The 2004 AoA Survey of Older Americans Act Participants:

Data Files and Documentation

January 2005

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1. INTRODUCTION

This data set and documentation covers the results of the 2004 AoA Survey of Older Americans Act (OAA) Participants. The purpose of this nationally representative sample survey was to collect information on the demographic characteristics, functional status, and service assessments of clients participating in OAA state and community programs on aging. The survey covered seven services: home-delivered meals, homemaker assistance, transportation, caregiver support associated with these three programs, the Family Caregiver Support Program, congregate meals, and information and assistance. In addition, the survey included measures of social functioning and emotional well-being (for home-delivered meals, homemaker assistance, and transportation), physical functioning (for home delivered meals, homemaker assistance, and transportation), and demographic characteristics for all clients.

This documentation includes a description of the sampling and variance estimation procedures, below, a CD with the data files in SAS and SPSS formats, a codebook showing all variable names and response items, a copy of the questionnaire, and sample SAS programs, with the corresponding output tables. In addition to the survey response items, the data files include several derived variables, which appear at the end of the codebook. The SAS code for these derived variables appears under the “Sample Programs” tab in this notebook.

2. SAMPLE SELECTION, WEIGHTING, AND VARIANCE ESTIMATION

The survey employed a two-stage sample design, first selecting Area Agencies on Aging (AAAs) in stage one and, in the second stage, a sample of clients for each service within each AAA.

Weighting of each service record was done separately. Initially, base weights were computed by taking the inverse of the selection probability, and then the base weights were adjusted for nonresponse followed by a trimming of the extreme weights. Finally a poststratification adjustment was made using available control totals. Fay's modified Balanced Repeated Replication (BRR) method was used for variance computation of survey estimates.

Agency Selection

At the first stage of the two-stage design for the national survey, a stratified sample of 150 AAAs (allowing for a 20% non-response) was selected from the frame of 649 agencies. In addition, all AAAs in Ohio and Iowa were included in the sample to support separate state surveys for a sub-set of services. In Ohio, the state survey covered transportation, home delivered meals, homemaker assistance, caregivers associated with these three services, and the Family Caregiver Support Program. In Iowa, the state survey covered home delivered meals, homemaker assistance, caregivers associated with these two services, and the Family Caregiver Support Program. With the enhanced AAA sample for these two states, the survey had a total of 165 AAAs. Through weighting, the final data set controlled for the increased probability of selection of AAAs in the two states for their applicable services.

Services not part of the state surveys had a sample size of 150 AAAs. The AAA sample was selected by using five budget size strata plus two separate strata for Iowa and Ohio. The size strata were formed based on the square root of the total budget sizes of the AAAs. The AAA and client samples were proportionally allocated to the total of the square root of the budget sizes in each stratum. However, the sample of AAAs was selected with equal probability within a stratum. This method was used instead of a direct probability proportional to size (PPS) sampling because in the first national survey it was found that budget size was not necessarily correlated with the total number of clients in each agency for every service. In the absence of any other information, budget size was still used in sample selection, with less importance. First, the square root of the budget size was used to reduce the effect of large variation in budget sizes. Second, the sample was allocated at the stratum level proportional to total of the square root of the budget size. This scheme gave higher probability of selection to agencies with larger budget sizes

but the agencies with budget sizes within different ranges (size strata) received the same probability of selection. Table A-1 shows the allocation of agencies in different strata and Table A-2 shows the number of agencies selected from Iowa and Ohio in state and national samples.

Table A-1. Sampling strata and allocation of agencies into strata for the national sample.

STRAT03	State	Square Root of Budget Size	Allocation of AAA Sample
STC	All	Greater than $5,199	16
ST1	Excludes OH and IA	$2,117 - $5,199	56
ST2	Excludes OH and IA	$1,481 - $2,116	33
ST3	Excludes OH and IA	$995 - $1,480	24
ST4	Excludes OH and IA	Less than $995	14
OH	OH	Less than $5199	4*
IA	IA	Less than $5199	3*

*All remaining agencies in Iowa and Ohio were included for the state surveys.

Table A-2. Numbers of Area Agencies included in national and state sample from Iowa and Ohio.

State	Total Number of Agencies	National Sample		State Sample
		Certainty	Non-certainty	
IA	13	0	3	All 13
OH	12	3	4	All 12

Sixteen agencies with the highest budget sizes were selected with certainty in the national sample. Three of the certainty agencies came from Ohio and none from Iowa. The remaining sample was then selected independently within each stratum. The implicit stratification variables in the selection process were Census Division and state, meaning the number of agencies in each Division or state was selected roughly in proportion to the total of the square root of budget of a division or a state. Table A-3 shows the agency distribution in the frame and in the sample by Census Region. Services included in the state survey had a larger number of agencies in the sample due to the 15 additional agencies selected as part of the state surveys. These additional samples selected for the state surveys also contributed to the national estimates but with lesser weights since these samples represented Iowa and Ohio only.

Table A-3. Distributions of agencies in the universe and in the sample by region.

Census Region	Number of AAAs in the Frame	Number of AAAs in the National Sample	Number of AAAs in the National and State Sample
Northeast	172	39	39
Mid-west	121	35	50
South	233	49	49
West	123	27	27
Total	**649**	**150**	**165**

Client Selection

Client samples by service were drawn randomly. The total number of clients in each service was obtained by contacting sampled agencies before selecting the sample of clients. Based on the total number of clients, line numbers from client master lists were sampled using a Westat software application that took the total number of clients in each service by agency and randomly selected the matching line numbers for the selected clients. To avoid obtaining from the AAA a complete list of all clients and contact details, the agencies extracted and supplied Westat with only the contact details of selected line numbers. However, some agencies provided a complete list of all clients, and Westat randomly selected the clients to be interviewed, using the same methodology. The number of clients selected from a service within each agency is such that the expected overall probability of selection of a client within a service is roughly the same for all clients within each sampling stratum. Also, to allow for a nonresponse or ineligible rate (e.g., due to mortality, nursing home placement, or other service termination) of up to 50%, the number of clients selected was twice the required sample size. In the certainty agencies, the number of clients selected in each agency varied depending on the budget sizes of the agencies. However, in the non-certainty agencies, 10 clients were selected from each agency for the Family Caregiver Support Program (FCSP) and 12 clients were selected from each agency for all other services (which assumes a lower attrition rate for the FCSP sample than for the sample of other clients). For services included in state surveys in Iowa and Ohio, cluster sizes per service per agency were much higher and varied depending on the budget sizes of the agencies.

For Information and Assistance (I & A), initially a sample of two timeslots, within a week, was selected and then the client sample was drawn from those who called during these periods. A week was divided into 10 time slots where AM and PM of a weekday were considered two time slots. The calls

made during the weekend were included in the Monday AM time slot. From each selected agency, the sample of calls was obtained from all calls made during the selected timeslots.

A "Collected Caregiver" sample was created from the corresponding sample of clients in relevant services, namely homemaker, home delivered meals, and transportation services, from which the survey collected caregiver information. All caregivers corresponding to the sampled clients in these three services were included in the collected caregiver sample. Caregivers in the NFCSP were selected using the same method as other service recipients (e.g., randomly selected from numbered lists).

Selection Probability

The probability of selection of a client within a service can be mathematically expressed as follows.

$P_{i\in h}$ = Probability of selection of agency i in stratum h,

$$= \frac{\text{Number of noncertainty agencies selected from the stratum}}{\text{Total number of noncertainty agencies in the stratum}}$$

$$= \frac{m_h}{M_h}.$$

For certainty agencies, the probability of selection was 1 (i.e., $P_{h=c} = 1$).

P_{ijs} = Probability of selection of client j in service s within agency i,

$$= \frac{\text{Number of clients selected from service } s \text{ in agency } i}{\text{Total number of clients in service } s \text{ in agency } i} = \frac{n_{is}}{N_{is}}.$$

Therefore, the overall probability of selection of client j in service s within agency i in stratum h was

$$\pi_{ijs} = P_{i\in h} \times P_{ijs} = \frac{m_h}{M_h} \times \frac{n_{is}}{N_{is}} \quad \text{for the clients within noncertainty agencies,}$$

$$= 1 \times \frac{n_{is}}{N_{is}} = \frac{n_{is}}{N_{is}} \quad \text{for the clients within certainty agencies.}$$

Weighting

Weighting was done in four steps: calculation of base weights, nonresponse adjustment, trimming of extreme weights, and poststratification adjustments to known control totals.

Base Weights

The base weight is the inverse of the overall selection probability of a client. The base weight of a client can be obtained by calculating the base weight of an agency and then the agency-level base weight of a client in a service within an agency.

The base weight of an agency i can be expressed as

$$a_{i,i\in h} = \frac{1}{P_h} = \frac{M_h}{m_h} \qquad \text{for noncertainty agencies,}$$

$$= 1 \qquad \text{for certainty agencies,}$$

and the base weight of a client in a service within an agency can be expressed as

$$v_{ijs} = \frac{1}{P_{ijs}} = \frac{N_{is}}{n_{is}},$$

= the within agency base weight of client j in service s within agency i.

Therefore, the overall base weight of a client within a service is

$$w_{ijs} = a_i \times v_{ijs} = \frac{1}{\pi_{ijs}},$$

$$= \frac{M_h}{m_h} \times \frac{N_{is}}{n_{is}} \qquad \text{for noncertainty agencies,}$$

$$= 1 \times \frac{N_{is}}{n_{is}} \qquad \text{for certainty agencies.}$$

For I&A, since two timeslots out of 10 in a week were included in the sample, the base weights were multiplied by 5x52 to obtain the annual total, which were adjusted using AoA I&A control totals from the State Program Reports (see Poststratification, below).

Nonresponse Adjustment

As not all sampled agencies and clients responded to the survey, the base weights had to be adjusted for nonresponse. The nonresponse adjustment was done in two steps by performing separate adjustments for agency-level and client-level nonresponses.

If m_{hs}^r denotes the number of agencies in stratum h responded to the survey for service s then the agency-level nonresponse adjustment was done as follows:

$$a_{is,i\in h}^r = \frac{M_h}{m_h} \times \frac{m_h}{m_{hs}^r} = \frac{M_h}{m_{hs}^r}$$

= the nonresponse adjusted weight of agency i in service s.

If n_{is}^r denotes the number of clients responded in service s within agency i then the client-level nonresponse adjustment was done as follows:

$$v_{ijs}^r = \frac{N_{is}}{n_{is}} \times \frac{n_{is}}{n_{is}^r} = \frac{N_{is}}{n_{is}^r},$$

= the nonresponse adjusted weight for client j in service s within agency i.

Therefore, the overall nonresponse adjusted weight of client j in service s within agency i is

$$w_{ijs}^r = a_{is}^r \times v_{is}^r = \frac{M_h}{m_{hs}^r} \times \frac{N_{is}}{n_{is}^r}.$$

Trimming of Weights

To keep the variance of the estimates within an acceptable level, extreme weights were trimmed. The target was to select the clients within a service with equal probability so that the base weights of all clients within a service were roughly equal. This would be the case if the measure of size

used in selecting the agencies (i.e., annual budget) is perfectly correlated to the number of clients in a service and there is no nonresponse. But in reality, this correlation is not very high. Some agencies had higher budgets due to larger client sizes in some services but smaller numbers of clients in other services. Similarly, some agencies had smaller budgets but relatively higher numbers of clients in a particular service. This contributed to the variability in the selection probabilities and hence in the base weights. Moreover, the variability in weights was increased further due to the adjustment of varying nonresponse rates of clients from agency to agency. Since the variability in the weights increases the variances of the survey estimates, those weights which were too high or low compared to the average weight were trimmed to upper and lower acceptable limits to reduce the variance of the weights. The upper and lower acceptable limits were determined by using the standard deviation and the distribution of the weights. The loss in the sum of weights due to the trimming was distributed to the weights of other clients in the same trimming cell defined by strata and Census Division. This ensured that the sum of the weights is the same before and after trimming but variance of the weights is reduced. In other words, this made a compromise between the reduction in variance and the increase in bias due to trimming. The trimmed nonresponse adjusted weights will be denoted by w_{ijs}^{θ} in the following sections.

Poststratification Adjustment

The final step of weighting involved the benchmarking of the estimated number of clients in a service based on the trimmed nonresponse adjusted weights to the known total number of clients (control total) obtained from the AoA State Program Reports (SPR). The poststratification adjustment or benchmarking was done either at the national level or at the regional level depending on the sample size and the availability of control totals. For state surveys, benchmarking was done at the state level of the relevant states.

The post-stratified weights (w_{ijs}^{p}) for the service s were calculated by multiplying the trimmed nonresponse adjusted weights (w_{ijs}^{θ}) by the ratio of the known control total (N_s) and the estimated total $(\sum_{ij} w_{ijs}^{\theta})$ as follows:

$$w_{ijs}^{p} = w_{ijs}^{\theta} \times \frac{N_s}{\sum_{ij} W_{ijs}^{\theta}}$$

Poststratification Adjustment for Transportation Service

For the Transportation service, the control total was not available. However, State Units on Aging (SUAs) included the number of one-way passenger trips in the State Program Report (SPR). The SPR regional level trip count was used for the purposes of computing a control total for the number of clients receiving transportation services by region. The following summarizes the methodology for constructing this transportation client count:

- The national survey asked respondents how many one-way trips per month they usually took using AAA transportation service. To ensure proper identification of AAA-funded transportation programs, the computer assisted telephone interviewing (CATI) software allowed the interviewer to prompt the respondent with the specific name of the transportation service, which the provider had supplied to Westat during the client sampling stage.

- An average annual per-person trip count by region was estimated from the survey data file with trimmed weights.

- By dividing the total trip count by the per-person average annual number of trips, we estimated the total persons received transportation services by region.

The method of estimation explained above can be mathematically expressed as follows:

$$\hat{N}_s = \sum_g \hat{N}_{gs} = \sum_g \frac{T_g}{\bar{t}_g} = \sum_g \frac{T_g}{\dfrac{\sum_{ij} t_{ij} w_{ijs}^{\boldsymbol{\theta}}}{\sum_{ij} w_{ijs}^{\boldsymbol{\theta}}}} = \sum_g \frac{T_g}{\hat{T}_{gw}} \times \hat{N}_{gw}$$

where,

$\hat{N}_s$ is the final estimate of transportation client count,

$\hat{N}_{gs}$ is the final estimate of transportation client count in region g,

T_g is the total number of one-way trips reported by the SUAs in region g,

$\bar{t}_g = \dfrac{\sum_{ij, i \in g} t_{ij} w_{ijs}^{\boldsymbol{\theta}}}{\sum_{ij, i \in g} w_{ijs}^{\boldsymbol{\theta}}}$ is the per-person weighted average of annual number of trips in region g,

t_{ij} is the number of annual one-way trips made by client j in agency i,

$\hat{T}_{gw} = \sum_{ij, i \in g} t_{ij} w_{ijs}^{\theta}$ is an initial estimate of the total number of one-way trips in region g based on trimmed nonresponse adjusted weights,

$\hat{N}_{gw} = \sum_{ij, i \in g} w_{ijs}^{\theta}$ is an initial estimate of the total number of transportation clients in region g based on trimmed nonresponse adjusted weights.

The above estimator is widely know as *Ratio Estimator* in the sample survey literature because the initial estimate of the total number of transportation clients ($\hat{N}_w$) is adjusted by the ratio of actual and estimated number of total one-way trips ($\frac{T}{\hat{T}_w}$).

Poststratification Adjustment for Caregivers

Several sets of poststratified weights were computed for caregivers to produce estimates for different target populations such as caregivers of different services separately, caregivers of all three services combined, and all collected and NFCSP caregivers combined. Different sets of control totals were estimated accordingly based on relevant information collected in the survey. Initially, the number of caregivers in each service was estimated from the respective service recipient client sample from whom the caregiver sample was collected ("Collected Caregivers"). This estimate was used to compute poststratified weights for producing estimates separately for caregivers in each service. These estimates were then adjusted for double counting (i.e., for multiple counting of the same client/caregiver in more than one service). This adjusted estimate of total caregivers was used to compute poststratified weights for producing estimates of all collected caregivers combined. Finally, an adjustment was made to account for the fact that some collected caregivers are also listed in the NFCSP. This final adjusted estimate of all types of caregivers was used to make poststratification adjustments of the weights for producing estimates of all collected and NFCSP caregivers combined. The control total for NFCSP caregivers is available in the SPR, which was used for initial poststratification adjustment of the NFCSP caregiver sample. This control total, and the NFCSP sample, excluded persons who received only *information* from the program, which focused the survey on the more tangible aspects of the National Family Caregiver Support Program, consistent with the design of the caregiver questionnaire.

Variance Estimation

Westat routinely uses replication based variance estimation methods for computing sampling errors of the survey estimates derived from complex multi-stage sample designs. Westat's variance computation software, WesVar, is designed for this purpose. A version of balanced repeated replication (BRR) referred to as "Fay's method" was used to calculate the standard errors of estimates derived from the AoA survey. Implementation of BRR methods for variance estimation requires the use of a series of "replicate weights," each of which provides an alternative (replicate-specific) estimate of a statistic of interest. The variability of the replicate estimates is then used to obtain the variance or standard error of the statistic.

Let y_{ij} denote a survey characteristic (variable) for the j th respondent in the i th agency, and let w_{ij}^{p} denote the corresponding full-sample weight. Further, let w_{ij}^{k} denote the kth replicate weight, where $k = 1, 2, ..., K$. The estimated total for the survey variable was given by the weighted sum

$$\hat{y} = \sum_{ij} w_{ij}^{p} y_{ij} \ .$$

The corresponding replicate estimates were given by the weighted sums

$$\hat{y} = \sum_{ij} w_{ij}^{k} y_{ij} \ , \text{ for } k = 1, 2, ..., K \ .$$

The variance of the estimate $\hat{y}$ was then computed as:

$$\text{var}(\hat{y}) = \frac{1}{(1-.30)^2} \sum_{k=1}^{K} (\hat{y}_k - \hat{y})^2 \ ,$$

where the 0.30 in the above formula is referred to as "Fay's factor." The corresponding standard error is simply the square root of $\text{var}(\hat{y})$ as computed above.

The replicate weights, w_{ij}^{k} , required for variance estimation were derived from replicate-specific base weights and include all of the adjustments (e.g., nonresponse and poststratification) used to develop the full-sample weights, w_{ij}^{p} .

By creating variance strata and variance units, first, replicates were formed. For noncertainty AAAs, variance strata were formed with two or three AAAs in each stratum and each AAA was treated as a variance unit. For certainty AAAs, each AAA was treated as a variance stratum and random groups of clients were formed as variance units. This difference in forming variance strata for certainty and noncertainty AAAs was to reflect the fact that there was no first stage variance for certainty AAAs. Under BRR, the replicates are formed in a balanced way by taking one variance unit from each variance stratum. However, a modified version of BRR called Fay's method was used for the AoA survey. Under the modified approach, the full-sample weights are adjusted or "perturbed" to define the required replicates, rather than taking one variance unit from each stratum. Further details on BRR and Fay's method, or replication methods in general, can be found in WesVar 4.0 User's Guide, (www.Westat.com).

WesVar or SUDAAN can use replicate weights to compute variance estimates.

3. SIGNIFICANCE TESTING OF DIFFERENCE BETWEEN TWO ESTIMATES

The statistic given below can be used to test if the difference between two estimates of proportions is statistically significant or not. This test can be used to check the significance of the difference either between an agency level estimate and a national level estimate or between estimates of two different agencies. The test statistic is

$$z = \frac{|\hat{p}_1 - \hat{p}_2|}{\sqrt{SE^2(\hat{p}_1) + SE^2(\hat{p}_2)}}$$

where, $\hat{p}_1$ and $\hat{p}_2$ are the two estimates to be compared, and $SE^2(\hat{p}_1)$ and $SE^2(\hat{p}_2)$ are squares of the corresponding standard errors of the two estimates.

When the sample size (i.e., the number of valid responses in each comparison group) is 30 or more, the above test statistic will follow a statistical distribution called *normal distribution* and the difference will be considered significant at 95% level of confidence if $z > 1.96$.

However, if the number of valid responses in one of the groups is less than 30 then the above test statistic will follow a different statistical distribution called *t-distribution* with $(n_1 + n_2 - 2)$ degrees of freedom, where n_1 and n_1 are the number of valid responses in two groups. In this case, the critical value for the significance of a difference will depend on $(n_1 + n_2 - 2)$. The following table presents a rough indication of critical values of t distribution for 95% level of confidence for different values of $(n_1 + n_2 - 2)$. The computed value of z must be greater than the corresponding critical value for the difference between two estimates to be considered significant.

Degrees of freedom, $(n_1 + n_2 - 2)$	Critical value of t distribution at 95% level of confidence
>58	1.96
30-58	2.05
25-29	2.06
20-24	2.08
15-19	2.13