, and tribal preferences limited the number of diagnoses and symptoms for which we were able to screen. For example, we could not screen for trauma or posttraumatic stress disorder because questions regarding possible child maltreatment would have to be included, and the reservations/reserves did not want to address this issue in the survey because of mandatory reporting requirements. Although we did screen for substance abuse and substance abuse disorders, they were not addressed in this analysis. This analysis has been done for AI adults (Whitbeck, Chen et al., 2004) but not yet completed for adolescents. Because our analyses are based on cross-sectional data, there is always the question of direction of effects. For example, from these results it is impossible to discern if depressed adolescents are more apt to view themselves as discriminated against and thinking about historical loss, or whether discrimination and historical loss result in depressive symptoms. Finally, we should note that a large number of the adolescents reported thinking about historical loss only on special occasions or never thinking about it. It is very likely that perceived historical loss affects only those adolescents who are deeply engaged in their culture. This likelihood may account for the increased effects of historical loss or adolescents who live on remote reserves.

CONCLUSION

The experiences of Indigenous people in North America represent a living example of the long-term effects of government policies of ethnic cleansing. They were defeated militarily, isolated geographically from interaction with the mainstream culture, their religions made illegal, and their

children taken and re-socialized. We are just now beginning to investigate the potential long-term emotional and behavioral consequences of these policies. Certainly, Indigenous elders, service providers, and tribal leaders believe that the effects have been profound.

Our findings provide evidence that the losses are in the forefront of the perceptions for a significant portion of Indigenous adolescents and adults who think of them daily or more often. Moreover, the results provide evidence that these perceptions of historical loss, similar to perceived discrimination, are associated with internalizing symptoms. However, there is much to learn about the construct and the specific mechanisms through which it operates. We believe it is a unique stressor that operates both in conjunction with and independently of perceived discrimination. Experiences of discrimination are reminders of one's "place" in the dominant society. For Indigenous people, perceived historical loss is a reminder that they had no place in dominant society.

Les B. Whitbeck, Ph.D.
University of Nebraska-Lincoln
Department of Sociology
739 Oldfather Hall
Lincoln, NE 68588-0324
Phone: 402/472-5562
Fax: 402/472-4983
E-mail: lwhitbeck2@unlnotes.unl.edu

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PRELIMINARY ASSESSMENT OF APACHE HOPEFULNESS: RELATIONSHIPS WITH HOPELESSNESS AND WITH COLLECTIVE AS WELL AS PERSONAL SELF-ESTEEM

Vanessa Lea Hammond, BS, P. J. Watson, PhD, Brian J. O'Leary, PhD,
and D. Lisa Cothran, PhD

Abstract: Hopelessness is central to prominent mental health problems within American Indian (AI) communities. Apaches living on a reservation in Arizona responded to diverse expressions of hope along with Hopelessness, Personal Self-Esteem, and Collective Self-Esteem scales. An Apache Hopefulness Scale expressed five themes of hope and correlated negatively with Hopelessness and positively with both Collective and Personal Self-Esteem. These data confirmed the potential of conducting more extensive analyses of hope within AI tribal life.

Psychological adjustment of the Apache self requires coping resources that address the challenges of tribal life. That these challenges are collective as well as personal seems apparent in the well-documented mental health problems of American Indians (AIs) in general (Barron, Oge, & Markovich, 1999), and of Apaches in particular (May & Van Winkle, 1994). Powerlessness, low self-esteem, and a sense of hopelessness are central to many of these mental health problems, which include depression, suicide, and alcoholism (Trimble, 2000). The Beck Hopelessness Scale (Beck & Steer, 1988) operationalizes a pessimistic explanatory style that predicts many of these disorders.

Logically, the antidote to hopelessness should be hopefulness. Hope is defined, in part, "by the perception of successful agency related to goals" (Snyder et al., 1991, p. 570). Hopefulness can be learned (Zimmerman, 1990), and an understanding of Apache opportunities to learn hope could be useful in efforts to improve tribal life. Culturally sensitive approaches to counseling, for example, could focus on efforts to develop greater Apache hopefulness (LaFromboise, Trimble, & Mohatt, 1990).

The present project sought to conduct a preliminary assessment hopefulness among Apaches living on a reservation. Tribal life seemed to present five more obvious opportunities for developing a sense of personal agency: family life, education, work, communal involvement, and spirituality. The researchers developed a preliminary Apache Hopefulness Scale that included at least one item

expressing each of these five themes. The presumption was that adjustment of the Apache self is a collective as well as a personal process. A valid Apache Hopefulness Scale should therefore correlate predictably not only with the Beck Hopelessness Scale and with Personal Self-Esteem (Rosenberg, 1989), but also with Collective Self-Esteem (Crocker & Luhtanen, 1990). The Collective Self-Esteem Scale measures positive perceptions of the self as a member of the group (Luhtanen & Crocker, 1992) and may be as important as individual self-esteem in defining the adjustment of ethnic groups (Crocker, Luhtanen, Blaine, & Broadnax, 1994).

In summary, this study offered a preliminary assessment of Apache hopefulness. The assumption was that Apaches might develop hopeful perceptions of personal agency in activities associated with family life, education, work, communal involvement, and spirituality. The further expectation was that Apache Hopefulness would correlate negatively with Hopelessness and positively with both Personal and Collective Self-Esteem.

METHOD

Participants

A convenience sample of 91 individuals included 23 men and 68 women who lived on the White Mountain Apache Reservation in Whiteriver, Arizona. Their average age was 30.6 years, with a range from 18 to 67 years. Thirty percent of the sample was full-blooded Apache, with the remainder being at least partially Apache. Thirty-eight of the participants were employed, and 76 had received a high school diploma or GED. All participation was voluntary, uncompensated, and in full conformity with institutional ethical guidelines.

Measures

In addition to assessing background characteristics, the questionnaire booklet used in this project included four psychological scales:

Personal Self-Esteem (10 items, α = .70, *M* response per item = 2.91, *SD* = 0.42)

The widely used Rosenberg (1989) Self-Esteem Scale operationalized global personal self-esteem. Reactions to the items of this instrument occurred along a 4-point Likert-type scale ranging from (1) *strongly disagree* to (4) *strongly agree*. Illustrating greater self-esteem were self-reports that "I take a positive attitude toward myself" and the reverse-scored assertion that "I certainly feel useless at times."

Collective Self-Esteem (15 items, α = .78; *M* = 4.56; *SD* = 0.83)

The Luhtanen and Crocker (1990) scale recorded four dimensions of Collective Self-Esteem: Membership ("I am a worthy member of the social groups I belong to"), Private Collective Self-Esteem ("In general, I'm glad to be a member of the social groups I belong to"), Public Collective Self-Esteem ("Overall, my social groups are considered good by others"), and Identity ("The social groups I belong to are an important reflection of who I am"). Reactions to the four items from each subscale ranged from (1) *strongly disagree* to (7) *strongly agree*. Preliminary analysis revealed poor internal reliabilities for each subscale, with Cronbach's alpha equal to .52 or lower. All 16 items were, therefore, combined into a single index of Collective Self-Esteem, with the removal of one item clearly improving internal reliability (i.e., the reverse-scored statement that "I feel I don't have much to offer to the social groups I belong to"). The psychometric adequacy and validity of Collective Self-Esteem Scale has been confirmed with ethnically diverse samples (e.g., Crocker et al., 1994; Liang, & Fassinger, 2008; Zea, Reisen, & Poppen, 1999).

Hopelessness (20 items, α = .80; *M* = 1.30; *SD* = 0.20)

The 20 items of the Beck Hopelessness Scale included such statements as "I might as well give up because I can't make things better for myself" and the reverse-scored claim that "in the future, I expect to succeed in what concerns me most" (Beck & Steer, 1988). This instrument used a true (2)-false (1) response format and has well-established validity (Beck, Steer, Beck, & Newman, 1993; Beck, Steer, Kovacs, & Garrison, 1985).

Apache Hopefulness

Items for a possible Apache Hopefulness Scale focused on five categories of life experience thought to be principal areas of potential Apache hopefulness: family, education, work, spirituality, and community. These themes reflected experiences of the first author who worked periodically over a 3-year period as a community volunteer in Whiteriver. Each category contained 10 possible items, including such statements as "I feel hopeful that I will have a stable, long-term job" and "I fear that I will not be someone my family turns to for support" (reverse scored). Reverse-scored statements were included to help control for acquiescence response sets. Reactions to each item involved a (1) *strongly disagree* to (5) *strongly agree* response format.

Procedures

Residents of the reservation participated in this study during the summer of 2006. The first author identified possible participants through personal contacts. All were at least 18 years old and came from various tribal venues, including a grocery store, stands selling food and crafts on the street, the post office, a community college, gas stations, a crisis pregnancy center, and the local jail.

The researcher emphasized the general purpose and voluntary nature of the project and guaranteed the confidentiality of all responding. After signing informed consent forms, participants completed the questionnaire in approximately 30 minutes. All responded privately within the general locale in which they had been contacted, and all received thanks for their cooperation.

Construction of a final Apache Hopefulness Scale occurred in three steps. First, we examined the internal reliability of all 50 items combined together, and removed any statement displaying a negative item-to-total correlation. Second, we pared down the remaining items in a sequence of internal reliability analyses that gradually eliminated statements associated with relatively lower item-to-total correlations. In this process, we retained at least one item from each of the life experience categories of potential hopefulness and reduced the total items down to a number that would be acceptable for a very preliminary principal components analysis (i.e., approximately 18 items reflecting 5 participants per item). Third, we further reduced the measure through internal reliability and principal components analysis. We created a final scale by identifying statements that loaded on the first factor of the principal components analysis and that had an item-to-total correlation of at least .30. A final principal components analysis confirmed that all items loaded at .30 or greater when the data were forced into a single factor. We then examined relationships of this preliminary Apache Hopefulness Scale with all other measures.

RESULTS

The final Apache Hopefulness Scale contained the 14 items presented in Table 1. Each statement displayed an item-to-total correlation of .38 or greater and a loading of at least .47 on the single dimension of the final principal components analysis. This component accounted for 39.6% of the total response variance. This scale included four statements related to family, five associated with education, two each for the work and spirituality categories, and one community item. Mean responding was 3.15 (SD = 0.51) on the 5-point Likert scale. Cronbach's alpha was .87.

Table 1
Items involving Family (F), Education (E), Work (W), Community (C), and Spirituality (S) in the Final Apache Hopefulness Scale

Items	Item-to-Total Correlation	Component Loading
1. I see myself having good relationships with my family members in the future. (F)	.52	.60
2. I do not think I will ever be able to improve my education status from the point I am at now. (E)*	.49	.55
3. I feel hopeful that I will be self-confident in my future jobs. (W)	.68	.76

continued on next page

Table 1, Continued
Items involving Family (F), Education (E), Work (W), Community (C), and Spirituality (S) in the Final Apache Hopefulness Scale

Items	Item-to-Total Correlation	Component Loading
4. I do not think that getting a higher education is possible for me. (E)*	.54	.60
5. I feel that I will be a person that my family members can confide in. (F)	.63	.72
6. I fear that I will not be able to better my community in any way. (C)*	.54	.59
7. I believe that I will be proficient at a specific trade or skill. (E)	.61	.69
8. I feel hopeful that the knowledge I will gain from my education will be beneficial in my future. (E)	.55	.64
9. I am confident that I will be a hard-working, reliable employee. (W)	.50	.59
10. I feel that my experiences will prepare me to have a good family in future. (F)	.58	.67
11. I feel hopeful that I will be a positive influence in the lives of my family members. (F)	.61	.70
12. I do not see myself having a spiritual connection anytime in the future. (S)*	.43	.49
13. My eagerness for gaining knowledge will increase as I go through life. (E)	.58	.67
14. I am hopeful that I will be rewarded in the afterlife for the actions I do in my life. (S)	.38	.47

*Reverse scored

Table 2 summarizes the Apache Hopefulness Scale's correlations with other measures. Apache Hopefulness, Personal Self-Esteem, and Collective Self-Esteem correlated positively with each other and negatively with Hopelessness. No differences appeared between the correlations of Apache Hopefulness with Personal and Collective Self-Esteem, $t\,(88) = 0.10$, $p > .50$. However, the linkage of the Beck Hopelessness Scale with Personal Self-Esteem was stronger than its association with Collective Self-Esteem, $t\,(88) = 2.88$, $p < .01$.

Table 2
Correlations among Apache Hopefulness Scale, Beck Hopelessness Scale, Collective Self-Esteem Scale, and Personal Self-Esteem Scale

Variables	Apache Hopefulness	Beck Hopelessness	Collective Self-esteem	Rosenberg Self-esteem
Apache Hopefulness	-	-0.64***	0.52***	0.51***
Beck Hopelessness		-	-0.38***	-0.68***
Collective Self-esteem			-	0.35**
Personal Self-esteem				-

* $p < .01$
** $p < .001$
***$p < .0001$

To what extent did both forms of self-esteem combine to predict hope-related psychological functioning? To answer that question, Personal and Collective Self-Esteem served as simultaneous predictors in multiple regression procedures. When Apache Hopefulness was the dependent variable, the multiple R^2 was .39 ($p < .001$) with both Personal ($\beta = .38$, $p < .001$) and Collective Self-Esteem ($\beta = .38$, $p < .001$) serving as reliable predictors. When Hopelessness was the dependent variable, the multiple R^2 was .48 ($p < .001$) with Personal ($\beta = -.62$; $p < .001$) but not Collective Self-Esteem ($\beta = -.16$, $p > .05$) proving to be a significant predictor.

DISCUSSION

Hopelessness may be central to prominent mental health problems within AI communities. The present project assumed that opportunities for hopefulness exist within tribal life and can serve as resources for overcoming hopelessness. Apaches living on a reservation in Arizona responded to 50 possible expressions of hope. A final, internally reliable 14-item Apache Hopefulness Scale made reference to five potential themes of Apache hopefulness. As hypothesized, Apache Hopefulness correlated negatively with Hopelessness and positively with Collective as well as with Personal Self-Esteem.

This project represented only a very preliminary effort to define Apache Hopefulness. The specific statements of the final scale, for example, could not have exhaustively expressed the five themes of hopefulness. Even a preliminary assessment, nevertheless, should be useful in identifying key elements of Apache hope. Of the 14 final items, the statement loading strongest on the final principal components analysis expressed hope relative to employment: "I feel hopeful that I will be self-confident in my future jobs." The theme with the largest number of items was education, with the strongest loading apparent in the assertion, "I believe that I will be proficient at a specific trade or skill," a belief which had clear work implications as well. Four items made reference to family life, with each displaying a loading of .60 or greater. The family item with the strongest loading stated, "I feel that I will be a person that my family members can confide in." In short, work, education, and family life may be especially important in future efforts to understand opportunities for Apache hope.

Other themes may make some contribution as well. The final scale included two spirituality items, with the strongest loading apparent for the reverse-scored belief that "I do not see myself having a spiritual connection anytime in the future." Within the limited procedural parameters of this project, only one expression of community-related hopefulness could be identified. This reverse-scored item said, "I fear that I will not be able to better my community in any way." Inclusion of only one belief about community life might mean that the attempt to express this

theme was relatively unsuccessful, and that additional articulations of community relevant hope may deserve special further consideration. Alternatively, this result might mean that community involvement is a relatively weak source of Apache hope. If so, it may be important to remember the clear linkage between Apache Hopefulness and Collective Self-Esteem. Such a finding suggests that hopefulness for Apaches has a collective dimension and that explicit efforts to strengthen the communal foundations of hope might be necessary to maximally address tribal needs.

Apache Hopefulness correlated strongly with Hopelessness. Why not, then, simplify the issue by relying solely upon the Beck Hopelessness Scale to sketch an adequate, albeit mirror-imaged, depiction of hope within tribal life? A first answer to that question returns to the assumption that psychological adjustment of the Apache self is a collective as well as a personal process. Apache Hopefulness was more successful than Hopelessness in assessing the collective dimension of adjustment. Apache Hopefulness, for example, correlated equally well with both forms of self-esteem, whereas the Beck Hopelessness Scale correlated more strongly with Personal Self-Esteem. Even more noteworthy was the finding that only Personal Self-Esteem served as a significant multiple regression predictor of Hopelessness, whereas both forms of self-esteem predicted Apache Hopefulness. The two forms of self-esteem did tend to explain greater variance in Hopelessness than in Apache Hopefulness, but refinements in the measurement of Apache Hopefulness could increase the overall variance explained. In short, one reason for examining not only the Beck Hopelessness Scale was that Apache Hopefulness seemed to be more successful in accounting for the collective dimension of psychological adjustment.

A second reason may also argue against a sole reliance upon the Beck Hopelessness Scale. Again, hope is defined, in part, "by the perception of successful agency related to goals" (Snyder et al., 1991, p. 570); this project sought to discern opportunities for successful Apache agency. In addition, however, "hope is influenced by the perceived availability of successful pathways related to goals" (Snyder et al., p. 570). An ultimately successful research program into the hopefulness of AIs would, therefore, do three things: (1) offer a comprehensive assessment of opportunities for successful agency within tribal life, (2) engage in formal evaluations of the pathways available for achieving those goals, and (3) analyze opportunities for bringing personal agency and pathways together. In other words, an assessment of tribal circumstances based solely upon the Beck Hopelessness Scale would merely define the problem. A focus on hopefulness might encourage a broader vision that more explicitly explored opportunities for making things better. Of course, this study served only as a very preliminary analysis of hopefulness. Explorations of the ultimate potentials of hopefulness will obviously require a much more extensive and long-term research program.

Numerous limitations characterized this project. Again, Apache Hopefulness items may not have fully expressed the five proposed themes of hopefulness. Further reflection might reveal that some potentially relevant themes were not even examined. The number of participants was small, and a convenience sample was utilized. A larger, more representative sample would obviously yield more definitive information and would make it possible to develop more complex, multidimensional indices of hopefulness. Additional procedures will be needed to establish test-retest reliability, to examine age and gender differences, and to assess whether engagement in Apache culture influences responding. Evidence of measurement invariance is available for the Rosenberg Self-Esteem Scale in early adolescent AIs (e.g., Michaels, Barr, Roosa, & Knight, 2007), but measurement equivalence will also need to be evaluated with older samples and with all of the other measures used in this project. Finally, these data reflected Apache tribal circumstances within a very specific locale. Whether such results generalize to other locales or to other tribes is an important question.

In conclusion, hopelessness may be a noteworthy element in the mental health problems experienced by AIs. This project assumed that opportunities for hopefulness can be identified within tribal life and may have a potential for working against hopelessness by addressing collective as well as personal dimensions of psychological adjustment. Findings from this preliminary study supported that assumption and suggested that a focus on hope, rather than on hopelessness alone, might have advantages in future efforts to address the challenges of tribal life. In general terms, therefore, the most important conclusion of the present project may be that a source of hopefulness may exist within formal social scientific efforts to better understand the hopes of AIs.

P. J. Watson, Ph.D.
Psychology Department
#2803, 350 Holt Hall
615 McCallie Avenue
University of Tennessee at Chattanooga
Chattanooga, TN 37403
E-mail: paul-watson@utc.edu

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AUTHORS' NOTE

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Formal tribal approval was not required as long as informed consent was obtained from participants, which was done.