ASSESSMENT OF BLOOD LEAD LEVELS IN THE U.S.A. FROM NHANESII DATA

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ABSTRACT

Changing demographics of the subject groups at the 64 sites sampled during NHANESII accounts for over half the apparent 5.61 ug/dl blood lead decrease from 1976 to 1980. Site-specific gasoline lead exposure accounts for 0.51 ug/dl of the blood lead decrease, in agreement with the change expected due to the decrease of 0.32 ug/m^3 in average air lead and the accepted range $1 \leq \alpha \leq 2$ for blood lead response to air lead change.

INTRODUCTION

The U.S. Government's second National Health and Nutritional Examination Survey (NHANESII) was a cross-sectional study designed to assess national health status. Venous blood lead levels (BPb) were measured for 9,936 of the 20,333 examinees. Mobile caravan teams visited 64 sites in the continguous U.S.A. and Hawaii between 1976 and 1980. A preliminary analysis reported a 36.7% reduction in BPb over the four-year study period and noted that the decrease in BPb reflects the decrease in national use of lead in gasoline production (ref 1).

Because the NHANESII sample was not selected to insure valid within-study time analyses, several categories of demographic variables were evaluated in the present study to examine their effect on the reported BPb decline. Three alternative measures of exposure to lead from gasoline were tested for their utility as indicators of BPb response. Finally, time was introduced to represent all other time-related BPb effects that may be present.

ADJUSTMENT FOR DEMOGRAPHICS

The effect of changing site demographics on the BPb time trend was investigated by classifying each examinee in terms of 6 personal variables (P) describing race, sex, age and family income, 3 residence variables (R) describing degree of urbanization, and 6 caravan itinerary variables (I) describing season of the year and region of the U.S.A. These classification variables assume a value of 1 if the descriptor applies to the examinee, 0 otherwise. Means were computed for each site based on examinee records with a venous BPb, and the 64 site means further analyzed.

Three BPb adjustments were evaluated corresponding to different selection sets of candidate explanatory terms for variation among site mean BPb's. The first set included the 6 P variables and their 15 two-way interactions; the second set added the 3 R variables to the first set; and, the third set added the 6 I variables to the second set. A weighted least squares stepwise regression procedure was applied to each full set of selection candidates. Weighting was by number of BPb values at each site.

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Terms were retained if their significance with BPb satisfied the $p < 0.15$ criterion.

Adjusted site mean BPb's were obtained by adding the weighted site mean BPb to the residuals from the final regression model. Each adjusted set of values, along with the unadjusted BPb's, then was regressed on site mean examination date. Values of BPb were predicted at the first and last site mean examination date in NHANESII to evaluate the influence of differential site demographics.

The results of the time analyses on the unadjusted and adjusted site mean BPb's are given in Table 1. They illustrate the confounding inherent among BPb, site demographics and time during the study period. Each group of demographic variables was able to explain some of the time trend with terms from the third selection set reducing the unadjusted decrease by more than half.

Table 1

Time Trend and Four Year Change of Blood Lead
Unadjusted and Adjusted for Demographics

	Time Trend		Remaining Four Year Decrease	
	ug/dl/yr	Std. Error	BPb, ug/dl	%
Unadjusted	-1.43	0.18	5.61	32.7
Adjusted for P	-1.09	0.18	4.29	26.0
for P and R	-0.74	0.17	2.92	18.4
for P, R and I	-0.57	0.14	2.26	14.5

ADJUSTMENT FOR GASOLINE LEAD AND DEMOGRAPHICS

Gasoline lead (GPb) is the best documented of the identified sources of lead which include food, water, paint and dust. National GPb use has been claimed to explain the decrease in unadjusted BPb (ref 2), and so was evaluated as one GPb exposure variable. National GPb use (tonnes) was computed from data by state on lead content and consumption of gasoline. To reflect site to site variation, a GPb density (tonnes/mi^2) for each site was computed by multiplying the relevant state GP use by the ratio of population in the site counties to state population, and dividing by land area of the site counties. The basis for this definition is the correlation between population and gasoline use (ref 3). Subsite GPb density was calculated similarly but based on each BPb examinee's residence characteristics. Applicable data permitted calculation of all 3 GPb exposures for 55 of the original 64 sites.

Mean BPb's from the 55 sites were adjusted as before for 5 selection sets, each containing all of the P,R and I demographic terms and one of the GPb exposure variables or its logarithm. The adjusted BPb's then were regressed on site mean examination date. These results, along with the significance levels of the GPb exposure terms, are given in Table 2. In all cases inclusion of a GPb term further reduced the BPb decrease from the 2.26 ug/dl unaccounted for by demographics. The remaining trend was consistent for all but national GPb use.

Table 2

Time Trend and Four Year Change of Blood Lead
Adjusted for Demographics and Gasoline Lead Exposure

GPb Exposure Variable	Signif. Level p	Time Trend ug/dl/yr	Time Trend Std. Error	Remaining Four Year Decrease BPb, ug/dl	Remaining Four Year Decrease %
National	≤ 0.0001	-0.14	0.12	0.57	3.8
Site Density	≤ 0.0001	-0.44	0.13	1.75	11.3
Subsite Density	0.0311	-0.47	0.12	1.85	11.9
Log (Site Density)	≤ 0.0001	-0.52	0.13	2.05	13.1
Log (Subsite Density)	0.1076	-0.39	0.13	1.55	10.1

TIME-RELATED BLOOD LEAD EFFECTS

In the absence of credible and suitable data on lead sources besides gasoline, a time variable, reflecting site mean examination date, was adopted as a surrogate for other time-related BPb effects. A stepwise regression procedure was used on each of 5 selection sets again containing the full set of demographic terms, one of the GPb exposure variables and the surrogate, time. First, the model was forced to include both time and the GPb variable used; in companion analyses the selection of all terms was allowed to proceed solely on the basis of the inclusion criterion. As shown in Table 3, under both forced and unforced conditions the time variable was significant for all cases, but only Site GPb Density retained significance. When time is taken into account as a surrogate for unquantified time-related BPb effects, national GPb use is no longer significant. These results suggest other time-related BPb effects are present in NHANESII.

Table 3

Significance Levels of Gasoline Lead Exposure
and Time Terms in Models Including Demographics

GPb Exposure Variable	Forced GPb Signif. Level	Forced Time Signif. Level	Unforced GPb Signif. Level	Unforced Time Signif. Level
National	0.8850	≤ 0.0001	NS	≤ 0.0001
Site Density	0.0022	≤ 0.0001	0.0022	≤ 0.0001
Subsite Density	0.6276	≤ 0.0001	NS	≤ 0.0001
Log (Site Density)	0.0019	≤ 0.0001	0.0019	≤ 0.0001
Log (Subsite Density)	0.7520	≤ 0.0001	NS	≤ 0.0001

NS = Not Selected, $p > 0.15$

CONCLUSIONS

This analysis has shown that many factors related to personal and residence characteristics and sampling itinerary significantly affect NHANESII BPb values, and can account for 3.35 ug/dl of the apparent decrease between 1976 and 1980. Of the GPb exposure variables only Site GPb Density and its logarithm had a significant effect on BPb in the presence of the time surrogate. The portion of the four-year decrease due to Site GPb Density was determined by the analysis to be 0.5 ug/dl. This is consistent with the observed national average air lead decrease of 0.3 ug/m^3 over the same period (ref 4), and the well-documented air lead/blood lead relationship (ref 5,6). Figure 1 shows the relative contributions to the four-year blood lead decrease.

The unexplained portion of the BPb decrease, 1.75 ug/dl, is reflected by the time variable and may be due to improved sample handling over the course of the NHANESII study, effectiveness of numerous government programs to reduce lead intake through food, paint and water (ref 7), or other unquantified causes.

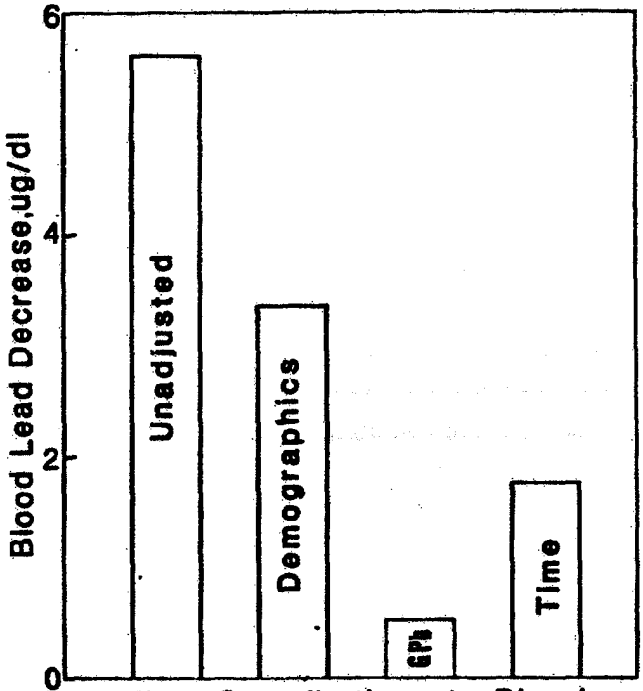

Fig.1 Contributions to Blood Lead Decrease,1976-80

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2. New Scientist, 94, 570 (1982)
3. J M Pierrard et al, Vehicle Emissions Controls and Ambient Air Quality, SAE Australasia, Jubilee Year Conference, Melbourne (1977)
4. EPA Office of Air Quality Standards, National Trend in the Maximum Quarterly Average Lead Levels, 1970-1979
5. R D Snee, Int Arch Occup Environ Health 48, 219 (1981)
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ATTACHMENT 1

DECK 502
NHANES II WEIGHT DECK
(One record for each SP)

Item	Tape Position	No. of Positions	Source and Description
Sample Number	1-5	5	Deck 371, cols. 1-5
Deck Number	6-8	3	502
Segment Number	9-12	4	Deck 371, cols. 16-19
Serial Number	13-14	2	Deck 371, cols. 20-21
Column Number	15-16	2	Deck 371, cols. 43-44
Examination Status 1-Examined 2-Not Examined	17	1	Deck 371, cols. 36
Age at Interview			
months(6-11 mos.)	18-19	2	Deck 371, cols. 45-46
years(01-74 yrs.)	20-21	2	Deck 371, cols. 47-48
Race 1-White 2-Black 3-Other	22	1	Deck 371, col. 56
Sex 1-Male 2-Female	23	1	Deck 371, col. 55
Family Income Group 11-Under $1,000 (including loss) 12-$1,000-1,999 13-$2,000-2,999 14-$3,000-3,999 15-$4,000-4,999 16-$5,000-5,999 17-$6,000-6,999 18-$7,000-9,999 19-$10,000-14,999 20-$15,000-19,999 21-$20,000-24,999 22-$25,000-and over 88-Unknown	24-25	2	Deck 371, cols. 107-108
Family Income Recode	26	1	Recode / Description 1 Less than $6,000 2 $6,000-$9,999 3 $10,000-14,999 4 $15,000-24,999 5 $25,000 + 8 Unknown
PSU Number	27-29	3	Deck 371, cols. 13-15
SMSA-NONSMSA Code 1-In SMSA in central city 2-In SMSA not in central city 4-Not in SMSA	30	1	Deck 371, col. 12

DECK 502 - CONTINUED

Item	Tape Position	No. of Positions	Source and Description
Region code 1-Northeast 2-Midwest 3-South 4-West	31	1	Deck 371, col. 209
Medical History Interview Status 1-Completed 2-Not completed	32	1	Deck 371, col. 208
Education Group 00-None 21-28-Elementary grades(1-8) 31-34-High School (1-4) 41-45-College (1-5+) 88-Blank, but applicable	33-34	2	Deck 371, cols. 62-63
Education Level Recode	35	1	Recode — Description 1 — Grade 5 or less 2 — Grades 6-11 3 — Grade 12 4 — 1-4 yrs.college 5 — 4+ yrs.college 9 — Unknown
1)Poverty-Nonpoverty Segment	36	1	1* - nonpoverty 2* - poverty
2) PSU to Super Stratum Weight	37-43	7	(xxx.xxxx) - Table 1
3) Segment to PSU Weight	44-51	8	(xxxx.xxxx) - Table 1
4) Total Weight	52-60	9	(xxxxx.xxxx) - Product of (2)·(3)
5) Special Census Weight	61-65	5	(x.xxxx) - Table 2,3,4 or 5
6) Individual (HH) Sub-sampling Weight	66-69	4	(x.xxx)
7) Basic Weight	70-79	10	(xxxxxx.xxxx)-Product of (4)·(5)·(6)
9) Nonresponse Adjustment Factor for Medical History Interview Persons	81-88	8	(xx.xxxxxx)

*Odd digit in segment number column (column 12)

*Even digit in segment number column (column 12)

Item	Tape Position	No. of Positions	Source and Description
10) Medical History Inteviewed weight adjusted for nonresponse	89-96	8	(xxxxxxx.x)-Product of (7)*(9)
11) Population Control Factor	97-103	7	(x.xxxxxx)
12) Medical History Interview Final Weight	104-109	6	(xxxxxx)-Product of (10)*(11)
13) Nonresponse Adjustment Factor for examined persons	110-117	8	(xx.xxxxxx)
14) Examined weight adjusted for nonresponse	118-125	8	(xxxxxxx.x)-Product of (7)*(13)
15) Population Control Factor	126-132	7	(x.xxxxxx)
16) Examined Final Weight	133-138	6	(xxxxxx)-Product of (14)*(15)
17) Special Test Specific Weights			
A. GTT Sub-sampling Weight	139	1	0 or 2 depending on sub-sampling
1. GTT Basic Weight	140-149	10	(xxxxxx.xxxx)-Product of (7)*(17A)
2. GTT Nonresponse adjustment factor	150-157	8	(xx.xxxxxx)
3. GTT Basic Weight adjusted for nonresponse	158-165	8	(xxxxxxx.x)-Product of (17A1)*(17A2)
4. GTT Population control factor	166-172	7	(x.xxxxxx)
5. GTT Final Examined Weight	173-178	6	(xxxxxx) - Product of (17A3)*(17A4)
B. Lead Sub-sampling Weight	179	1	0,1,or 2 depending on sub-sampling
1. Lead Basic Weight	180-189	10	(xxxxxx.xxxx)-Product of (7)*(17B)
2. Lead nonresponse adjustment factor	190-197	8	(xx.xxxxxx)
3. Lead Basic Weight adjusted for nonrespnse	198-205	8	(xxxxxxx.x)-Product of (17B1)*(17B2)
4. Lead Population control factor	206-212	7	(x.xxxxxx)
5. Lead Final Examined Weight	213-218	6	(xxxxxx)-Product of 17B3)*(17B4)

DECK 502 - CONTINUED

Item	Tape Position	No. of Positions	Source and Description
C. Carboxyhemoglobin Sub-sampling Weight	219	1	0 or 2 depending on sub-sampling
1. Carboxyhemoglobin Basic Weight	220-229	10	(xxxxxx.xxxx)-Product of (7)· (17C)
2. Carboxy - nonresponse adjustment factor	230-237	8	(xx.xxxxxx)
3. Carboxy - Basic Weight adjusted for nonresponse	238-245	8	(xxxxxxx.x)-Product of (17C1)· (17C2)
4. Carboxy - Population Control Factor	246-252	7	(x.xxxxxx)
5. Carboxy - Final Examined Weight	253-258	6	(xxxxxx)-Product of (17C3)· (17C4)
D. Bile Acids Sub-sampling Weight	259	1	0 or 2 depending on sub-sampling
1. Bile Acids Basic Weight	260-269	10	(xxxxxx.xxxx)-Product of (7)· (17D)
2. Bile Acids nonresponse adjustment factor	270-277	8	(xx.xxxxxx)
3. Bile Acids Basic Weight adjusted for nonresponse	278-285	8	(xxxxxxx.x)-Product of (17D1)· (17D2)
4. Bile Acids population control factor	286-292	7	(x.xxxxxx)
5. Bile Acids Final Examined Weight	293-298	6	(xxxxxx)-Product of (17D3)· (17D4)
E. Pesticides Sub-sampling Weight	299	1	0, 1, or 2 depending on sub-sampling
1. Pesticides Basic Weight	300-309	10	(xxxxxx.xxxx)-Product of (7)· (17E)
2. Pesticide nonrespnse adjustment factor	310-317	8	(xx.xxxxxx)
3. Pesticide Basic Weight adjusted for nonresponse	318-325	8	(xxxxxxx.x)-Product of (17E1)· (17E2)
4. Pesticide Population Control Factor	326-332	7	(x.xxxxxx)
5. Pesticides Final Examined Weight	333-338	6	(xxxxxx)-Product of (17E3)· (17E4)

ATTACHMENT 2

Income Imputation Table for Examinees Whose Income is Not Known (To be used only for HANES II Weighting)

Education Completed	Poverty Segment	NonPoverty Segment
Grade 5 or less	$6,000	$6,000-9,999
Grade 6-11	6,000-9,999	10,000-14,999
4 Yrs. of High School	10,000-14,999	15,000-24,999
1-4 Yrs. College	15,000-24,999	25,000 +
4 + Yrs. College	25,000 +	25,000 +
Unknown	6,000	6,000-9,999

NHANES II

INSTRUCTIONS FOR OBTAINING FINAL INTERVIEWED AND

EXAMINED PERSON WEIGHTS

I. Construct Deck 502 - HANES II Weight Deck (one record for each sample person - SP) according to the attached format. (Attachment 1)

II. For each record enter in column 36 a poverty-nonpoverty segment code. If a record contains an odd digit (nonpoverty) in column 12, then enter a "1" in column 36. If a record contains an even digit (poverty) in column 12, then enter a "2" in column 36.

III. For each record enter in columns 37-43 the PSU to Super Stratum Weight (table 1) according to the PSU of each record.

IV. For each record enter in columns 44-51 the Segment to PSU weight (table 1) according to the poverty-nonpoverty segment code for each record, i.e. - if column 36 contains a "1", then enter in columns 44-51 the non-poverty/new construction segment to PSU weight; if column 36 contains a "2", then enter in columns 44-51 the poverty segment to PSU weight.

V. For each record enter in columns 52-60 the product of item (2) . item (3).*

*All products should be rounded to the indicated precision and not truncated.

VI. For each record enter in columns 61-65 the special census weights (tables 2-5) according to the following:

A. Table 2 - for each record containing the stand (columns 1-2), PSU, segment, and serial numbers listed, enter the weight given;

B. Table 3 - for each record containing the stand (columns 1-2), PSU, and segment numbers listed, enter the weight given;

C. Table 4 - for each record containing the stand, PSU, and segment numbers listed, enter the weight given;

D. Table 5 - for each record containing the stand, PSU, and segment numbers listed, enter the weight "zero".

Special Note 1: Under the segment number column "none" means that none of the segments in that stand and PSU should have a weight of zero.

Special Note 2: For any stand, PSU, and segment number with a prior special weight entry, it should be overridden with the zero weight of table 5.

Special Note 3: For each record not containing one of the special Census weights from table 2, 3, 4, or 5 above, enter a weight of 1.0000 in columns 61-65.

VII. For each record enter in columns 66-69 the individual household (IHI) sub-sampling weight according to the following:

A. If age equals 6 months - 5 years, i.e. if columns 18-19 equals 06-11 then enter 4/3 (1.333) in columns 66-69 or if columns 20-21 equals 01-05 then enter 4/3 (1.333) in columns 66-69;

B. If age equals 6-59 years, i.e. if columns 20-21 equals 06-59 then enter 4.000 in columns 66-69;

C. If age equals 60-74 years, i.e. if columns 20-21 equals 60-74 then enter 4/3 (1.333) in columns 66-69.

VIII. For each record enter in columns 70-79 the basic weight to be calculated as follows:

A. Multiply the weight in columns 52-60 by the weight in columns 61-65 by the weight in columns 66-69, i.e. item 4 . item 5 . item 6.

IX. Task 1

Obtain a distribution of the sums of the sample weights by sex, race, and age, i.e. summation of the basic weight (columns 70-79) by the sex, race, and age groups given in table 1. The sum of the weights for each of the cells should closely approximate the population estimates as of the mid-point of the survey provided to NCHS by Census.

X. Adjustment for Nonresponse

The procedure involves two levels of nonresponse adjustment:

1. Level 1 is for non-interviewed (non-completed medical history) persons;

2. Level 2 is for non-examined persons.

The adjustments for each level should be made within each of the following age-income classes across stands or PSU's classified by SMSA, Non-SMSA within the 4 Census regions:

	Family Income				
Age of SP	Under $6,000	$6,000 - 9,999	$10,000 - 14,999	$15,000 - 24,999	$25,000 +
6 mo. - 5 yrs.					
6 - 59 yrs.					
60 - 74 yrs.					

SMSA and Non-SMSA stands should be distributed by region as follows:

Region	SMSA	Non-SMSA
Northeast		
Midwest		
South		
West		

A nonresponse factor should be calculated for 120 different age (3) by income (5) by region (4) by SMSA/Non-SMSA (2) classes:

A. Example for computing non-response adjustment factors for non-interviewed (non-completed medical history) persons. For stands classified as SMSA in the Northeast region for SP's 6 months - 5 years of age with family income less than $6,000 calculate the following:

1. Sum the weights (i.e. the basic weight in columns 70-79) for all sample persons who are in the given age-income group for each stand classified as SMSA in the Northeast region, then sum across all stands classified as SMSA in the Northeast region.

2. Sum the weights (i.e. the basic weight in columns 70-79) for all sample persons for whom a medical history interview was completed (i.e. if column 32 equals 1) in the given age-income group for each stand classified as SMSA in the Northeast region, then sum across all stands classified as SMSA in the Northeast region.

3. Obtain the ratio of (1) to (2) above and enter the result in columns 81-88 for each medical history interviewed sample person in the given age-income, region-SMSA class.

4. Repeat (1), (2), and (3) above for each of the remaining 119 cells.

Note: Unknown income should be imputed for weighting purposes from Attachment 2 using the SP's highest educational level attained.

B. Example for computing non-response adjustment factors for non-examined persons. Consider the same example as in (A) above and calculate the following:

1. The numerator is the same as for (A1) above.

2. The denominator is the sum of the weights (i.e. the basic weight in columns 70-79) for all examined sample persons (i.e., if column 17 equals 1) in the given age-income group for each stand classified as SMSA in the Northeast region, then sum across all stands classified as SMSA in the Northeast region.

3. Obtain the ratio of (1) to (2) above and enter the result in columns 110-117 for each examined sample person in the given age-income, region-SMSA class.

4. Repeat (1), (2), and (3) above for each of the remaining 119 cells.

Note: Unknown income should be imputed for weighting purposes from attachment 2 using the SP's highest educational level attained.

XI. Task 2

Obtain a distribution of the nonresponse factors for examined persons (columns 110-117) and for medical history interviewed persons (columns 81-88).

XII. For each medical history interviewed SP record enter in columns 89-96 the interviewed weight adjusted for nonresponse, i.e. multiply the basic weight in columns 70-79 (item 7) by the nonresponse adjustment factor for medical history interviewed persons in columns 81-88 (item 9).

XIII. Task 3

Obtain a distribution of the nonresponse adjusted weights in columns 89-96 for poverty and nonpoverty persons according to the following size of the weights: $< 3{,}000$, 4,000, 5,000, 6,000 ... 60,000. Then sum all the weights and compare with the population estimate in table 1.

XIV. For each examined SP record enter in columns 118-125 the examined weight adjusted for nonresponse, i.e. multiply the basic weight in columns 70-79 (item 7) by the nonresponse adjustment factor for examined persons in columns 110-117 (item 13).

XV. Task 4

Obtain a distribution of the nonresponse adjusted weights in columns 118-125 for poverty and nonpoverty persons according to the following size of the weights: <3,000, 4,000, 5,000, 6,000 ... 60,000. Then sum all the weights and compare with the population estimate in table 1.

XVI. Adjustment to Population Controls.

Within each of the 76 cells defined below calculate the population control factor for medical history interviewed persons and for examined persons:

Age group (6 months-1 yr., 1, 2, 3, 4, 5, 6, 7, 8-9, 10-11, 12-14, 15-17, 18-19, 20-24, 25-34, 35-44, 45-54, 55-64, 65-74)

Sex and race group (male nonblack, male black, female nonblack, female black)

Within a cell the population control factor is equal to the U.S. population estimate for that cell (table 1) divided by the sum of the weights adjusted for nonresponse, i.e. for medical history interviewed persons enter in columns 97-103 of each record in a given cell the results of dividing the U.S. population estimate for the cell by the sum of the weights in columns 89-96 for that cell; for

examined persons enter in columns 126-132 of each record in a given cell the result of dividing the U.S. population estimate for the cell by the sum of the weights in columns 118-125 for that cell.

XVII. Task 5

Print out the population control factor for each cell for medical history interviewed persons.

XVIII. Task 6

Print out the population control factor for each cell for examined persons.

XIX. Medical History Interview Final Weight

For each medical history interviewed person record enter in columns 104-109 the product of columns 89-96 and 97-103, i.e. item 10 by item 11. This product is the final medical history interviewed person weight.

XX. Task 7

Obtain a distribution of the above weights (columns 104-109) for poverty and nonpoverty persons according to the following size of the weights: < 3,000, 4,000, 5,000 ... 100,000; list of weights > 100,000; and sum of final weights for the same cells as in table 1.

XXI. Examined Final Weight

For each examined person record enter in columns 133-138 the product of columns 118-125 and 126-132, i.e. item 14 by item 15. This product is the final examined person weight.

XXII. Task 8

Obtain a distribution of the above weights (columns 133-138) for poverty and nonpoverty persons according to the following size of the weights: < 3,000, 4,000, 5,000 ... 100,000; list of weights > 100,000; and sum of final weights for the same cells as in table 1.

XXIII. For each record enter in columns 139-338 special examined test specific weights according to the following:

A. GTT

1. ½ sample of persons 20-74 years, i.e. if columns 20-21 equals 20-74 and if columns 3-5 equals 600-799 or if columns 20-21 equals 20-74 and if columns 1-5 equals 42850-42855 or 42857-42874, then enter in column 139 a weight of 2. For all other records enter a weight of zero in column 139.

2. For each GTT sample person enter in columns 140-149 the product of columns 70-79 and column 139, i.e., item 7 by item 17A.

3. Adjustment for nonresponse

The adjustment should be made within each of the following age-income classes across stands classified by SMSA, non-SMSA within the 4 Census regions:

	Family Income				
Age of SP	Under $6,000	$6,000 - 9,999	$10,000 - 14,999	$15,000 - 24,999	$25,000 +
20-59 yrs.					
60-74 yrs.					

Region	SMSA	Non-SMSA
Northeast		
Midwest		
South		
West		

4. A nonresponse factor should be calculated for 80 different age (2) by income (5) by region (4) by SMSA/non-SMSA (2) classes according to the following:

   a. Sum the GTT basic weights in columns 140-149 for each GTT sample person within each of the 80 cells defined above.

   b. Sum the GTT basic weights in columns 140-149 for each examined (column 17 equals 1) GTT person within each of the 80 cells defined above.

   c. Obtain the ratio of (a) to (b) above for each of the 80 cells and enter the result in columns 150-157 for each GTT examined person within a given age-income, region-SMSA cell.

5. For each examined GTT person enter in columns 158-165 the GTT basic weight adjusted for nonresponse, i.e., multiply the GTT basic weight in columns 140-149 (item 17A1) by the GTT nonresponse adjustment factor in columns 150-157 (item 17A2).

6. Adjustment to Population Controls

   Within each of the population estimation cells defined in XVI above starting with age 20-24 years calculate the

population control factor for all examined GTT persons. Within a cell the population control factor is equal to the U.S. population estimate for a given cell (table 1) divided by the sum of the GTT basic weights adjusted for nonresponse, i.e., for each examined GTT person enter in columns 166-172 of each record in a given cell the result of dividing the U.S. population estimate for a cell by the sum of the weights in columns 158-165 for a given cell.

7. Task 9

Print out the population control factor for each cell.

8. GTT Final Examined Weight

For each examined GTT person enter in columns 173-178 the product of columns 158-165 and 166-172, i.e., item 17A3 by 17A4.

9. Task 10

Obtain a distribution of the weights in columns 173-178 for poverty and nonpoverty persons according to the following size of weights < 3000, 4,000, 5,000...100,000; list of weights >100,000; and sum of GTT final examined weights for the same cells as in table 1 beginning with age 20-24 years.

B. Lead

1. All persons 6 months - 6 years and ½ sample of persons 7-74 years, i.e. if columns 18-19 equals 06-11 and columns 3-5 is less than or equal to 099 or if columns 20-21 equals 01-02 and columns 3-5 is less than or equal to 099, then enter in column 179 a weight of 1; if columns 20-21 equals 03-06 and columns 3-5 equals 100-299, then enter in column 179 a weight of 1; if columns 20-21 equals 07-11 and columns 3-5 equals 101, 103, 105 ... 299 (odd numbers), then enter in column 179 a weight of 2; if columns 20-21 equals 12-74 and columns 3-5 equals 301, 303, 305...799 (odd numbers), then enter in column 179 a weight of 2.

2. For each lead sample person enter in columns 180-189 the product of columns 70-79 and column 179, i.e., item 7 by item 17B.

3. Adjustment for Nonresponse

   The adjustment should be made within each of the following age-income classes across stands classified by SMSA, non-SMSA within the 4 Census regions:

Age of SP	Family Income				
	Under $6,000	$6,000 - 9,999	$10,000 - 14,999	$15,000 - 24,999	$25,000 +
6 mo. - 5 yrs.					
6 - 59 yrs.					
60 - 74 yrs.					

Region	SMSA	Non-SMSA
Northeast		
Midwest		
South		
West		

4. A nonresponse factor should be calculated for 120 different age (3) by income (5) by region (4) by SMSA/non-SMSA (2) classes according to the following:

   a. Sum the lead basic weights in columns 180-189 for each lead sample person within each of the 120 cells defined above.

b. Sum the lead basic weights in columns 180-189 for each examined (column 17 equals 1) lead person within each of the 120 cells defined above.

c. Obtain the ratio of (a) to (b) above for each of the 120 cells and enter the result in columns 190-197 for each lead examined person.

5. For each examined lead person enter in columns 198-205 the lead basic weight adjusted for nonresponse, i.e., multiply the lead basic weight in columns 180-189 (item 17B1) by the lead nonresponse adjustment factor in columns 190-197 (item 17B2).

6. Adjustment to Population Controls

Within each of the population estimation cells defined in XVI above calculate the population control factor for all examined lead persons. Within a cell the population control factor is equal to the U.S. population estimate for a given cell (table 1) divided by the sum of the lead basic weights adjusted for nonresponse, i.e., for each examined lead person enter in columns 206-212 of each record in a given cell the result of dividing the U.S. population estimate for a cell by the sum of the weights in columns 198-205 for a given cell.

TABLE 1. NHANES II Population Estimates by Sex, Race, and Age at Interview

Age at Interview	Total	Male			Female		
		All Races	Nonblack	Black	All Races	Nonblack	Black
All ages	213,285,776	102,914,332	91,382,534	11,531,798	110,371,444	97,193,683	13,177,761
6 months - 74 years	203,553,834	99,062,004	87,890,712	11,171,292	104,491,830	91,809,966	12,681,864
6 months - 1 year	1,598,910	818,693	697,947	120,746	780,217	662,821	117,396
1 year	3,103,401	1,586,041	1,349,926	236,115	1,517,360	1,286,164	231,196
2 years	2,974,124	1,521,266	1,289,607	231,659	1,452,858	1,226,462	226,396
3 years	3,012,659	1,540,846	1,307,309	233,537	1,471,813	1,244,336	227,477
4 years	3,033,981	1,550,081	1,311,287	238,794	1,483,900	1,250,370	233,530
5 years	3,139,029	1,603,722	1,357,685	246,037	1,535,307	1,293,787	241,520
6 years	3,382,482	1,723,934	1,464,243	259,691	1,658,548	1,402,026	256,522
7 years	3,569,660	1,822,528	1,555,483	267,045	1,747,132	1,482,992	264,140
8-9 years	6,861,327	3,498,036	2,995,394	502,642	3,363,291	2,865,622	497,669
10-11 years	7,066,576	3,601,437	3,076,827	524,610	3,465,139	2,943,793	521,346
12-14 years	11,632,359	5,920,447	5,069,163	851,284	5,711,912	4,866,234	845,678
15-17 years	12,451,556	6,320,104	5,452,994	867,110	6,131,452	5,260,472	870,980
18-19 years	8,122,656	3,943,644	3,453,703	489,941	4,179,012	3,610,177	568,835
20-24 years	19,325,240	9,330,889	8,287,481	1,043,408	9,994,351	8,690,325	1,304,026
25-34 years	32,751,743	15,895,345	14,349,553	1,545,792	16,856,398	14,902,911	1,953,487
35-44 years	23,650,966	11,366,584	10,254,542	1,112,042	12,284,382	10,869,827	1,414,555
45-54 years	23,031,654	11,114,037	10,070,026	1,044,011	11,917,617	10,702,181	1,215,436
55-64 years	20,349,881	9,607,060	8,805,710	801,350	10,742,821	9,783,843	958,978
65-74 years	14,495,630	6,297,310	5,741,832	555,478	8,198,320	7,465,623	732,697

Note: The numbers in this table constitute estimates and closely approximate the U.S. civilian, noninstitutionalized population as estimated by the U.S. Bureau of the Census as of March 1, 1978.

7. Task 11

Print out the population control factor for each cell.

8. Lead Final Examined Weight

For each examined lead person enter in columns 213-218 the product of columns 198-205 and 206-212, i.e., item 17B3 by item 17B4.

9. Task 12

Obtain a distribution of the weights in columns 213-218 for poverty and nonpoverty persons according to the following size of the weights: < 3,000, 4,000, 5,000 ...100,000; list of weights > 100,000; and sum of lead final examined weights for the same cells as in table 1.

C. CARBOXYHEMOGLOBIN

1. ½ sample of persons 3-74 years, i.e. if columns 20-21 equals 03-74 and columns 3-5 equals 100, 102, 104 ...798 (even numbers between 100-798), then enter in column 219 a weight of 2. For all other records enter a weight of zero in column 219.

2. For each carboxyhemoglobin sample person enter in column 220-229 the product of columns 70-79 and column 219 i.e. item 7 by item 17C.