Imputation of Non-Response on Economic Variables in the MHAS 2021

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Introduction

This report describes the levels of non-response and the imputation procedure used in the Mexican Health and Aging Study (MHAS/ENASEM) 2021, to assign an exact amount of economic value to questions that had a non-response or a response using unfolding brackets. We used a multiple imputation technique, involving the method of sequence of regressions with a SAS-based software routine (IVEware version 0.3), developed by researchers at the Survey Methodology Program, Survey Research Center, Institute for Social Research at the University of Michigan (Raghunathan et al. 2000; Raghunathan 2001).

The methodology we are using for the 2021 imputation is like the one used for non-response imputation in MHAS 2018 as well as the previous waves. For a more detailed description of the imputation process, please refer to the companion MHAS project documents "Imputation of Non-Response on Economic Variables in the Mexican Health and Aging Study (MHAS/ENASEM)" from previous waves (2001, 2003, 2012, 2015, 2018). To facilitate the comparison with the MHAS 2018 project document, the numbering of Tables and Diagrams was preserved.

The objective of the imputation is to provide three main groups of variables to the users:1) total income and its components at the individual level, 2) total net worth at the household level:

- Total Income (`income_21`)
  - Individual family help income (`inc_family_21`)
  - Individual business income (`inc_business_21`)
  - Individual property rent income (`inc_property_21`)
  - Individual capital assets income (`inc_capital_21`)
  - Individual earned income (`inc_earned_21`)
  - Individual pension income (`inc_pension_21`)
  - Individual transfer income (`inc_trans_21`)
- Individual/Couple Household (`k52a_21`)
- Net Worth (`net_assets_21`)
  - Net value of houses (the individual or couple) (`net_house_21`)
  - Net value of business (of the individual or couple) (`net_business_21`)
  - Net value of other properties (of the individual or couple) (`net_otherprop_21`)

- Net value of capital assets (of the individual or couple) (`net_capital_21`)
- Net value of vehicles (of the individual or couple) (`net_vehicle_21`)
- Net value of other assets (of the individual or couple) (`net_others_21`)
- Other debts (of the individual or couple) (`net_debts_21`)

Economic Variables in the MHAS: Differences between 2018 and 2021

The MHAS 2021 imputed economic variables include 40 different components of annual income flows to measure total income of a person -- and his/her spouse if applicable (Table 1), 17 different types of assets to calculate total net worth of the individual or couple (Table 2), and 14 other imputed economic variables (Table 3).

It is important to note that the process used to construct the income and net worth variables in 2021 is slightly different than the one used for previous waves. The difference is due to the changes implemented to the survey instruments and mostly to the deletion of certain variables. Tables 4.1 to 4.7 include all imputed variables by group of imputation. These tables include the variable name from the raw data file, the derived variables, imputed variables, as well as the flag that indicates if the variable was imputed. The "Derived" variables refer to the amount of expenditure, income, or value of an asset as it was derived from the answers to the corresponding questions on the survey, and these may contain missing values. The "Imputed" variables contain these values plus imputed values, that is, these variables contain no missing values. Finally, the "Flag" variable is a dummy that indicates for each case if the variable was imputed or not.

Table 1 summarizes the changes for the components of income. First, family help income was aggregated in 2021; in previous waves the economic help received was asked separately for each child. Second, in 2021, the rental property's income and expenditure questions were only asked for the primary property while in previous rounds the respondent had the option to report up to two properties. Third, in 2021 the option to report a third pension for each of the retirement, widow, disability and other pensions was removed. This removal of the third pension may decrease the value of total pension income in 2021. However, it is important to notice that these changes to the survey instruments were done after observing

that the report of second properties and third pensions were not frequent or substantial[1]. Lastly, starting in 2021 respondents were given the option to report up to two transfers received from public institutions. In 2021 only 40 components were included to determine total income, compared to 43 in 2018. A new component was included to capture any income from any state or federal program for the contingency of COVID-19. Despite these changes, the distribution of the overall income in 2021 is comparable to the one obtained in 2018 (see Table 7.1). Also, there is no change in 2021 for the components of total net worth (See Table 2).

Selected flowcharts that illustrate the procedures for the construction of the imputed variables are available in Appendix B of this document. Only those that were modified to reflect the changes in 2021 were included. The complete IVEware program codes used in the imputation procedure are included in Appendix C.

The Impact of the Unfolding Brackets to Reduce Non-Response

Similar to what we have observed in previous waves, significant recovery of non-response was obtained through the use of follow-up brackets. The results in Table 1 indicate, for example, that among those who report business profits from the primary business (see Table 1 row "Business profits-1"), the initial non-response was 12.4%, but more than half of these cases were recovered through the use of unfolding brackets (8.8%). According to the results presented in Table 2, among those who own a home ("Gross value house/apartments"), the initial non-response on the value was 36.4%, but in more than 85 percent of these cases (31.1% of those who own a home) the value response was recovered by follow-up brackets. In Table 3, the results also indicate that among those who required a hospitalization ("Total hospitalization costs"), 8.6% of 12.1% of the initial non-response on the total cost was recovered through the brackets.

Comparison of Variables With- and Without Imputations

Tables 5 presents the distribution of the derived and imputed variables for a select group of survey items. The tables show that, like the previous waves, the imputed values tend to shift the distributions to the

[1] Please refer to Table 1 in the MHAS 2018 project document, available in the study document "Imputation of Non-Response on Economic Variables in the Mexican Health and Aging Study (MHAS/ENASEM) 2018" to see the frequency of deleted questions.

right, as compared to the derived variables containing missing values. For example, in Table 5.2 for the variable of spouse's earned income, the derived variable contained 80.1% of the cases with 0, whereas the imputed variable contains 77.7% of cases with value 0. Part of the reason for this shift is the majority of non-response occurred among the cases that declared that the individual receives income from such source. Even among the cases that are greater than zero though, the imputation seems to be shifting the distribution rightwards. That is, most missing values get an imputed value from the high end of the distribution.

Table 6.1 includes the list of imputed variables, as well as the variables used to calculate each variable for each type of assets and the total net worth variable. The table also includes the name of each asset type and indicates whether each variable was added or subtracted for the calculations of total net worth.

Table 6.2 shows the list of imputed variables and the variables used to calculate each income variable by source and the total income variable; all variables were added for these calculations, except for "Property rent income" which adds income and subtracts expenditures.

Construction of the Variables for Total Income at the Individual Level and Net Worth at the Household Level

Similar to previous waves, we need to determine whether an income source that was "joint" was to be divided by two or by one. However, in 2021, we do not construct a new variable, we use an existing variable `k52a_21` added in section K. This variable takes the value 1 if this interview is with an individual i.e. all information refers to one person; and takes the value 2 if the interview is one within a household couple.

To simplify the process in 2021, we added `k45d_21`, a variable that indicates the number "NP" of the person that the own-income questions refer to. We also added `k52a_1_21`, a variable that indicates the number "NP" of the person that the corresponding spouse's income questions refer to. If the value of `k45d_21` was equal to the variable NP (Person Number), then the information provided for the respondent own income corresponds to the selected subject. On the other hand, if the value of `k52a_1_21` was equal to "NP", then the income variable corresponded to the SPOUSE'S variables. This variable is used to construct the final variables for total income (`income_21`) and its components, at the individual level.

Table 7.1 presents the distribution of the total individual income variable (`income_21`) as it is obtained with- and without- imputation of missing values. Table 7.2 presents the distribution of the total net worth (`net_assets_21`) at the household level with- and without- imputation of missing values. The tables show that the distribution of both total income and total net worth is shifted towards the right with the imputed values. This is consistent with the findings in previous waves.

In Tables 8.1 and 8.2 we present the average value of total income (in monthly pesos) and distribution of income sources by gender, age and urban/rural. In MHAS 2021 we observe an increase in the percentage of total income from property income, compared to 2018 (Table 8.1). This pattern is consistent with what has been reported by the National Household Income and Expenditure Survey (*Encuesta Nacional de Ingreso y Gasto de los Hogares*, ENIGH) in 2018 and 2020. In the ENIGH, the proportion of income from rental property within total income went from 5.9% to 5.4% between 2018 and 2020. In the MHAS, this proportion went down from 0.7% to 0.3% in households with older adults. In addition, we found that the youngest cohorts are the ones who show the greatest decrease, which could be explained because their expenses (for example: mortgage payments) exceed the income obtained from their rent.

Imputation Process: Additional Steps

Different to the previous waves, after the completion of the imputation process, a total of 12 unique individual identifiers (`CUNICAH` & `NP`) were found to lack corresponding values for total income, as well as the specific income categories of `inc_earned`, `inc_pension`, and `inc_trans`. Among these, two individuals (`CUNICAH` = 6985, `NP` = 10 and 50) possessed income values at the household level, but the attribution of these values to their respective income owners remained uncertain. This resulted in the omission of information regarding the rightful owner of the income at the individual level, and it was not possible to calculate the corresponding total income. Notably, in the cases where a spouse had chosen to skip the income interview, and the household was incorrectly identified as a household with one individual while it had two, their k52a_21 values underwent a modification from an initial individual designation (1. Individual) to a classification indicative of a couple (2. Couple within the household). This affected the individuals identified with `CUNICAH` = 7656, 8011, 8053, 12631, 12909, 13942, 15373, 15878, 16542, and 18822.

Given these circumstances, a decision was made to resolve the missing values for these 10 cases by employing income data sourced from the year 2018. This choice aimed to ensure the continuity and coherence of the dataset. However, it is important to note that certain individuals lacked all available 2018 income data, making it impossible to impute their income data. The following is a list of these individuals: (CUNICAH, NP) (7656, 50), (13943, 20), and (15373, 50). The other cases were imputed using a multiple imputation technique, involving the method of sequence of regressions with a SAS-based software routine (IVEware version 0.3)

A similar approach was employed for the Gross Business_1 variable (imamk8_1_21). Due to insufficient data available from 2021 to facilitate the imputation procedure, the inclusion of 2018 data was necessary to carry out the imputation. This solution aligns with our goal of maintaining data integrity and completeness throughout the imputation process.

Tables, Diagrams, and Appendices

Table 1. Total (Individual or Couple) Income components: Distribution of responses by type

Individual (or Couple) Source of Income (*)		Total n	Receives Income			If (yes) Receives Income			
2018	2021		% Yes	% No	% NR/DK	n	% Actual Value	% Bracketed Value	% Missing
Family help income_1 Family help income_2 Family help income_3 Family help income_4 Family help income_5 Family help income_6 Family help income_7	Family help income (G18a)	9,963	34.0	65.6	0.4	3,385	93.3	3.8	2.9
Business income-1	Business income-1 (K11_1)	10,716	10.4	89.1	0.5	1,112	85.3	12.1	2.7
Business income-2	Business income-2 (K11_2)	10,716	0.0	100.0	0.0	0	.	.	.
Business expenditure-1	Business expenditure-1 (K13_1)	10,716	11.0	88.5	0.5	1,182	87.4	9.8	2.8
Business expenditure-2	Business expenditure-2 (K13_2)	10,716	0.0	100.0	0.0	0	.	.	.
Business profits-1	Business profits-1 (K15_1)	10,716	10.5	89.0	0.5	1,126	87.6	8.8	3.6
Business profits-2	Business profits-2 (K15_2)	10,716	0.0	100.0	0.0	0	.	.	.
Rent from residence	Rent from residence (J36b)	10,716	1.7	97.9	0.4	182	64.3	26.9	8.8
Property rent income-1	Property rent income (K27_1)	10,716	1.7	98.2	0.1	184	90.2	4.9	4.9
Property expenditure-1	Property expenditure (K29_1)	10,716	6.1	93.8	0.0	655	31.6	6.7	61.7
Capital assets income-1	Capital assets income-1 (K36_1)	10,716	1.7	97.9	0.4	182	64.3	26.9	8.8
Capital assets income-2	Capital assets income-2 (K36_2)	10,716	0.1	99.8	0.1	14	85.7	14.3	0.0
Capital assets income-3	Capital assets income-3 (K36_3)	10,716	0.1	99.9	0.1	9	66.7	33.3	0.0
Own earned income-1	Own earned income-1 (K47a)	10,716	13.6	86.4	0.0	1461	96.1	3.2	0.7
Own earned income-2	Own earned income-2 (K48a)	10,716	10.2	89.8	0.1	1089	95.2	4.0	0.7
Own earned income-3	Own earned income-3 (K50a)	10,716	0.5	99.5	0.0	54	98.2	1.8	0.0
Own earned income-4	Own earned income-4 (K51a)	10,716	0.16	99.8	0.0	17	100.0	0.0	0.0
Spouse's earned income-1	Spouse's earned income-1 (K53a)	5,199	22.3	77.6	0.2	1157	86.6	9.7	3.7
Spouse's earned income-2	Spouse's earned income-2 (K54a)	5,199	14.0	85.3	0.6	729	79.7	15.6	4.7
Spouse's earned income-3	Spouse's earned income-3 (K56a)	5,199	0.3	99.7	0.0	15	80.0	13.3	6.7
Spouse's earned income-4	Spouse's earned income-4 (K57a)	5,199	0.1	99.9	0.0	5	60.0	40.0	0.0
Own pension income - retirement-1	Own pension income - retirement-1 (K61_1_1)	10,716	18.5	81.5	0.0	1979	94.1	4.7	1.2
Own pension income - retirement-2	Own pension income - retirement-2 (K61_1_2)	10,716	0.7	99.2	0.0	72	90.3	6.9	2.8
Own pension income - widow-1	Own pension income - widow-1 (K61_2_1)	10,716	8.9	91.1	0.0	952	95.3	3.7	1.1
Own pension income - widow-2	Own pension income - widow-2 (K61_2_2)	10,716	0.11	99.89	0.0	12	91.7	8.3	0.0
Own pension income - disability-1	Own pension income - disability-1 (K61_3_1)	10,716	0.7	99.24	0.03	78	100.0	0.0	0.0
Own pension income - disability-2	Own pension income - disability-2 (K61_3_2)	10,716	0.01	99.99	0.0	1	100.0	0.0	0.0
Own other pension income-1	Own other pension income-1 (K61_4_1)	10,716	1.7	98.2	0.0	187	98.4	0.0	1.6
Own other pension income-2	Own other pension income-2 (K61_4_2)	10,716	0.04	99.96	0.0	4	100.0	0.0	0.0
Spouse's pension income - retirement-1	Spouse's pension income - retirement-1(K67_1_1)	5,199	18.5	81.3	0.2	960	84.6	12.0	3.4
Spouse's pension income - retirement-2	Spouse's pension income - retirement-2(K67_1_2)	5,199	0.5	99.5	0.0	25	76.0	24.0	0.0
Spouse's pension income - widow-1	Spouse's pension income - widow-1 (K67_2_1)	5,199	0.2	99.6	0.2	10	100.0	0.0	0.0
Spouse's pension income - widow-2	Spouse's pension income - widow-2 (K67_2_2)	5,199	0.0	100.0	0.0	0	.	.	.
Spouse's pension income - widow-3									
Spouse's pension income - disability-1	Spouse's pension income - disability-1 (K67_3_1)	5,199	0.8	99.0	0.2	42	95.2	4.8	0.0
Spouse's pension income - disability-2	Spouse's pension income - disability-2 (K67_3_2)	5,199	0.02	99.98	0.0	1	100.0	0.0	0.0
Spouse's other pension income-1	Spouse's other pension income-1 (K67_4_1)	5,199	0.8	99.0	0.2	43	97.7	2.3	0.0
Spouse's other pension income-2	Spouse's other pension income-2 (K67_4_2)	5,199	0.02	99.8	0.0	1	100.0	0.0	0.0
Spouse's other pension income-3									
Covid Income	Covid Income (K77_21)	10,716	6.3	93.1	0.6	675	91.7	0.0	8.3
Own transfer income from institutions	Own transfer income from institutions-1 (K80_1_1)	10,716	40.3	59.6	0.1	4317	98.89	0.0	0.1
	Own transfer income from institutions-2 (K80_1_2)	10,716	0.7	99.3	0.0	78	80.8	0.0	19.2
Own transfer income from properties	Own transfer income from properties (K80_3)	10,716	1.2	98.7	0.1	129	91.5	0.0	8.5
Spouse's transfer income from institutions	Spouse's transfer income from institutions-1 (K83_1_1)	5,199	28.9	71.0	0.1	1,501	98.9	0.0	1.1
	Spouse's transfer income from institutions-2 (K83_1_2)	5,199	0.7	99.3	0.0	35	77.1	0.0	22.9

Spouse's transfer income from properties	Spouse's transfer income from properties (K83_2)	5,199	0.7	99.2	0.2	34	85.3	0.0	14.1

Table 2. Total (Individual or Couple) Net Worth Components -- Distribution of Reponses by Type

Individual (or Couple) Type of Asset (*)		Total n	Owns Type of Asset			If (yes) Owns Asset, Response to Value			
2018	2021		% Yes	% No	% NR/DK	n	% Actual Value	% Bracketed Value	% Missing
Gross value houses/apartments	Gross value houses/apartments (J31)	10,716	72.7	26.6	0.7	7,790	63.6	31.1	5.3
Total debt houses/apartments	Total debt houses/apartments (J28)	10,716	4.0	95.9	0.1	429	69.9	23.5	6.5
Total debt mortgages/loans	Total debt mortgages/loans (J26)	10,716	4.0	95.9	0.1	429	87.6	9.8	2.6
Net value other houses/apartments	Net value other houses/apartments (J34)	10,716	9.3	90.3	0.3	995	70.3	26.1	3.6
Gross value business-1	Gross value business-1 (K8_1)	10,716	12.5	87.0	0.5	1,340	**0.0***	72.3	27.7
Gross value business-2	Gross value business-2 (K8_2)	10,716	0.0	100.0	0.0	0	.	.	.
Total debt business-1	Total debt business-1 (K4_1)	10,716	0.9	98.5	0.5	101	88.1	10.9	1.0
Total debt business-2	Total debt business-2 (K4_2)	10,716	0.0	100.0	0.0	0	.	.	.
Gross value other real estate properties-1	Gross value other real estate properties (K24_1)	10,716	6.1	93.8	0.0	655	70.8	23.2	6.0
Total debt other real estate properties-1	Total debt other real estate properties (K20_1)	10,716	0.3	99.6	0.1	30	83.3	13.3	3.3
Net value capital assets-1	Net value capital assets-1 (K33_1)	10,716	5.8	94.0	0.1	625	68.5	26.6	5.0
Net value capital assets-2	Net value capital assets-2 (K33_2)	10,716	0.9	99.0	0.1	101	94.1	5.0	1.0
Net value capital assets-3	Net value capital assets-3 (K33_3)	10,716	0.2	99.7	0.1	22	54.5	31.8	13.6
Gloss value vehicles	Gloss value vehicles (K42)	10,716	29.8	70.2	0.0	3,191	87.7	10.5	1.9
Total debt vehicles	Total debt vehicles (K40)	10,716	2.3	97.7	0.1	244	86.1	11.9	2.0
Net value other assets	Net value other assets (K44)	10,716	81.9	18.1	0.0	8,780	74.6	20.5	4.9
Other debts	Other debts (K86)	10,716	12.6	87.2	0.1	1,354	94.9	4.3	0.8

Note: * 9,326 participants reported not having a business. While 1,340 reported having a business, no one provided an actual value in K8_1 and the variable had to be imputed using the 2021 brackets and the imputed 2018 data (if any).

Table 3. Other imputed variables (Individual or Couple) -- Distribution of Reponses by Type

Individual (or Couple) type of income, expenditures, and costs (*)		Total n	Receives/has income, expenditure and costs			If (yes) Receives/has income, expenditure and costs, Response to Value			
2018	2021		% Yes	% No	% NR/DK	n	% Actual Value	% Bracketed Value	% Missing
Total hospitalization cost	Total hospitalization cost (D6)	15,739	4.1	95.8	0.0	650	87.8	8.6	3.5
Total dentist costs	Total dentist costs (D9_1)	15,739	28.9	71.1	0.0	4550	96.8	2.5	0.7
Total outpatient procedure costs	Total outpatient procedure costs (D9_2)	15,739	2.3	97.7	0.0	362	93.6	4.1	2.2
Total medical visits costs	Total medical visits costs (D9_3)	15,739	39.1	60.9	0.0	6150	96.2	2.8	1.0
Medications costs	Medications costs (D12a)	15,739	53.0	47.0	0.0	8348	96.3	2.9	0.8
Total hospitalization costs – Next of kin	Total hospitalization costs – Next of kin (SD5)	1,799	20.4	79.2	0.4	367	78.2	17.2	4.6
Medical visits pay in–kind - Next of kin	Medical visits pay in–kind - Next of kin (SD8)	1,799	52.3	47.7	0.0	940	84.5	13.1	2.4
Medications costs – Next of kin	Medications costs – Next of kin (SD10a)	1,799	68.9	31.1	0.0	1239	85.1	12.4	2.4
Family help given_1 Family help given_2 Family help given_3 Family help given_4 Family help given_5 Family help given_6 Family help given_7	Family help given (G8c)	9,963	14.6	85.4	0.1	1450	92.6	6.8	0.6
Monthly rent houses/apartments	Monthly rent houses/apartments (J20)	10,716	4.3	95.7	0.0	456	97.37	2.6	0.0
Household Consumption	Household Consumption (K88)	10,716	100.0	0.0	0.0	10716	94.8	3.9	1.3
Pensions income before death	Pensions income before death (K101)	865	5.9	94.0	0.1	51	96.1	2.0	2.0
Pensions income after death	Pensions income after death (K103)	865	26.8	73.1	0.1	232	94.8	3.9	1.3
Death expenditures	Death expenditures (K111)	865	93.5	6.5	0.0	809	80.1	15.3	4.6

Table 4. Groups of Variables and Names Used in the Imputation Procedure

Table 4.1. GROUP 1. Respondent's Total Income Components (Own or Joint Income)

Income component	Raw variable	Derived variable	Imputed variable	Flag variable
Family help income	G18a	amg18a_21	imamg18a_21	g18a_imp_21
Business income-1	K11_1	amk11_1_21	imamk11_1_21	k11_1_imp_21
Business income-2	K11_2	amk11_2_21	imamk11_2_21	k11_2_imp_21
Business expenditures-1	K13_1	amk13_1_21	imamk13_1_21	k13_1_imp_21
Business expenditures-2	K13_2	amk13_2_21	imamk13_2_21	k13_2_imp_21
Business profits-1	K15_1	amk15_1_21	imamk15_1_21	k15_1_imp_21
Business profits-2	K15_2	amk15_2_21	imamk15_2_21	k15_2_imp_21
Property rent income	K27_1	amk27_1_21	imamk27_1_21	k27_1_imp_21
Property expenditure	K29_1	amk29_1_21	imamk29_1_21	k29_1_imp_21
Capital assets income-1	K36_1	amk36_1_21	imamk36_1_21	k36_1_imp_21
Capital assets income-2	K36_2	amk36_2_21	imamk36_2_21	k36_2_imp_21
Capital assets income-3	K36_3	amk36_3_21	imamk36_3_21	k36_3_imp_21
Own earned income-1	K47a	amk47a_21	imamk47a_21	k47a_imp_21
Own earned income-2	K48a	amk48a_21	imamk48a_21	k48a_imp_21
Own earned income-3	K50a	amk50a_21	imamk50a_21	k50a_imp_21
Own earned income-4	K51a	amk51a_21	imamk51a_21	k51a_imp_21
Own pension income - retirement-1	K61_1_1	amk61_1_1_21	imamk61_1_1_21	k61_1_1_imp_21
Own pension income - retirement-2	K61_1_2	amk61_1_2_21	imamk61_1_2_21	k61_1_2_imp_21
Own pension income - widow-1	K61_2_1	amk61_2_1_21	imamk61_2_1_21	k61_2_1_imp_21
Own pension income - widow-2	K61_2_2	amk61_2_2_21	imamk61_2_2_21	k61_2_2_imp_21
Own pension income - disability-1	K61_3_1	amk61_3_1_21	imamk61_3_1_21	k61_3_1_imp_21
Own pension income - disability-2	K61_3_2	amk61_3_2_21	imamk61_3_2_21	k61_3_2_imp_21
Own other pension income-1	K61_4_1	amk61_4_1_21	imamk61_4_1_21	k61_4_1_imp_21
Own other pension income-2	K61_4_2	amk61_4_2_21	imamk61_4_2_21	k61_4_2_imp_21
Covid Income	K77_21	amk77_21	imamk77_21	k77_imp_21
Own transfer income from institutions-1	K80_1_1	amk80_1_1_21	imamk80_1_1_21	k80_1_1_imp_21
Own transfer income from institutions-2	K80_1_2	amk80_1_2_21	imamk80_1_2_21	k80_1_2_imp_21
Own transfer income from properties	K80_3	amk80_3_21	imamk80_3_21	k80_3_imp_21

Table 4.2. GROUP 2. Spouse's Total Income Component

Income component	Raw variable	Derived variable	Imputed variable	Flag variable
Spouse’s earned income-1	K53a	amk53a_21	imamk53a_21	k53a_imp_21
Spouse’s earned income-2	K54a	amk54a_21	imamk54a_21	k54a_imp_21
Spouse’s earned income-3	K56a	amk56a_21	imamk56a_21	k56a_imp_21
Spouse’s earned income-4	K57a	amk57a_21	imamk57a_21	k57a_imp_21
Spouse’s pension income - retirement-1	K67_1_1	amk67_1_1_21	imamk67_1_1_21	k67_1_1_imp_21
Spouse’s pension income - retirement-2	K67_1_2	amk67_1_2_21	imamk67_1_2_21	k67_1_2_imp_21
Spouse’s pension income - widow-1	K67_2_1	amk67_2_1_21	imamk67_2_1_21	k67_2_1_imp_21
Spouse’s pension income - widow-2	K67_2_2	amk67_2_2_21	imamk67_2_2_21	k67_2_2_imp_21
Spouse’s pension income - disability-1	K67_3_1	amk67_3_1_21	imamk67_3_1_21	k67_3_1_imp_21
Spouse’s pension income - disability-2	K67_3_2	amk67_3_2_21	imamk67_3_2_21	k67_3_2_imp_21
Spouse’s other pension income-1	K67_4_1	amk67_4_1_21	imamk67_4_1_21	k67_4_1_imp_21
Spouse’s other pension income-2	K67_4_2	amk67_4_2_21	imamk67_4_2_21	k67_4_2_imp_21
Covid Income	K77_21	amk77_21	imamk77_21	k77_imp_21
Spouse’s transfer income from institutions-1	K83_1_1	amk83_1_1_21	imamk83_1_1_21	k83_1_1_imp_21
Spouse’s transfer income from institutions-2	K83_1_2	amk83_1_2_21	imamk83_1_2_21	k83_1_2_imp_21
Spouse’s transfer income from properties	K83_2	amk83_2_21	imamk83_2_21	k83_2_imp_21

Table 4.3. GROUP 3. Components of Individual (or Couple) Total Net Worth and Household Consumption

Income component	Raw variable	Derived variable	Imputed variable	Flag variable
Gross value houses/apartments	J31	amj31_21	imamj31_21	j31_imp_21
Total debt houses/apartments	J28	amj28_21	imamj28_21	j28_imp_21
Total debt mortgages/loans	J26	amj26_21	imamj26_21	j26_imp_21
Net value other houses/apartments	J34	amj34_21	imamj34_21	j34_imp_21
Gross value business-1	K8_1	amk8_1_21	imamk8_1_21	k8_1_imp_21
Gross value business-2	K8_2	amk8_2_21	imamk8_2_21	k8_2_imp_21
Total debt business-1	K4_1	amk4_1_21	imamk4_1_21	k4_1_imp_21
Total debt business-2	K4_2	amk4_2_21	imamk4_2_21	k4_2_imp_21
Gross value other real estate properties	K24_1	amk24_1_21	imamk24_1_21	k24_1_imp_21
Total debt other real estate properties	K20_1	amk20_1_21	imamk20_1_21	k20_1_imp_21
Net value capital assets-1	K33_1	amk33_1_21	imamk33_1_21	k33_1_imp_21
Net value capital assets-2	K33_2	amk33_2_21	imamk33_2_21	k33_2_imp_21
Net value capital assets-3	K33_3	amk33_3_21	imamk33_3_21	k33_3_imp_21
Gloss value vehicles	K42	amk42_21	imamk42_21	k42_imp_21
Total debt vehicles	K40	amk40_21	imamk40_21	k40_imp_21
Net value other assets	K44	amk44_21	imamk44_21	k44_imp_21
Other debts	K86	amk86_21	imamk86_21	k86_imp_21
Total cost household consumption	K88	amk88_21	imamk88_21	k88_imp_21

Table 4.4. GROUP 4. Hospitalizations and other utilization of services

Income component	Raw variable	Derived variable	Imputed variable	Flag variable
Total hospitalization cost	D6	amd6_21	imamd6_21	d6_imp_21
Total dentist costs	D9_1	amd9_1_21	imamd9_1_21	d9_1_imp_21
Total outpatient procedure costs	D9_2	amd9_2_21	imamd9_2_21	d9_2_imp_21
Total medical visits costs	D9_3	amd9_3_21	imamd9_3_21	d9_3_imp_21
Medications costs	D12a	amd12a_21	imamd12a_21	d12a_imp_21
Total hospitalization costs – Next of kin	SD5	amsd5_21	imamsd5_21	sd5_imp_21
Medical visits pay in-kind – Next of kin	SD8	amsd8_21	imamsd8_21	sd8_imp_21
Medications costs – Next of kin	SD10a	amsd10a_21	imamsd10a_21	sd10a_imp_21

Table 4.5. GROUP 5. Household Monthly Rent

Income component	Raw variable	Derived variable	Imputed variable	Flag variable
Monthly rent houses/apartments	J20	amj20_21	imamj20_21	j20_imp_21

Table 4.6. GROUP 6. Pensions Income

Income component	Raw variable	Derived variable	Imputed variable	Flag variable
Pensions income before death	K101	amk101_21	imamk101_21	k101_imp_21
Pensions income after death	K103	amk103_21	imamk103_21	k103_imp_21
Death expenditures	K111	amk111_21	imamk111_21	k111_imp_21

Expenditures associated with the death of the spouse such as funeral costs, legal fees, etc.., medical costs are excluded.

Table 4.7. GROUP 7. Help Given

Income component	Raw variable	Derived variable	Imputed variable	Flag variable
Family help given	G8c	amg8c_21	imamg8c_21	g8c_imp_21

Tables 5. Distribution of Select Derived and Imputed Variables by Range of Amount

SELECT INCOME SOURCES

Table 5.1 Own earned income-1 (K47a)

Amount	Derived Variable		Imputed Variable	
	Freq.	%	Freq.	%
1-3,200	286	20.4	292	20.0
3,201-5,000	307	21.9	606	21.5
5,001-7,000	250	17.8	256	17.5
7,001-12,000	323	23.0	343	23.5
>12,000	238	17.0	257	17.6
Sub-total	1,404	100.0	1463	100.0
0	9,254	86.8	9,254	86.4
Total	10,658		10,716	

Table 5.2 Spouse's earned income-1 (K53a)

Amount	Derived Variable		Imputed Variable	
	Freq.	%	Freq.	%
1-4,000	279	27.8	310	26.7
4,001-5,000	144	14.4	154	13.3
5,001-7,000	182	18.2	198	17.1
7,001-10,000	198	19.8	221	19.1
>10,000	199	19.9	276	23.8
Sub-total	1,002	100.0	1,159	100.0
0	4,032	80.1	4,040	77.7
Total	5,034		5,199	

Table 5.3 Business income-1 (K11_1)

Amount	Derived Variable		Imputed Variable	
	Freq.	%	Freq.	%
1-2,000	213	22.5	220	19.6
2,001-5,000	213	22.5	216	19.3
5,001-10,000	197	20.8	207	18.5
10,001-20,000	160	16.9	198	17.7
>20,000	165	17.4	280	25.0
Sub-total	948	100.0	1,121	100.0
0	9,548	91.0	9595	89.5
Total	10,496		10,716	

Table 5.4 Business expenditure-1 (K13_1)

Amount	Derived Variable		Imputed Variable	
	Freq.	%	Freq.	%
1-1,100	234	22.7	238	20.2
1,101-2,500	205	19.8	211	17.9
2,501-5,000	201	19.5	207	17.5
5,001-12,000	198	19.2	222	18.8
>12,000	195	18.9	302	25.6
Sub-total	1033	100.0	1180	100.0
0	9484	90.2	9536	89.0
Total	10517		10716	

Table 5.5 Own pension income - retirement-1 (K61_1_1)

Amount	Derived Variable		Imputed Variable	
	Freq.	%	Freq.	%
1-3,000	506	27.2	525	26.5

3,001-4,000	283	15.2	288	14.5
4,001-7,600	330	17.7	361	18.2
7,601-15,000	388	20.8	399	20.2
>15,000	355	19.1	407	20.6
Sub-total	1862	100.0	1980	100.0
0	8735	82.4	8736	81.5
Total	10597		10716	

Table 5.6 Family help income (G18a)

Amount	Derived Variable		Imputed Variable	
	Freq.	%	Freq.	%
1-500	701	22.2	805	23.6
501-1,000	564	17.9	574	16.9
1,001-2,000	811	25.7	833	24.5
2,001-4,000	670	21.2	716	21.0
>4,000	413	13.1	477	14.0
Sub-total	3159	100.0	3405	100.0
0	6539	67.4	6558	65.8
Total	9698		9963	

SELECT NET WORTH COMPONENTS

Table 5.7 Gross value houses/apartments (J31)

Amount	Derived Variable		Imputed Variable	
	Freq.	%	Freq.	%
1-250,000	1007	20.3	1395	17.8
250,001-500,000	1185	23.9	1623	20.7
500,001-800,000	929	18.7	1520	19.4
800,001-1,400,000	849	17.1	1546	19.7
>1,400,000	985	19.9	1750	22.3
Sub-total	4955	100.0	7834	100.0
0	2846	36.5	2882	26.9
Total	7801		10716	

Table 5.8 Gross value business-1 (K8_1)

Amount	Derived Variable		Imputed Variable	
	Freq.	%	Freq.	%
1-31,732	-	-	149	20.0
31,733-100,000	-	-	159	21.4
100,001-200,000	-	-	142	19.1
200,001-419,133	-	-	146	19.6
>419,133	-	-	148	19.9
Sub-total	-	-	744	100.0
0	9,326	100.0	9,972	93.1
Total	10716		10716	

Note: 9,326 participants reported not having a business. While 1,340 reported having a business, no one provided an actual value in K8_1 and the variable had to be imputed using the 2021 brackets and the imputed 2018 data (if any).

"-" Means that there were no values, non-responses, for the derived variables since no exact value was provided.

Table 5.9 Net value capital assets-1 (K33_1)

Amount	Derived Variable		Imputed Variable	
	Freq.	%	Freq.	%
1-10,000	104	24.3	118	18.8
10,001-30,000	84	19.6	115	18.4

30,001-70,000	70	16.4	111	17.7
70,001-250,000	85	19.9	138	22.0
>250,000	85	19.9	144	23.0
Sub-total	428	100.0	626	100.0
0	10076	95.9	10090	94.2
Total	10504		10716	

Table 5.10 Gloss value vehicles (K42)

Amount	Derived Variable		Imputed Variable	
	Freq.	%	Freq.	%
1-25,000	588	21.0	624	19.5
25,001-40,000	569	20.3	592	18.5
40,001-70,000	546	19.5	607	19.0
70,001-150,000	614	22.0	734	23.0
>150,000	480	17.2	636	19.9
Sub-total	2797	100.0	3193	100.0
0	7523	72.9	7523	70.2
Total	10320		10716	

Table 5.11 Net value other assets (K44)

Amount	Derived Variable		Imputed Variable	
	Freq.	%	Freq.	%
1-4,000	1393	21.3	1412	17.1
4,001-10,000	1709	26.1	1735	21.0
10,001-20,000	1092	16.7	1134	13.7
20,001-50,000	1320	20.2	1433	17.3
>50,000	1034	15.8	2559	30.9
Sub-total	6548	100.0	8273	100.0
0	1936	22.8	2443	22.8
Total	8484		10716	

Tables 6. Variables Used in the Calculation of Total Net Worth and Total Income

Table 6.1 Total (Individual or Couple) Net Worth Components

List of variables according to treatment given for the calculation of total net worth

Type of Net Assets and Variable Name	Constructed variable	Raw variable	Derived variable	Imputed variable	Treatment
Total net worth	net_assets_21				
Net value of houses (Added)	net_house_21				
Added					
Gross value houses/apartments		J31	amj31_21	imamj31_21	Joint
Net value other houses/apartments		J34	amj34_21	imamj34_21	Joint
Deducted					
Total debt houses/apartments		J28	amj28_21	imamj28_21	Joint
Net value of business (Added)	net_business_21				
Added					
Gross value business-1		K8_1	amk8_1_21	imamk8_1_21	Joint
Gross value business-2		K8_2	amk8_2_21	imamk8_2_21	Joint
Deducted					
Total debt business-1		K4_1	amk4_1_21	imamk4_1_21	Joint
Total debt business-2		K4_2	amk4_2_21	imamk4_2_21	Joint
Net value of other properties (Added)	net_otherprop_21				
Added					
Gross value other real estate properties		K24_1	amk24_1_21	imamk24_1_21	Joint
Deducted					
Total debt other real estate properties		K20_1	amk20_1_21	imamk20_1_21	Joint
Net value of capital assets (Added)	net_capital_21				
Added					
Net value capital assets-1		K33_1	amk33_1_21	imamk33_1_21	Joint
Net value capital assets-2		K33_2	amk33_2_21	imamk33_2_21	Joint
Net value capital assets-3		K33_3	amk33_3_21	imamk33_3_21	Joint
Net value of vehicles (Added)	net_vehicle_21				
Added					
Gloss value vehicles		K42	amk42_21	imamk42_21	Joint
Deducted					
Total debt vehicles		K40	amk40_21	imamk40_21	Joint
Net value of other assets (Added)	net_others_21				
Net value other assets		K44	amk44_21	imamk44_21	Joint
Other debts (Deducted)	net_debts_21				
Other debts		K86	amk86_21	imamk86_21	Joint

Table 6.2 Total (Individual or Couple) Income Components

List of variables according to treatment given for the calculation of total income

Income Sources and Variable Name	Income variable	Raw variable	Derived variable	Imputed variable	Treatment
Total income	income_21				
Family help income	inc_family_21				
Added variables					
Family help income		G18a	amg18a_21	imamg18a_21	Joint
Business income	inc_business_21				
Added variables					
Business profits-1		K15_1	amk15_1_21	imamk15_1_21	Joint
Business profits-2		K15_2	amk15_2_21	imamk15_2_21	Joint
Property rent income	inc_property_21				
Added variables					
Rent from residence		J36b	amj36b_21	imamj36b_21	Joint
Property rent income		K27_1	amk27_1_21	imamk27_1_21	Joint
Deducted variables					
Property expenditure		K29_1	amk29_1_21	imamk29_1_21	Joint
Capital assets income	inc_capital_21				
Added variables					
Capital assets income-1		K36_1	amk36_1_21	imamk36_1_21	Joint
Capital assets income-2		K36_2	amk36_2_21	imamk36_2_21	Joint
Capital assets income-3		K36_3	amk36_3_21	imamk36_3_21	Joint
Earned income	inc_earned_21				
Added variables					
Own earned income-1		K47a	amk47a_21	imamk47a_21	Individual
Own earned income-2		K48a	amk48a_21	imamk48a_21	Individual
Own earned income-3		K50a	amk50a_21	imamk50a_21	Individual
Own earned income-4		K51a	amk51a_21	imamk51a_21	Individual
Added variables					
Spouse’s earned income-1		K53a	amk53a_21	imamk53a_21	Individual
Spouse’s earned income-2		K54a	amk54a_21	imamk54a_21	Individual
Spouse’s earned income-3		K56a	amk56a_21	imamk56a_21	Individual
Spouse’s earned income-4		K57a	amk57a_21	imamk57a_21	Individual
Pension income	inc_pension_21				
Added variables					
Own pension income - retirement-1		K61_1_1	amk61_1_1_21	imamk61_1_1_21	Individual
Own pension income - retirement-2		K61_1_2	amk61_1_2_21	imamk61_1_2_21	Individual
Own pension income - widow-1		K61_2_1	amk61_2_1_21	imamk61_2_1_21	Individual
Own pension income - widow-2		K61_2_2	amk61_2_2_21	imamk61_2_2_21	Individual
Own pension income - disability-1		K61_3_1	amk61_3_1_21	imamk61_3_1_21	Individual
Own pension income - disability-2		K61_3_2	amk61_3_2_21	imamk61_3_2_21	Individual
Own other pension income-1		K61_4_1	amk61_4_1_21	imamk61_4_1_21	Individual
Own other pension income-2		K61_4_2	amk61_4_2_21	imamk61_4_2_21	Individual
Added variables					
Spouse's pension income - retirement-1		K67_1_1	amk67_1_1_21	imamk67_1_1_21	Individual
Spouse's pension income - retirement-2		K67_1_2	amk67_1_2_21	imamk67_1_2_21	Individual
Spouse's pension income - widow-1		K67_2_1	amk67_2_1_21	imamk67_2_1_21	Individual
Spouse's pension income - widow-2		K67_2_2	amk67_2_2_21	imamk67_2_2_21	Individual

Spouse's pension income - disability-1		K67_3_1	amk67_3_1_21	imamk67_3_1_21	Individual
Spouse's pension income - disability-2		K67_3_2	amk67_3_2_21	imamk67_3_2_21	Individual
Spouse's other pension income-1		K67_4_1	amk67_4_1_21	imamk67_4_1_21	Individual
Spouse's other pension income-2		K67_4_2	amk67_4_2_21	imamk67_4_2_21	Individual

Transfer income	inc_trans_21				
Added variables					
Covid Income		K77	amk77_21	imam77_21	Joint
Own transfer income from institutions-1		K80_1_1	amk80_1_1_21	imamk80_1_1_21	Individual
Own transfer income from institutions-2		K80_1_2	amk80_1_2_21	imamk80_1_2_21	Individual
Own transfer income from properties		K80_3	amk80_3_21	imamk80_3_21	Individual
Added variables					
Spouse's transfer income from institutions-1		K83_1_1	amk83_1_1_21	imamk83_1_1_21	Individual
Spouse's transfer income from institutions-2		K83_1_2	amk83_1_2_21	imamk83_1_2_21	Individual
Spouse's transfer income from properties		K83_2	amk83_2_21	imamk83_2_21	Individual

Tables 7. Distribution of Income and Assets (Derived and Imputed) by Range of Amount

Table 7.1. Total Individual Income

Amount	Derived Variable		Imputed Variable	
	Freq.	%	Freq.	%
1-1,550	1,553	22.4	2693	22.5
1,551-3,100	1,278	18.5	2063	17.3
3,101-5,250	1,323	19.1	2135	17.9
5,251-9,950	1,383	20.0	2333	19.5
>9,950	1,383	20.0	2734	22.9
Sub-total	6,920	100.0	11958	100.0
<=0	1,710	19.8	2872	19.4
Total	8,630		14830	

Table 7.2. Total Net Worth (Individual or Couple)

Amount	Derived Variable		Imputed Variable	
	Freq.	%	Freq.	%
1-50,000	1,024	21.1	1,220	12.3
50,001-320,000	934	19.2	1,757	17.7
320,001-660,000	963	19.8	1,927	19.4
660,001-1,221,000	967	19.9	2,220	22.3
>1,221,000	972	20.0	2,816	28.3
Sub-total	4,860	100.0	9,940	100.0
<=0	590	10.8	776	7.2
Total	5,450		10,716	

Tables 8. Mean Total Income at the Individual Level and Total Net Worth al the Household Level, and Distribution across Income Sources and Type of Assets by Key Characteristics

Table 8.1. Mean total income (monthly pesos) and distribution of income sources by characteristics for 2021 MHAS

Variables	Total income	% Distribution across Income Sources							
		Total	Earned	Pension	Transfer	Business	Property rent	Capital	Family help
Total (n=14,830)	9154	100.0	18.8	25.5	36.8	9.5	0.3	2.9	6.2
Gender									
Male	10833	100.0	24.3	29.7	30.2	9.4	0.3	2.5	3.7
Female	7953	100.0	13.5	21.4	43.4	9.5	0.2	3.3	8.6
Age									
Less than 50	4513	100.0	44.7	2.2	48.0	19.0	-18.5	0.6	3.9
50-59	7689	100.0	42.9	12.0	28.0	10.9	-0.5	1.4	5.2
60-69	10029	100.0	16.8	29.6	36.6	8.3	0.9	2.9	4.9
70 and more	10148	100.0	3.4	32.1	42.5	9.0	1.0	4.0	8.0
Urban/Rural									
Less urban	6306	100.0	17.7	20.3	31.9	18.7	-0.6	2.4	9.6
More urban	11363	100.0	19.3	27.8	39.0	5.5	0.6	3.1	4.7

Table 8.2. Total net value of assets and distribution of type of assets by key characteristics for 2021 MHAS

Variables	Total net value of assets	% Distribution across Type of Net Assets							
		Total	Housing	Business	Real estate	Capital assets	Vehicle	Assets not listed	(-) Debts
Total (n=10,716)	955770	100.0	80.2	2.4	4.7	1.4	3.1	8.8	0.7
Individual/couple									
One person	823731	100.0	81.8	2.1	4.5	1.3	1.9	9.0	0.6
Couple	1095885	100.0	78.9	2.6	4.8	1.5	4.1	8.7	0.7

Appendix A. Descriptive Statistics of Derived (Un-imputed) and Imputed Variables

Appendix A1 MHAS/ENASEM 2021
Total Sampled's Income Components
(Including zeros)

Variable	N	Mean	Std. Dev.	Minimum	Maximum

amk11_1_21	10496	1975.3	21853.0	0	1000000
imamk11_1_21	10716	2985.0	28377.4	0	1359949.82
amk11_2_21	10716	0.0	0.0	0	0
imamk11_2_21	10716	0.0	0.0	0	0
amk13_1_21	10517	1424.9	17893.0	0	1000000
imamk13_1_21	10716	2012.3	19610.5	0	1000000
amk13_2_21	10716	0.0	0.0	0	0
imamk13_2_21	10716	0.0	0.0	0	0
amk15_1_21	10526	904.5	9689.5	0	500000
imamk15_1_21	10716	1240.5	10816.6	0	500000
amk15_2_21	10716	0.0	0.0	0	0
imamk15_2_21	10716	0.0	0.0	0	0
amk27_1_21	10688	160.9	3523.1	0	300000
imamk27_1_21	10716	199.6	3731.4	0	300000
amk29_1_21	10263	142.5	7227.4	0	700000
imamk29_1_21	10716	223.1	7457.5	0	700000
amk36_1_21	10608	132.4	9764.2	0	1000000
imamk36_1_21	10716	362.3	10731.2	0	1000000
amk36_2_21	10708	3.7	168.6	0	12000
imamk36_2_21	10716	4.1	170.8	0	12000
amk36_3_21	10707	10.6	800.2	0	80000
imamk36_3_21	10716	11.1	800.5	0	80000
amk47a_21	10658	1144.3	4608.8	0	150000
imamk47a_21	10716	1193.0	4668.1	0	150000
amk48a_21	10658	116.2	1029.7	0	41666.67
imamk48a_21	10716	131.1	1074.0	0	41666.67
amk50a_21	10715	19.4	431.3	0	30000
imamk50a_21	10716	19.9	435.1	0	30000
amk51a_21	10716	0.3	14.3	0	1000
imamk51a_21	10716	0.3	14.3	0	1000
amk61_1_1_21	10597	1824.4	10041.4	0	500000
imamk61_1_1_21	10716	2002.1	10287.6	0	500000
amk61_1_2_21	10709	104.8	4924.4	0	500000
imamk61_1_2_21	10716	116.4	4954.1	0	500000
amk61_2_1_21	10669	391.5	1826.3	0	41000
imamk61_2_1_21	10716	422.4	1914.8	0	41000
amk61_2_2_21	10715	5.0	196.0	0	14000
imamk61_2_2_21	10716	5.8	211.8	0	14000
amk61_3_1_21	10713	29.5	484.2	0	27200
imamk61_3_1_21	10716	29.5	484.2	0	27200
amk61_3_2_21	10716	0.7	67.6	0	7000
imamk61_3_2_21	10716	0.7	67.6	0	7000
amk61_4_1_21	10711	63.7	931.9	0	50000
imamk61_4_1_21	10716	65.8	940.8	0	50000
amk61_4_2_21	10716	0.6	34.5	0	2500
imamk61_4_2_21	10716	0.6	34.5	0	2500
amk77_21	10650	143.6	1745.0	0	100000
imamk77_21	10716	174.6	1825.3	0	100000
amk80_1_1_21	10658	708.7	1626.6	0	110000
imamk80_1_1_21	10716	718.5	1637.0	0	110000
amk80_1_2_21	10701	11.1	256.3	0	20000
imamk80_1_2_21	10716	13.0	263.8	0	20000

Variable	N	Mean	Std. Dev.	Minimum	Maximum
amj36b_21	10698	57.099	1194.46	0	100000
imamj36b_21	10716	62.701	1209.67	0	100000
amg18a_21	9698	807.49	2294.91	0	100000
imamg18a_21	9963	846.86	2318.58	0	100000

Appendix A2 MHAS/ENASEM 2021

Total Spouse's Income Components

(Including zeros)

Variable	N	Mean	Std. Dev.	Minimum	Maximum
amk53a_21	5034	1749.3	10673.0	0	600000
imamk53a_21	5199	2131.0	10990.6	0	600000
amk54a_21	5018	128.6	1454.9	0	75000
imamk54a_21	5199	216.6	1600.4	0	75000
amk56a_21	5195	8.8	234.8	0	10000
imamk56a_21	5199	15.8	480.3	0	29361.55
amk57a_21	5197	0.2	9.3	0	583.3333333
imamk57a_21	5199	0.7	31.2	0	2000
amk67_1_1_21	5041	1334.9	4419.6	0	50000
imamk67_1_1_21	5199	1589.3	4743.0	0	50000
amk67_1_2_21	5193	20.3	503.2	0	25000
imamk67_1_2_21	5199	37.1	713.5	0	25000
amk67_2_1_21	5189	11.7	398.4	0	25000
imamk67_2_1_21	5199	11.7	398.0	0	25000
amk67_2_2_21	5199	0.0	0.0	0	0
imamk67_2_2_21	5199	0.0	0.0	0	0
amk67_3_1_21	5189	33.9	541.4	0	26000
imamk67_3_1_21	5199	40.1	650.5	0	26000
amk67_3_2_21	5199	0.8	55.5	0	4000
imamk67_3_2_21	5199	0.8	55.5	0	4000
amk67_4_1_21	5188	32.8	693.4	0	40000
imamk67_4_1_21	5199	32.9	692.8	0	40000
amk67_4_2_21	5199	0.3	21.5	0	1550
imamk67_4_2_21	5199	0.3	21.5	0	1550
amk83_1_1_21	5176	488.9	912.7	0	20000
imamk83_1_1_21	5199	494.2	918.1	0	20000
amk83_1_2_21	5191	9.5	299.0	0	20000
imamk83_1_2_21	5199	9.5	298.7	0	20000
amk83_2_21	5186	986.1	33784.6	0	2000000
imamk83_2_21	5199	1373.8	37526.2	0	2000000

Appendix A3 MHAS/ENASEM 2021

Total Assets and Household Components

(Including zeros)

Variable	N	Mean	Std. Dev.	Minimum	Maximum
amj31_21	7801	587029.1	918610.3	0	8000000
imamj31_21	10716	694757.8	889620.1	0	8000000
amj28_21	10581	6625.57	65827.06	0	3000000
imamj28_21	10716	10055.72	74813.26	0	3000000
amj26_21	10658	388.1627	11846.05	0	770000
imamj26_21	10716	448.3245	12009.32	0	770000
amj34_21	10376	56257.21	325374.7	0	8000000
imamj34_21	10716	81507.32	379189.8	0	8000000
amj20_21	10704	108.7995	700.2011	0	27000
imamj20_21	10716	111.9804	708.9066	0	27000
amk8_1_21	9326	0	0	0	0
imamk8_1_21	10716	24399.01	228345.28	0	9000000
amk8_2_21	10716	0	0	0	0
imamk8_2_21	10716	0	0	0	0
amk4_1_21	10649	1367.6	61439.23	0	6000000
imamk4_1_21	10716	1510.66	61660.57	0	6000000
amk4_2_21	10716	0	0	0	0
imamk4_2_21	10716	0	0	0	0
amk20_1_21	10703	412.3143	11822.65	0	650000
imamk20_1_21	10716	469.3601	12142.6	0	650000
amk24_1_21	10520	30986.15	251235.7	0	7000000
imamk24_1_21	10716	45378.18	285845.2	0	7000000
amk33_1_21	10504	8556.77	107693.3	0	5000000
imamk33_1_21	10716	12496.23	116930.3	0	5000000
amk33_2_21	10704	444.105	8482.17	0	500000
imamk33_2_21	10716	487.5211	8754.21	0	500000
amk33_3_21	10700	678.7196	35118.33	0	3000000
imamk33_3_21	10716	713.6343	35135.28	0	3000000
amk40_21	10676	2355.05	24806.86	0	1200000
imamk40_21	10716	2860.55	27126.66	0	1200000
amk42_21	10320	28116.88	100805.3	0	4300000
imamk42_21	10716	32831.99	105035	0	4300000
amk44_21	8484	53461	266419.7	0	8000000
imamk44_21	10716	84449.69	261403.3	0	8000000
amk86_21	10633	6009.21	48788.49	0	2000000
imamk86_21	10716	6355.08	48989.93	0	2000000
amk88_21	10163	5599.5	11273.69	100	600000
imamk88_21	10716	5748.74	11094.25	92.12682	600000

Appendix A4 MHAS/ENASEM 2021

Hospital and other utilization of services

(Including zeros)

Variable	N	Mean	Std. Dev.	Minimum	Maximum
amd6_21	10675	1714.71	14732.6	0	550000
imamd6_21	10739	1949.69	15302.45	0	550000
amd9_1_21	10644	1333.7	7110.9	0	300000
imamd9_1_21	10739	1398.48	7154.78	0	300000
amd9_2_21	10723	367.6435	4223.61	0	200000
imamd9_2_21	10739	387.6155	4292.77	0	200000
amd9_3_21	10560	1411.77	6483.94	0	216000
imamd9_3_21	10739	1510.83	6550.32	0	216000
amd12a_21	10514	772.6234	3040.49	0	100000
imamd12a_21	10739	805.4531	3041.43	0	100000
amsd5_21	1708	10692.05	46546.08	0	800000
imamsd5_21	1799	11245.37	47106.74	0	800000
amsd8_21	1653	7492.4	28777.94	0	600000
imamsd8_21	1799	8594.17	28995.21	0	600000
amsd10a_21	1615	5299.2	17609.9	0	380000
imamsd10a_21	1799	6309.96	17778.58	0	380000

Appendix A5 MHAS/ENASEM 2021

Pension Income and Death Expenditures

(Including zeros)

Variable	N	Mean	Std. Dev.	Minimum	Maximum
amk101_21	862	282.97564	1645.11	0	25000
imamk101_21	865	295.39128	1671.85	0	25000
amk103_21	852	1329.02	3159.68	0	40000
imamk103_21	865	1352.81	3192.26	0	40000
amk111_21	704	31410.65	36743.54	0	520000
imamk111_21	865	32562.84	35512.42	0	520000

Appendix A6 MHAS/ENASEM 2021

Help Given

(Including zeros)

Variable	N	Mean	Std. Dev.	Minimum	Maximum
amg8c_21	9849	347.14138	1918.65	0	80000
imamg8c_21	9963	375.8423	1956.54	0	80000

Appendix A7 MHAS/ENASEM 2021

Total Sampled's Income Components

(Without zeros)

Variable	N	Mean	Std. Dev.	Minimum	Maximum
amk11_1_21	948	21869.76	69691.28	100	1000000
imamk11_1_21	1121	28534.5	83512.49	98.955711	1359949.8
amk11_2_21	0	.	.	.	.
imamk11_2_21	0	.	.	.	.
amk13_1_21	1033	14506.97	55429.57	100	1000000
imamk13_1_21	1180	18274.2	56547.76	100	1000000
amk13_2_21	0	.	.	.	.
imamk13_2_21	0	.	.	.	.
amk15_1_21	986	9655.77	30308.67	100	500000
imamk15_1_21	1126	11805.21	31456.57	60.7843	500000
amk15_2_21	0	.	.	.	.
imamk15_2_21	0	.	.	.	.
amk27_1_21	166	10362.32	26412.22	280	300000
imamk27_1_21	184	11627.12	26107.98	280	300000
amk29_1_21	207	7064.47	50527.25	100	700000
imamk29_1_21	258	9266.03	47271.66	1	700000
amk36_1_21	117	12001.98	92596.62	100	1000000
imamk36_1_21	184	21097.15	79390.68	1	1000000
amk36_2_21	12	3297	3978.9	100	12000
imamk36_2_21	14	3111.71	3690.24	100	12000
amk36_3_21	6	18850	30737.84	1000	80000
imamk36_3_21	9	13233.33	25719.45	1000	80000
amk47a_21	10658	1144.31	4608.75	0	150000
imamk47a_21	10716	1192.96	4668.08	0	150000
amk48a_21	10658	116.17753	1029.71	0	41666.67
imamk48a_21	10716	131.05936	1074.04	0	41666.67
amk50a_21	10715	19.359216	431.27165	0	30000
imamk50a_21	10716	19.918643	435.12245	0	30000
amk51a_21	10716	0.3456669	14.312192	0	1000
imamk51a_21	10716	0.3456669	14.312192	0	1000
amk61_1_1_21	1862	10383.13	22026.95	300	500000
imamk61_1_1_21	1980	10835.66	21846.18	196.40583	500000
amk61_1_2_21	65	17271.54	61287.45	1150	500000
imamk61_1_2_21	72	17320.59	58323.89	72.913049	500000
amk61_2_1_21	907	4605.07	4455.3	500	41000
imamk61_2_1_21	952	4754.84	4548.5	500	41000
amk61_2_2_21	11	4854.55	3908.74	1550	14000
imamk61_2_2_21	12	5142.09	3857.65	1550	14000
amk61_3_1_21	78	4049.36	4016.57	350	27200
imamk61_3_1_21	78	4049.36	4016.57	350	27200
amk61_3_2_21	1	7000	.	7000	7000
imamk61_3_2_21	1	7000	.	7000	7000
amk61_4_1_21	184	3708.46	6102.2	450	50000
imamk61_4_1_21	187	3770.17	6078.46	450	50000
amk61_4_2_21	4	1725	529.9371	1300	2500
imamk61_4_2_21	4	1725	529.9371	1300	2500
amk77_21	619	2470.32	6834.46	100	100000
imamk77_21	676	2767.24	6760.56	100	100000
amk80_1_1_21	4269	1769.3	2174.68	100	110000
imamk80_1_1_21	4322	1781.5	2179.7	89.867171	110000
amk80_1_2_21	63	1887	2782.25	100	20000
imamk80_1_2_21	78	1792.07	2540.35	14.199836	20000

Variable	N	Mean	Std. Dev.	Minimum	Maximum
amj36b_21	164	3724.7	8937.89	200	100000
imamj36b_21	175	3839.48	8690.64	200	100000
amg18a_21	3159	2478.96	3467.99	2	100000
imamg18a_21	3405	2477.91	3419.04	1.8337444	100000

Appendix A8 MHAS/ENASEM 2021

Total Spouse's Income Components

(Without zeros)

Variable	N	Mean	Std. Dev.	Minimum	Maximum
amk53a_21	1002	8788.4	22601.42	120	600000
imamk53a_21	1159	9559.1	21705.8	1	600000
amk54a_21	581	1110.36	4149.49	11.666667	75000
imamk54a_21	745	1511.39	3991.92	1	75000
amk56a_21	12	3796.67	3216.51	600	10000
imamk56a_21	15	5479.36	7320.23	81.190479	29361.55
amk57a_21	3	319.44444	271.1003	41.666667	583.33333
imamk57a_21	5	749.16667	752.83261	41.666667	2000
amk67_1_1_21	812	8287.45	7980.99	600	50000
imamk67_1_1_21	961	8598	7841.21	11.151889	50000
amk67_1_2_21	19	5559.47	6366.55	1300	25000
imamk67_1_2_21	25	7725.2	6955.58	1300	25000
amk67_2_1_21	10	6095	7092.97	1350	25000
imamk67_2_1_21	10	6095	7092.97	1350	25000
amk67_2_2_21	0	.	.	.	.
imamk67_2_2_21	0	.	.	.	.
amk67_3_1_21	40	4395.55	4396.66	560	26000
imamk67_3_1_21	42	4960.05	5352.67	560	26000
amk67_3_2_21	1	4000	.	4000	4000
imamk67_3_2_21	1	4000	.	4000	4000
amk67_4_1_21	42	4049.05	6646.58	550	40000
imamk67_4_1_21	43	3976.98	6583.96	550	40000
amk67_4_2_21	1	1550	.	1550	1550
imamk67_4_2_21	1	1550	.	1550	1550
amk83_1_1_21	1484	1705.18	911.80273	110	20000
imamk83_1_1_21	1502	1710.69	914.84363	110	20000
amk83_1_2_21	27	1822.22	3796.06	100	20000
imamk83_1_2_21	35	1405.94	3409.03	1	20000
amk83_2_21	29	176341.38	423481.01	150	2000000
imamk83_2_21	32	223197.26	430138.13	150	2000000

Appendix A9 MHAS/ENASEM 2021

Total Assets and Household Components

(Without zeros)

Variable	N	Mean	Std. Dev.	Minimum	Maximum
amj31_21	4955	924200.55	1008436.5	200	8000000
imamj31_21	7834	950347.74	916341.96	200	8000000
amj28_21	300	233683.92	316372.18	110	3000000
imamj28_21	435	247717.49	281382.22	1	3000000
amj26_21	377	10973.58	62136.01	200	770000
imamj26_21	421	11411.51	59615.57	200	770000
amj34_21	699	835085.55	960365.26	500	8000000
imamj34_21	999	874306.74	921899.15	500	8000000
amj20_21	444	2622.95	2288.22	300	27000
imamj20_21	456	2631.54	2278.12	300	27000
amk8_1_21	0	.	.	.	.
imamk8_1_21	744	351424.40	798040.10	130	9000000
amk8_2_21	0	.	.	.	.
imamk8_2_21	0	.	.	.	.
amk4_1_21	89	163635.39	655662.9	200	6000000
imamk4_1_21	100	161882.66	620708	200	6000000
amk4_2_21	0	.	.	.	.
imamk4_2_21	0	.	.	.	.
amk20_1_21	25	176520	173049.64	3000	650000
imamk20_1_21	30	167655.44	159628.73	3000	650000
amk24_1_21	464	702530.82	980419.96	800	7000000
imamk24_1_21	655	742400.81	905768.59	800	7000000
amk33_1_21	428	210000.79	492820.58	100	5000000
imamk33_1_21	626	213913.08	437321.32	100	5000000
amk33_2_21	95	50038.95	75392.01	1000	500000
imamk33_2_21	103	50721.13	74011.29	1000	500000
amk33_3_21	12	605191.67	894675.66	2000	3000000
imamk33_3_21	22	347604.77	709619.57	1	3000000
amk40_21	210	119726.19	131574.62	3000	1200000
imamk40_21	242	126668.21	130265.16	3000	1200000
amk42_21	2797	103741.94	172205.64	700	4300000
imamk42_21	3193	110187.18	168841.71	217.20902	4300000
amk44_21	6548	69267.43	301452.52	100	8000000
imamk44_21	8273	109387.51	292889.2	100	8000000
amk86_21	1285	49724.48	132417.9	187	2000000
imamk86_21	1354	50296.19	129595.74	187	2000000
amk88_21	10163	5599.5	11273.69	100	600000
imamk88_21	10716	5748.74	11094.25	92.126822	600000

Appendix A10 MHAS/ENASEM 2021
Hospital and other utilization of services
(Without zeros)

Variable	N	Mean	Std. Dev.	Minimum	Maximum
amd6_21	380	48169.68	62203.42	300	550000
imamd6_21	441	47477.77	59566.79	300	550000
amd9_1_21	2940	4828.54	12893.02	1	300000
imamd9_1_21	3020	4972.93	12817.75	1	300000
amd9_2_21	205	19230.44	23938.91	1	200000
imamd9_2_21	215	19360.94	23571.32	1	200000
amd9_3_21	4012	3715.92	10104.97	1	216000
imamd9_3_21	4169	3891.77	10063.4	1	216000
amd12a_21	5484	1481.28	4083.56	1	100000
imamd12a_21	5694	1519.1	4045.17	1	100000
amsd5_21	284	64302.89	98023.53	2	800000
imamsd5_21	301	67210.72	97598.49	2	800000
amsd8_21	794	15598.16	39983.4	20	600000
imamsd8_21	869	17791.62	39719.9	10.41985	600000
amsd10a_21	1055	8112.05	21261.06	20	380000
imamsd10a_21	1172	9685.68	21274.28	20	380000

Appendix A11 MHAS/ENASEM 2021
Pension Income and Death Expenditures
(Without zeros)

Variable	N	Mean	Std. Dev.	Minimum	Maximum
amk101_21	49	4978.06	4968.55	500	25000
imamk101_21	51	5010.07	4919.94	500	25000
amk103_21	220	5146.93	4365.15	500	40000
imamk103_21	226	5177.77	4386.21	500	40000
amk111_21	648	34125.15	37069.75	1000	520000
imamk111_21	791	35609.17	35646.16	792.17477	520000

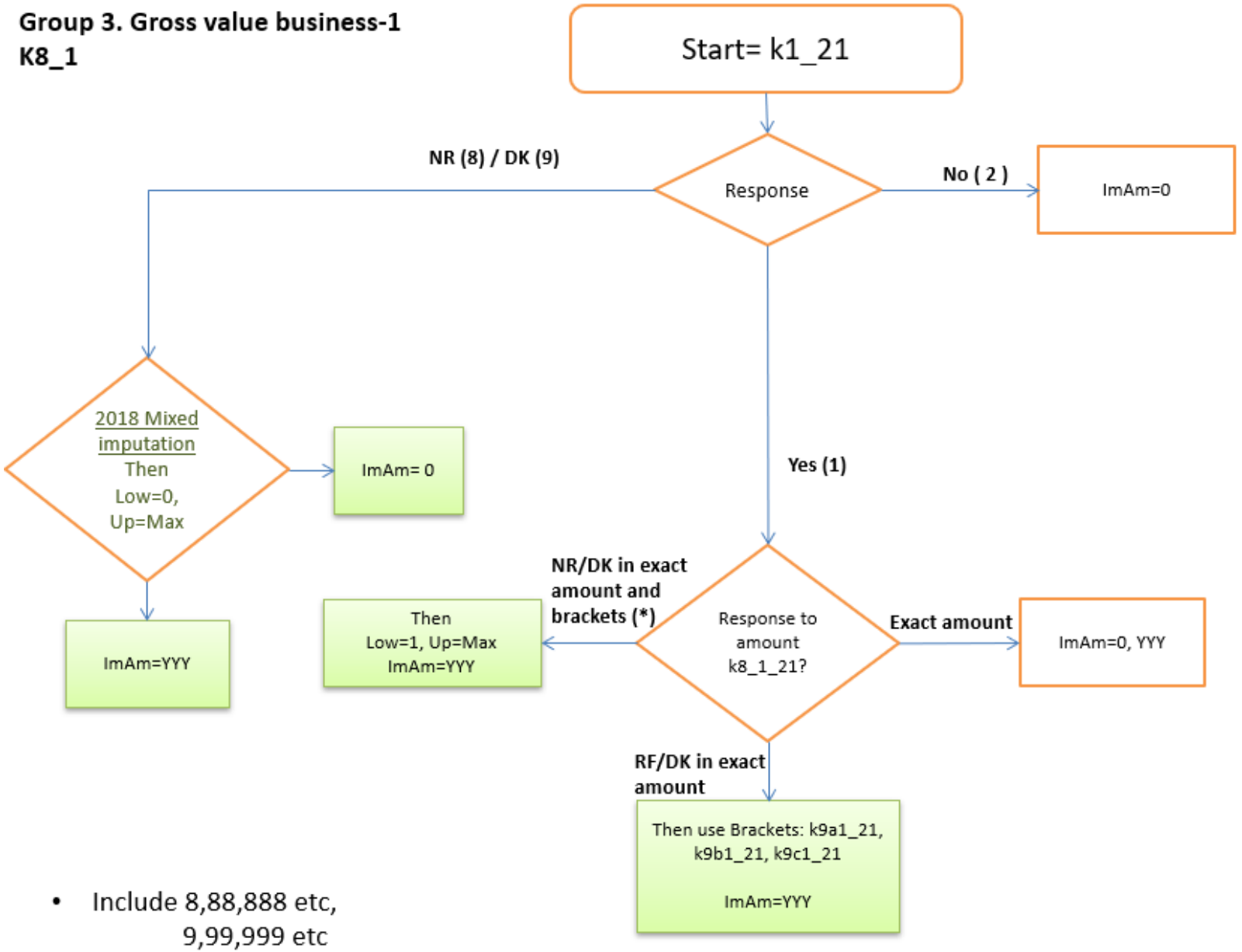
Appendix A12 MHAS/ENASEM 2021
Help Given
(Without zeros)

Variable	N	Mean	Std. Dev.	Minimum	Maximum
amg8c_21	1342	2547.69	4628.56	4.1666667	80000
imamg8c_21	1450	2582.43	4540.47	4.1666667	80000

Appendix B. SELECTED Diagrams of Procedure for Construction of the Imputed Variables

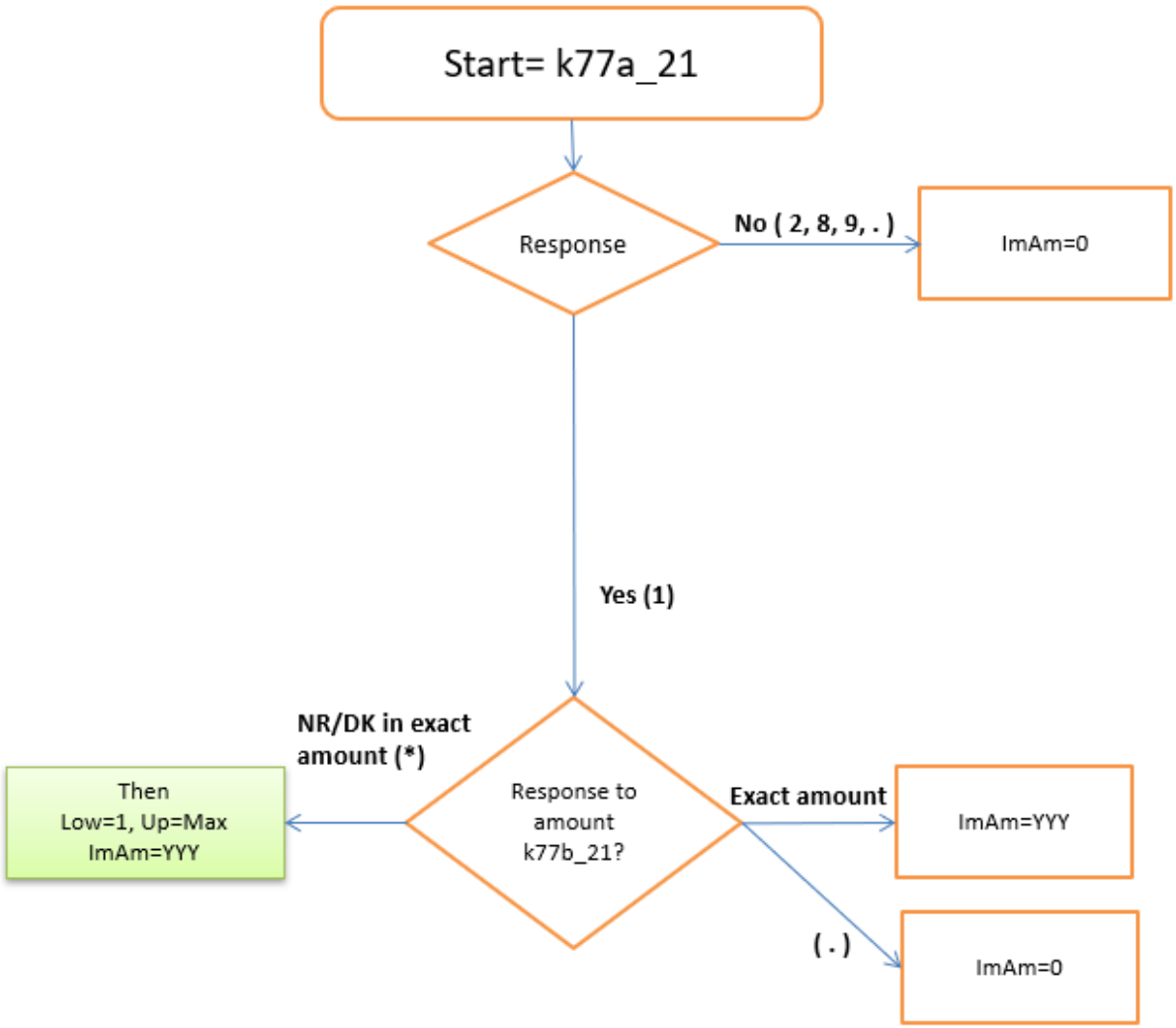
Note: for the construction of other imputed variables, please refer to "Imputation of Non-Response on Economic Variables in the Mexican Health and Aging Study (MHAS/ENASEM) 2018" Appendix B.

Group 3. Gross value business-1
K8_1



- Include 8,88,888 etc,
  9,99,999 etc

Group 1. Covid Income
K.77
Ex. K77_21



- Include 8,88,888 etc,
  9,99,999 etc

Appendix C. IVEWare Programs Used for Imputation

GROUP 1. Respondent's Total Income Components (Own or Joint Income)

```
/*******************************************************/
/* PROGRAM NAME : Impute2021_group1_core_help.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/5/2023 */
/* Impute missing value on core and proxy questionnaire */
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

proc contents data=output.Sect_g_j_k_sa_2021;
run;

data aa; set output.Sect_g_j_k_sa_2021; *** core and proxy questionnaire
N=10716;
proc sort out=temp nodupkey; by cunicah subhog_21 ; run; *** 10 duplicates;


***** Core questionnaire N=10716;
proc freq data=aa; table tipent_hh_21; run; ****core=1, proxy=2;

data aa1; set aa;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
g17_21 g18a_1_21 g18a_2_21 g18_monthly g18b1_21 g18b2_21;
if tipent_hh_21 = 1;
run;

data aa2; set aa1;
imamg18_21=g18_monthly;
if g17_21 =2 and missing(g18_monthly) then imamg18_21=0;
if missing(g17_21) and missing(g18_monthly) then imamg18_21=0;
*if g17_21 in (8,9) and g18_monthly=. then imamg18_21=.;
if g17_21=1 and g18a_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamg18_21=.;
if missing(imamg18_21) and (missing(g18b1_21) or g18b1_21=8) then
g18b1_21=9;
dumg18_21=(missing(imamg18_21)); ***imputation indicator;
run;

proc means data=aa2 n mean std min max nmiss;
variable imamg18_21 ;
run;

proc freq data=aa2;
tables dumg18_21;
run;
```

```
***** define range of imputation;
data aa3; set aa2;
if age_21 in (888, 999) then age_21=.;
lowg21=1; upg21=40000 ; ** Max=40000 ;
if g18b1_21=1 and g18b2_21=1 then do;
lowg21=500;
upg21=40000;
end;
if g18b1_21=1 and g18b2_21=2 then do;
lowg21=250; upg21=500;
end;
if g18b1_21=1 and g18b2_21=9 then do;
lowg21=250;
upg21=40000;
end;
if g18b1_21=2 then do;
lowg21=1;
upg21=250;
end;
if g18b1_21=9 then do;
lowg21=1;
upg21=40000;
end;
if g17_21 in (8,9) then lowg21=0;
if imamg18_21 >=0 then lowg21=imamg18_21;
if imamg18_21 >=0 then upg21=imamg18_21;
run;

proc freq data=aa3;
tables age_21;
run;

data output.group1_core_help;
set aa3;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21 imamg18_21 lowg21
upg21 dumg18_21;
run;

data dd1; set output.group1_core_help;run;

proc freq data=dd1;
tables yrschool;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
```

```
dataout dd_1;
categorical sex_21;
count age_21;
mixed imamg18_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowg21 upg21 dumg18_21;
bounds imamg18_21(<=upg21,>=lowg21)
yrschool(<=22, >=0)
age_21(<=107, >=17);
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data data imp.group1_core_help_imputed; set dd_1; drop lowg21 upg21; run;

*** check imputed amount;
proc freq data=imp.group1_core_help_imputed;
table imamg18_21;
where dumg18_21=1;
run;

*** print output: prior imputation/ without zero;
data group1;
set output.group1_core_help;
if imamg18_21=0 then imamg18_21=.;
run;

Title "Group1 core help - before imputation (mean without zero)";
proc means data=group1 n mean std min max  ;
variable imamg18_21;
run;

*** print output: prior imputation/ with zero;
Title "Group1 core help - before imputation (mean with zero)";
proc means data=output.group1_core_help n mean std min max nmiss;
variable imamg18_21 ;
run;

*** print output-imputed: mean with zero;
Title "Group1 core help - imputed (mean with zero)";
proc means n mean std min max  nmiss data=imp.group1_core_help_imputed;
var imamg18_21;
run;

*** print output-imputed: mean without zero;
data group2; set imp.group1_core_help_imputed;
if imamg18_21=0 then imamg18_21=.;
run;

Title "Group1 core help - imputed (mean without zero)";
```

```
proc means data=group2 n mean std min max ;
var imamg18_21;
run;
```

```
/*******************************************************/
/* PROGRAM NAME : Impute2021_group1_core_J36b.SAS */
/* PROGRAMMED BY : Brandon O'Grady */
/* LAST UPDATEED : 5/5/2023 */
/* Impute missing value on core and proxy questionnaire */
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

data aa; set output.sect_g_j_k_sa_2021; *** core and proxy questionnaire
N=11401;
proc sort out=temp nodupkey; by cunicah subhog_21; run; *** no duplicate;
***** Core questionnaire N=10718;
data aa1; set aa;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
j36a_21 j36b_21 j37a_21 j37b_21 j37c_21;
if tipent_hh_21 = 1;
run;
proc freq; table j36a_21 j36b_21; run;

data aa2; set aa1;
if age_21 in (888, 999) then age_21=.;
imamj36b_21=j36b_21;
**** Imputation N=45;
*if j36a_21 =1 and missing(j36b_21) then imamj36b_21=.;
if j36a_21 =2 and missing(j36b_21) then imamj36b_21=0;
*if j36a_21 in (8,9) and missing(j36b_21)=. then imamj36b_21=.;
if j36a_21=1 and j36b_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamj36b_21=.;
if missing(imamj36b_21) and missing(j37a_21) then j37a_21=9;
dumj36b_21=1*(missing(imamj36b_21));
run;
proc freq; table imamj36b_21 j37a_21 j37b_21 j37c_21 dumj36b_21; run;

proc freq data=aa2;
tables yrschool age_21;
run;

***** define range of imputation;
%macro range(vname,va,vb,vc,rmax,r1,r1_2,r2_1,mix1);
data data&vname
(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21 imam&vname
dum&vname  low&vname up&vname &mix1 );
set aa2;
low&vname=1; up&vname=&rmax;
if &va=1 and &vc=1 then do;
```

```
low&vname=&r1_2; up&vname=&rmax;
end;
if &va=1 and &vc=2 then do;
low&vname=&r1; up&vname=&r1_2;
end;
if &va=1 and &vc=9 then do;
low&vname=&r1; up&vname=&rmax;
end;
if &va=2 and &vb=1 then do;
low&vname=&r2_1;
up&vname=&r1;
end;
if &va=2 and &vb=2 then do;
low&vname=1; up&vname=&r2_1;
end;
if &va=2 and &vb=9 then do;
low&vname=1; up&vname=&r1;
end;
if &va=9 then do;
low&vname=1; up&vname=&rmax;
end;
if imam&vname >=0 then do;
low&vname=imam&vname;
up&vname=imam&vname;
end;
if &mix1 in (8,9) then do;
low&vname=0; up&vname=&rmax;
end;
%mend range;
%range(j36b_21,j37a_21,j37b_21,j37c_21, 30000,6500,18000,2000,j36a_21); run;
/* proc freq data=aa2; table imamj36b_21;run; */


data output.group1_core_j36b;
set dataj36b_21;
by cunicah subhog_21;
run;

data dd1;
set output.group1_core_j36b;
drop j36a_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
```

```
count age_21;
mixed imamj36b_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowj36b_21 upj36b_21
dumj36b_21
;
bounds
imamj36b_21 (>=lowj36b_21 ,<=upj36b_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group1_core_j36b_imputed;
set dd_1;
drop lowj36b_21 upj36b_21;
run;


*** print putput: prior imputation;
Title "Group 1 proxy J36b - before imputation (mean with zero)";
proc means data=output.group1_core_j36b n mean std min max nmiss;
variable imamj36b_21 ; run;

Title "Group 1 proxy J36b - before imputation (mean without zero)";
data group1; set output.group1_core_j36b;
if imamj36b_21 =0 then imamj36b_21 =.;
run;
proc means data=group1 mean std min max n nmiss ;
var imamj36b_21 ; run;

*** print putput: mean with zero;
Title "Group 1 proxy J36b - imputed (mean with zero)";
proc means n mean std min max nmiss data=imp.group1_core_j36b_imputed;
var imamj36b_21 ;
run;
*** print output: mean without zero;
data group2; set imp.group1_core_j36b_imputed;
if imamj36b_21 =0 then imamj36b_21 =.;
run;
Title "Group 1 proxy J36b - imputed (mean without zero)";
proc means data=group2 n mean std min max nmiss ;
var imamj36b_21 ; run;
```

```
/*******************************************************/
/* PROGRAM NAME : Imput2021_group1_core_pension.SAS */
/* PROGRAMMED BY : Brandon O'Grady */
/* LAST UPDATEED : 5/22/2023 */
/* Impute missing value on core and proxy questionnaire */
/*******************************************************/

Libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw'; run;
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021'; run;
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021'; run;


proc contents data=output.sect_g_j_k_sa_2021; run;


data aa; set output.sect_g_j_k_sa_2021; *** core and proxy questionnaire
N=11401;
proc sort nodupkey; by cunicah subhog_21; run; *** no duplicate;

data bb1; set aa;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
k1_21
k10_1_21 k11_1_21 k12a1_21 k12b1_21 k12c1_21
k13_1_21 k14a1_21 k14b1_21 k14c1_21
k15_1_21 k16a1_21 k16b1_21 k16c1_21
K10_2_21 k11_2_21 k12a2_21 k12b2_21 k12c2_21
k13_2_21 k14a2_21 k14b2_21 k14c2_21
k15_2_21 k16a2_21 k16b2_21 k16c2_21
k26_1_21
k27_1_21 k28a1_21 k28b1_21 k28c1_21
k17_21
k29_1_21 k30a1_21 k30b1_21 k30c1_21
k31a_21 k35_1_21 k36_1_21 k37a1_21 k37b1_21 k37c1_21
k31b_21 k35_2_21 k36_2_21 k37a2_21 k37b2_21 k37c2_21
k31c_21 k35_3_21 k36_3_21 k37a3_21 k37b3_21 k37c3_21
k47_21 k47a1_21 k47b1_21 k47b2_21 k47b3_21
k48_21 k48a1_21 k48b1_21 k48b2_21 k48b3_21 k48a_monthly_21
k50_21 k50a1_21 k50b1_21 k50b2_21 k50b3_21
k51_21 k51a1_21 k51b1_21 k51b2_21 k51b3_21 k51a_monthly_21
k58a_21 k61_1_1_21 k62a1_1_21 k62b1_1_21 k62c1_1_21
k61_1_2_21 k62a1_2_21 k62b1_2_21 k62c1_2_21
k58b_21 k61_2_1_21 k62a2_1_21 k62b2_1_21 k62c2_1_21
k61_2_2_21 k62a2_2_21 k62b2_2_21 k62c2_2_21
k58c_21 k61_3_1_21 k62a3_1_21 k62b3_1_21 k62c3_1_21
k61_3_2_21 k62a3_2_21 k62b3_2_21 k62c3_2_21
k58d_21 k61_4_1_21 k62a4_1_21 k62b4_1_21 k62c4_1_21
k61_4_2_21 k62a4_2_21 k62b4_2_21 k62c4_2_21
k79a_21 k80_1_1_21 k80_1_2_21
k79c_21 k80_3_21  k77a_21 k77b_21;
```

```
if tipent_hh_21 in (1);
run;

data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk11_1_21=k11_1_21; **** Imputation N=209;
if k1_21 =2 and missing(k11_1_21) then imamk11_1_21=0;
if k1_21=1 and k10_1_21=2 and missing(k11_1_21) then imamk11_1_21=0;
if k1_21=1 and k10_1_21=1 and k11_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk11_1_21=.;
if missing(imamk11_1_21) and missing(k12a1_21) then k12a1_21=9;
imamk11_2_21=k11_2_21; **** Imputation N=0;
if k1_21 in (2,8,9) and missing(k11_2_21) then imamk11_2_21=0;
if k1_21=1 and (k10_2_21=2 or missing(k10_2_21)) and missing(k11_2_21) then
imamk11_2_21=0;
if k1_21=1 and k10_2_21=1 and k11_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then
imamk11_2_21=.;
if missing(imamk11_2_21) and missing(k12a2_21) then k12a2_21=9;
imamk13_1_21=k13_1_21; **** Imputation N=189;
if k1_21 =2 and missing(k13_1_21) then imamk13_1_21=0;
if k1_21=1 and k13_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then
imamk13_1_21=.;
if missing(imamk13_1_21) and missing(k14a1_21) then k14a1_21=9;
imamk13_2_21=k13_2_21; **** Imputation N=0;
if k1_21 in (2,8,9) and missing(k13_2_21) then imamk13_2_21=0;
if k1_21=1 and k13_2_21=. then imamk13_2_21=0;
if k1_21=1 and k13_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then
imamk13_2_21=.;
if missing(imamk13_2_21) and missing(k14a2_21) then k14a2_21=9;
imamk15_1_21=k15_1_21; **** Imputation N=2=179;
if k1_21 =2 and missing(k15_1_21) then imamk15_1_21=0;
if k1_21=1 and k15_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then
imamk15_1_21=.;
if missing(imamk15_1_21) and missing(k16a1_21) then k16a1_21=9;
imamk15_2_21=k15_2_21; **** Imputation N=0;
if k1_21 in (2,8,9) and missing(k15_2_21) then imamk15_2_21=0;
if k1_21=1 and k15_2_21=. then imamk15_2_21=0;
if k1_21=1 and k15_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then
imamk15_2_21=.;
if missing(imamk15_2_21) and missing(k16a2_21) then k16a2_21=9;
dumk11_1_21=1*(missing(imamk11_1_21));
```

```
dumk11_2_21=1*(missing(imamk11_2_21));
dumk13_1_21=1*(missing(imamk13_1_21));
dumk13_2_21=1*(missing(imamk13_2_21));
dumk15_1_21=1*(missing(imamk15_1_21));
dumk15_2_21=1*(missing(imamk15_2_21));
run;

proc means data=bb2 n mean std min max nmiss;
variable imamk11_1_21 imamk11_2_21 imamk13_1_21 imamk13_2_21 imamk15_1_21
imamk15_2_21 ; run;

proc freq data=bb2;
tables k15_1_21;
run;

***** define range of imputation;
%macro range(vname,va,vb,vc,rmax,r1,r1_2,r2_1,mix1,mix2);
data data&vname(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
imam&vname dum&vname low&vname up&vname &mix1 &mix2 );
set bb2;
low&vname=1; up&vname=&rmax;
if &va=1 and &vc=1 then do;
low&vname=&r1_2;up&vname=&rmax;
end;
if &va=1 and &vc=2 then do;
low&vname=&r1; up&vname=&r1_2;
end;
if &va=1 and &vc=9 then do;
low&vname=&r1; up&vname=&rmax;
end;
if &va=2 and &vb=1 then do;
low&vname=&r2_1; up&vname=&r1;
end;
if &va=2 and &vb=2 then do;
low&vname=1; up&vname=&r2_1;
end;
if &va=2 and &vb=9 then do;
low&vname=1; up&vname=&r1;
end;
if &va=9 then do;
low&vname=1; up&vname=&rmax;
end;
if imam&vname >=0 then do;
low&vname=imam&vname;
up&vname=imam&vname;
end;
if &mix1 in (8,9) then do;
low&vname=0;
up&vname=&rmax;
end;
if &mix2 in (8,9) then do;
low&vname=0;
```

```
up&vname=&rmax;
end;
%mend range;
%range(k11_1_21,k12a1_21,k12b1_21,k12c1_21,6600000,60000,180000,20000,k1_21,
k10_1_21); run;
%range(k11_2_21,k12a2_21,k12b2_21,k12c2_21,600000,60000,180000,20000,k10_2_2
1);run;
%range(k13_1_21,k14a1_21,k14b1_21,k14c1_21,5300000,60000,180000,20000,k1_21,
k14a1_21); run; ****k14a1,k14a2 missing, then range 0-max;
%range(k13_2_21,k14a2_21,k14b2_21,k14c2_21,540000,60000,180000,20000,k14a2_2
1);run;
%range(k15_1_21,k16a1_21,k16b1_21,k16c1_21,5000000,20000,60000,7500,k1_21,k1
6a1_21);run; ****k16a1,k16a2 missing, then rang 0-max;
%range(k15_2_21,k16a2_21,k16b2_21,k16c2_21,60000,20000,60000,7500,k16a2_21);
run;

data output.group1_core_pension1;
merge datak11_1_21(drop=k1_21 k10_1_21)
datak11_2_21(drop=k10_2_21)
datak13_1_21(drop=k1_21 k14a1_21)
datak13_2_21(drop=k14a2_21)
datak15_1_21(drop=k1_21 k16a1_21)
datak15_2_21(drop=k16a2_21) ;
run;

data dd1; set output.group1_core_pension1; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk11_1_21 imamk11_2_21 imamk13_1_21 imamk13_2_21 imamk15_1_21
imamk15_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk11_1_21 upk11_1_21
lowk11_2_21 upk11_2_21
lowk13_1_21 upk13_1_21
lowk13_2_21 upk13_2_21
lowk15_1_21 upk15_1_21
lowk15_2_21 upk15_2_21
dumk11_1_21
dumk11_2_21
dumk13_1_21
dumk13_2_21
dumk15_1_21
dumk15_2_21
```

```
;
bounds
imamk11_1_21 (>=lowk11_1_21 ,<=upk11_1_21)
imamk11_2_21 (>=lowk11_2_21 ,<=upk11_2_21)
imamk13_1_21 (>=lowk13_1_21 ,<=upk13_1_21)
imamk13_2_21 (>=lowk13_2_21 ,<=upk13_2_21)
imamk15_1_21 (>=lowk15_1_21 ,<=upk15_1_21)
imamk15_2_21 (>=lowk15_2_21 ,<=upk15_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data data imp.group1_core_pension1_imputed;
set dd_1;
drop lowk11_1_21 upk11_1_21
lowk11_2_21 upk11_2_21
lowk13_1_21 upk13_1_21
lowk13_2_21 upk13_2_21
lowk15_1_21 upk15_1_21
lowk15_2_21 upk15_2_21;
run;

data tem; set imp.group1_core_pension1_imputed;
proc freq ; table imamk11_1_21 ; where dumk11_1_21=1; run;
proc freq; table imamk11_2_21; where dumk11_2_21=1; run;
proc freq; table imamk13_1_21; where dumk13_1_21 =1; run;
proc freq; table imamk13_2_21; where dumk13_2_21 =1; run;
proc freq; table imamk15_1_21; where dumk15_1_21 =1; run;
proc freq; table imamk15_2_21; where dumk15_2_21 =1; run;
proc means; var imamk11_1_21 imamk11_2_21 imamk13_1_21 imamk13_2_21
imamk15_1_21
imamk15_2_21; run;


********** 2 **********;
proc freq data=bb2;
tables imamk29_1_21;
run;

data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk27_1_21=k27_1_21; **** Imputation N=27;
if k17_21=2 and missing(k27_1_21) then imamk27_1_21=0;
if k17_21=1 and k26_1_21=2 and missing(k27_1_21) then imamk27_1_21=0;
if k17_21=1 and k26_1_21=1 and k27_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk27_1_21=.;
```

```
if missing(imamk27_1_21) and missing(k28a1_21) then k28a1_21=9;
imamk29_1_21=k29_1_21; **** Imputation N=418;
if k17_21=2 and missing(k29_1_21) then imamk29_1_21=0;
if k17_21=1 and k29_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk29_1_21=.;
if missing(imamk29_1_21) and missing(k30a1_21) then k30a1_21=9;
dumk27_1_21=1*(missing(imamk27_1_21));
dumk29_1_21=1*(missing(imamk29_1_21));
run;

/*
proc means data=bb2;
var imamk27_1_21 imamk29_1_21;
run;

proc freq data=bb2;
tables dumk27_1_21 dumk29_1_21;
run;
*/
%range(k27_1_21,k28a1_21,k28b1_21,k28c1_21,125000,6000,18000,2000,k17_21,k26
_1_21);run;
%range(k29_1_21,k30a1_21,k30b1_21,k30c1_21,400000,800,2500,200,k17_21,k30a1_
21);run;

data output.group1_core_pension2;
merge
datak27_1_21(drop=k17_21 k26_1_21)
datak29_1_21(drop=k17_21 k30a1_21);
run;

data dd1; set output.group1_core_pension2; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk27_1_21 imamk29_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk27_1_21 upk27_1_21
lowk29_1_21 upk29_1_21
dumk27_1_21
dumk29_1_21
;
bounds
imamk27_1_21 (>=lowk27_1_21 ,<=upk27_1_21)
```

```
imamk29_1_21 (>=lowk29_1_21 ,<=upk29_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data data imp.group1_core_pension2_imputed;
set dd_1;
drop lowk27_1_21 upk27_1_21
lowk29_1_21 upk29_1_21;
run;

proc freq; table imamk27_1_15; where dumk27_1_15 =1; run; **** imputed;
proc freq; table imamk29_1_15; where dumk29_1_15 =1; run; **** imputed;

***************** 3 ***********;
proc freq data=bb2;
tables imamk36_3_21;
run;

data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk36_1_21=k36_1_21; **** Imputation N=87;
if k31a_21=2 and missing(k36_1_21) then imamk36_1_21=0;
if k31a_21=1 and k35_1_21=2 and missing(k36_1_21) then imamk36_1_21=0;
if k31a_21=1 and k35_1_21=1 and k36_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk36_1_21=.;
if missing(imamk36_1_21) and missing(k37a1_21) then k37a1_21=9;
imamk36_2_21=k36_2_21; **** Imputation N=6;
if k31b_21=2 and missing(k36_2_21) then imamk36_2_21=0;
if k31b_21=1 and k35_2_21=2 and missing(k36_2_21) then imamk36_2_21=0;
if k31b_21=1 and k35_2_21=1 and k36_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk36_2_21=.;
if missing(imamk36_2_21) and missing(k37a2_21) then k37a2_21=9;
imamk36_3_21=k36_3_21; **** Imputation N=6;
if k31c_21=2 and missing(k36_3_21) then imamk36_3_21=0;
if k31c_21=1 and k35_3_21=2 and missing(k36_3_21) then imamk36_3_21=0;
if k31c_21=1 and k35_3_21=1 and k36_3_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk36_3_21=.;
if missing(imamk36_3_21) and missing(k37a3_21) then k37a3_21=9;
dumk36_1_21=1*(missing(imamk36_1_21));
dumk36_2_21=1*(missing(imamk36_2_21));
dumk36_3_21=1*(missing(imamk36_3_21));
run;
/* proc freq data=bb2; table k31b_15 k35_2_15 k36_2_15 k37a2_15; run;
```

```
proc print data=bb2; var k31a_21 k35_1_21 k36_1_21 k37a1_21; where
dumk36_1_21=1;
run;
proc print data=bb2; var k31b_21 k35_2_21 k36_2_21 k37a2_21; where
dumk36_2_21=1;
run;
proc print data=bb2; var k31c_21 k35_3_21 k36_3_21 k37a3_21; where
dumk36_3_21=1;
run;
proc freq data=bb2;
tables dumk36_1_21 dumk36_2_21 dumk36_3_21;
run;
*/

proc means data=bb2;
var imamk36_1_21 imamk36_2_21 imamk36_3_21;
run;

%range(k36_1_21,k37a1_21,k37b1_21,k37c1_21,600000,400,2000,200,k31a_21,k35_1
_21);run;
%range(k36_2_21,k37a2_21,k37b2_21,k37c2_21,89893,400,2000,200,k31b_21,k35_2_
21);run;
%range(k36_3_21,k37a3_21,k37b3_21,k37c3_21,750000,400,2000,200,k31c_21,k35_3
_21);run;

data output.group1_core_pension3;
merge datak36_1_21 datak36_2_21 datak36_3_21 ;
run;

data dd1;
set output.group1_core_pension3;
keep cunicah subhog_21 tipent_hh_21
lowk36_1_21 upk36_1_21
dumk36_1_21
imamk36_1_21
yrschool sex_21 age_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk36_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk36_1_21 upk36_1_21
dumk36_1_21
```

```
;
bounds
imamk36_1_21 (>=lowk36_1_21 ,<=upk36_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

/* proc print ; var dumk36_1_21 lowk36_1_21 upk36_1_21;
where dumk36_1_21=1; run; */

data dd1;
set output.group1_core_pension3;
keep cunicah subhog_21 tipent_hh_21
lowk36_2_21 upk36_2_21
dumk36_2_21
imamk36_2_21
yrschool sex_21 age_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk36_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk36_2_21 upk36_2_21
dumk36_2_21
;
bounds
imamk36_2_21 (>=lowk36_2_21 ,<=upk36_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

/*
proc print ;
```

```
var dumk36_2_21 lowk36_2_21 upk36_2_21;
where dumk36_2_21=1;
run;
*/
/*
proc print data=bb2;
var k31b_21 k36_2_21 k37a2_21 k37b2_21 k37c2_21;
where dumk36_2_21=1;
run;
*/

data dd1;
set output.group1_core_pension3;
keep cunicah subhog_21 tipent_hh_21
lowk36_3_21 upk36_3_21
dumk36_3_21
imamk36_3_21
yrschool sex_21 age_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_3;
categorical sex_21 ;
count age_21;
mixed imamk36_3_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk36_3_21 upk36_3_21
dumk36_3_21
;
bounds
imamk36_3_21 (>=lowk36_3_21 ,<=upk36_3_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

/*
proc print ;
var dumk36_3_21 lowk36_3_21 upk36_3_21;
where dumk36_3_21=1;
run;
*/
```

```
/*
proc print data=bb2;
var k31c_21 k36_3_21 k37a3_21 k37b3_21 k37c3_21;
where dumk36_3_21=1;
run;
*/

data data imp.group1_core_pension3_imputed;
merge dd_1 dd_2 dd_3;
by cunicah subhog_21;
drop lowk36_1_21 upk36_1_21
lowk36_2_21 upk36_2_21
lowk36_3_21 upk36_3_21;
run;

****************** 4 ********************;
/*
proc freq data=bb2;
tables imamk48_21;
run;

proc print data=bb2;
var k48_21 k48a_monthly_21 k48a1_21;
where missing(imamk48_21);
run;*/

data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk47_21=k47a1_21; **** Imputation N=51;
if k47_21 = 2 and missing(k47a1_21) then imamk47_21=0;
if missing(k47_21) and missing(k47a1_21) then imamk47_21=0;
if k47_21 = 1 and k47a1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk47_21=.;
if missing(imamk47_21) and missing(k47b1_21) then k47b1_21=9;
imamk48_21=k48a_monthly_21; **** Imputation N=51;
if k48_21 = 2 and missing(k48a_monthly_21) then imamk48_21=0;
if missing(k48_21) and missing(k48a_monthly_21) then imamk48_21=0;
*if k48_21 = 1 and k48a_monthly_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk48_21=.;
if k48_21 = 1 and k48a1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk48_21=.;
if missing(imamk48_21) and missing(k48b1_21) then k48b1_21=9;
imamk50_21=k50a1_21; **** Imputation N=1;
if k50_21 = 2 and missing(k50a1_21) then imamk50_21=0;
if missing(k50_21) and missing(k50a1_21) then imamk50_21=0;
if k50_21 = 1 and k50a1_21
in(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,9999
999) then imamk50_21=.;
if missing(imamk50_21) and missing(k50b1_21) then k50b1_21=9;
```

```
imamk51_21=k51a_monthly_21; **** Imputation N=0;
if k51_21 =2 and missing(k51a_monthly_21) then imamk51_21=0;
if missing(k51_21) and missing(k51a_monthly_21) then imamk51_21=0;
if k51_21 =1 and k51a1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk51_21=.;
if missing(imamk51_21) and missing(k51b1_21) then k51b1_21=9;
dumk47_21=1*(missing(imamk47_21));
dumk48_21=1*(missing(imamk48_21));
dumk50_21=1*(missing(imamk50_21));
dumk51_21=1*(missing(imamk51_21));
run;
/*
proc freq data=bb2;
tables dumk47_21 dumk48_21 dumk50_21 dumk51_21;
run;
proc means data=bb2;
var imamk47_21 imamk48_21 imamk50_21 imamk51_21;
run;
*/

%range(k47_21,k47b1_21,k47b2_21,k47b3_21, 800000,7500,15000,2000,k47_21);
run;
%range(k48_21,k48b1_21,k48b2_21,k48b3_21, 100000,7500,15000,2000,k48_21);
run;
%range(k50_21,k50b1_21,k50b2_21,k50b3_21, 140000,7500,15000,2000,k50_21);
run;
%range(k51_21,k51b1_21,k51b2_21,k51b3_21, 100000,7500,15000,2000,k51_21);
run; *max=3333.33 < upper range of the bracket(15000), and max of k57(2nd
job bonus from spouse) is also <15000, so use bonus from primary job as
refernce;

/*
proc print data=Datak51_21; var cunicah lowk51_21 upk51_21; where
dumk51_21=1;
run;
proc print data=bb2;  where cunicah=14785;
run;
*/

data output.group1_core_pension4;
merge
datak47_21(drop=k47_21)
datak48_21(drop=k48_21)
datak50_21(drop=k50_21)
datak51_21(drop=k51_21);
by cunicah subhog_21;
run;

data dd1; set output.group1_core_pension4; run;
```

```
options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk47_21 imamk48_21 imamk50_21 imamk51_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk47_21 upk47_21
lowk48_21 upk48_21
lowk50_21 upk50_21
lowk51_21 upk51_21
dumk47_21
dumk48_21
dumk50_21
dumk51_21
;
bounds
imamk47_21 (>=lowk47_21 ,<=upk47_21)
imamk48_21 (>=lowk48_21 ,<=upk48_21)
imamk50_21 (>=lowk50_21 ,<=upk50_21)
imamk51_21 (>=lowk51_21 ,<=upk51_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 1;
/*multiples 5;*/
seed 2018;
run;

data data imp.group1_core_pension4_imputed;
set dd_1;
drop lowk47_21 upk47_21
lowk48_21 upk48_21
lowk50_21 upk50_21
lowk51_21 upk51_21;
run;

proc contents data=imp.group1_core_pension4_imputed;
run;

/* data temp; set imp.group1_core_pension4_imputed; run;
proc freq; table imamk47_21; where dumk47_21 =1 ; run; *** imputed;
proc freq; table imamk48_21; where dumk48_21 =1; run; *** imputed;
proc freq; table imamk50_21; where dumk50_21 =1; run; *** imputed;
proc freq; table imamk51_21; where dumk51_21 =1; run; *** imputed; */
```

```
********* 5 *********;

data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk61_1_1_21=k61_1_1_21;**** Imputation N=90;
if k58a_21 =2 and missing(k61_1_1_21) then imamk61_1_1_21=0;
if missing(k58a_21) and missing(k61_1_1_21) then imamk61_1_1_21=0;
if k58a_21=1 and k61_1_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk61_1_1_21=.;
if missing(imamk61_1_1_21) and missing(k62a1_1_21) then k62a1_1_21=9;
imamk61_1_2_21=k61_1_2_21;**** Imputation N=5;
if k58a_21 in (2,8,9) and missing(k61_1_2_21) then imamk61_1_2_21=0;
if missing(k58a_21) and missing(k61_1_2_21) then imamk61_1_2_21=0;
if k58a_21 =1 and k61_1_2_21=. then imamk61_1_2_21=0;
if k58a_21=1 and k61_1_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk61_1_2_21=.;
if missing(imamk61_1_2_21) and missing(k62a1_2_21) then k62a1_2_21=9;
imamk61_2_1_21=k61_2_1_21;**** Imputation N=30;
if k58b_21 =2 and missing(k61_2_1_21) then imamk61_2_1_21=0;
if missing(k58b_21) and missing(k61_2_1_21) then imamk61_2_1_21=0;
if k58b_21=1 and k61_2_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk61_2_1_21=.;
if missing(imamk61_2_1_21) and missing(k62a2_1_21) then k62a2_1_21=9;
imamk61_2_2_21=k61_2_2_21;**** Imputation N=1;
if k58b_21 in (2,8,9) and missing(k61_2_2_21) then imamk61_2_2_21=0;
if missing(k58b_21) and missing(k61_2_2_21) then imamk61_2_2_21=0;
if k58b_21 =1 and k61_2_2_21=. then imamk61_2_2_21=0;
if k58b_21=1 and k61_2_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk61_2_2_21=.;
if missing(imamk61_2_2_21) and missing(k62a2_2_21) then k62a2_2_21=9;
imamk61_3_1_21=k61_3_1_21;**** Imputation N=3;
if k58c_21 =2 and missing(k61_3_1_21) then imamk61_3_1_21=0;
if missing(k58c_21) and missing(k61_3_1_21) then imamk61_3_1_21=0;
if k58c_21=1 and k61_3_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk61_3_1_21=.;
if missing(imamk61_3_1_21) and missing(k62a3_1_21) then k62a3_1_21=9;
imamk61_3_2_21=k61_3_2_21;**** Imputation N=0;
if k58c_21 in (2,8,9) and missing(k61_3_2_21) then imamk61_3_2_21=0;
if missing(k58c_21) and missing(k61_3_2_21) then imamk61_3_2_21=0;
if k58c_21 =1 and k61_3_2_21=. then imamk61_3_2_21=0;
if k58c_21=1 and k61_3_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk61_3_2_21=.;
if missing(imamk61_3_2_21) and missing(k62a3_2_21) then k62a3_2_21=9;
imamk61_4_1_21=k61_4_1_21;**** Imputation N=4;
if k58d_21 =2 and missing(k61_4_1_21) then imamk61_4_1_21=0;
```

```
if missing(k58d_21) and missing(k61_4_1_21) then imamk61_4_1_21=0;
if k58d_21=1 and k61_4_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk61_4_1_21=.;
if missing(imamk61_4_1_21) and missing(k62a4_1_21) then k62a4_1_21=9;
imamk61_4_2_21=k61_4_2_21;**** Imputation N=0;
if k58d_21 in (2,8,9) and missing(k61_4_2_21) then imamk61_4_2_21=0;
if missing(k58d_21) and missing(k61_4_2_21) then imamk61_4_2_21=0;
if k58d_21 =1 and k61_4_2_21=. then imamk61_4_2_21=0;
if k58d_21=1 and k61_4_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk61_4_2_21=.;
if missing(imamk61_4_2_21) and missing(k62a4_2_21) then k62a4_2_21=9;
dumk61_1_1_21=1*(missing(imamk61_1_1_21));
dumk61_1_2_21=1*(missing(imamk61_1_2_21));
dumk61_2_1_21=1*(missing(imamk61_2_1_21));
dumk61_2_2_21=1*(missing(imamk61_2_2_21));
dumk61_3_1_21=1*(missing(imamk61_3_1_21));
dumk61_3_2_21=1*(missing(imamk61_3_2_21));
dumk61_4_1_21=1*(missing(imamk61_4_1_21));
dumk61_4_2_21=1*(missing(imamk61_4_2_21));
run;
/*
proc freq data=bb2;
tables dumk61_1_1_21 dumk61_1_2_21 dumk61_2_1_21 dumk61_2_2_21 dumk61_3_1_21
dumk61_3_2_21 dumk61_4_1_21 dumk61_4_2_21;
run;
proc means data=bb2 max;
var imamk61_1_1_21 imamk61_1_2_21 imamk61_2_1_21 imamk61_2_2_21
imamk61_3_1_21 imamk61_3_2_21 imamk61_4_1_21 imamk61_4_2_21;
run;
*/
%range(k61_1_1_21,k62a1_1_21,k62b1_1_21,k62c1_1_21,
300000,2000,7500,950,k58a_21);run;
%range(k61_1_2_21,k62a1_2_21,k62b1_2_21,k62c1_2_21, 50000,2000,7500,950);
run;
%range(k61_2_1_21,k62a2_1_21,k62b2_1_21,k62c2_1_21,
88000,2000,7500,950,k58b_21);run;
%range(k61_2_2_21,k62a2_2_21,k62b2_2_21,k62c2_2_21, 8500,2000,7500,950);
run;
%range(k61_3_1_21,k62a3_1_21,k62b3_1_21,k62c3_1_21,
28000,2000,7500,950,k58c_21);run;
%range(k61_3_2_21,k62a3_2_21,k62b3_2_21,k62c3_2_21, 0,2000,7500,950); run;/*
no observation ; */
%range(k61_4_1_21,k62a4_1_21,k62b4_1_21,k62c4_1_21,
45000,2000,7500,950,k58d_21);run;
%range(k61_4_2_21,k62a4_2_21,k62b4_2_21,k62c4_2_21, 2500,2000,7500,950);
run;/* no observation ; */

data output.group1_core_pension5;
merge
datak61_1_1_21(drop=k58a_21) datak61_1_2_21
```

```
datak61_2_1_21(drop=k58b_21) datak61_2_2_21
datak61_3_1_21(drop=k58c_21) datak61_3_2_21
datak61_4_1_21(drop=k58d_21) datak61_4_2_21;
by cunicah subhog_21;
run;

****** run P5 section 1 - output dd_1;
data dd1;
set output.group1_core_pension5;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 imamk61_1_1_21 yrschool
lowk61_1_1_21 upk61_1_1_21
dumk61_1_1_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk61_1_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk61_1_1_21
upk61_1_1_21
dumk61_1_1_21
;
bounds
imamk61_1_1_21 (>=lowk61_1_1_21 ,<=upk61_1_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

****** run P5 section 1 - output dd_2;
data dd1;
set output.group1_core_pension5;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 imamk61_1_2_21 yrschool
lowk61_1_2_21 upk61_1_2_21
dumk61_1_2_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
```

```
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk61_1_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk61_1_2_21
upk61_1_2_21
dumk61_1_2_21
;
bounds
imamk61_1_2_21 (>=lowk61_1_2_21 ,<=upk61_1_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group1_core_pension5_imputed1; merge dd_1 dd_2; by cunicah
subhog_21;
drop lowk61_1_1_21 upk61_1_1_21
lowk61_1_2_21 upk61_1_2_21 ;
run;
proc freq; table imamk61_1_1_21; where dumk61_1_1_21 =1; run; *** imputed;
proc freq; table imamk61_1_2_21; where dumk61_1_2_21 =1; run; *** imputed;

****** run P5 section 2 - output dd_1;
data dd1;
set output.group1_core_pension5;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 imamk61_2_1_21 yrschool
lowk61_2_1_21 upk61_2_1_21
dumk61_2_1_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk61_2_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
```

```
lowk61_2_1_21
upk61_2_1_21
dumk61_2_1_21
;
bounds
imamk61_2_1_21 (>=lowk61_2_1_21 ,<=upk61_2_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

****** run P5 section 2 - output dd_2;
data dd1;
set output.group1_core_pension5;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 imamk61_2_2_21 yrschool
lowk61_2_2_21 upk61_2_2_21
dumk61_2_2_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk61_2_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk61_2_2_21
upk61_2_2_21
dumk61_2_2_21
;
bounds
imamk61_2_2_21 (>=lowk61_2_2_21 ,<=upk61_2_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group1_core_pension5_imputed2;
merge dd_1 dd_2;
```

```
by cunicah subhog_21;
drop lowk61_2_1_21 upk61_2_1_21
lowk61_2_2_21 upk61_2_2_21 ;
run;
proc freq; table imamk61_2_1_21; where dumk61_2_1_21 =1; run; *** imputed;
proc freq; table imamk61_2_2_21; where dumk61_2_2_21 =1; run; *** imputed;

****** run P5 section 3 - output dd_1;
data dd1;
set output.group1_core_pension5;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 imamk61_3_1_21 yrschool
lowk61_3_1_21 upk61_3_1_21
dumk61_3_1_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk61_3_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk61_3_1_21
upk61_3_1_21
dumk61_3_1_21
;
bounds
imamk61_3_1_21 (>=lowk61_3_1_21 ,<=upk61_3_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

****** run P5 section 3 - output dd_2;
data dd1;
set output.group1_core_pension5;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 imamk61_3_2_21 yrschool
lowk61_3_2_21 upk61_3_2_21
dumk61_3_2_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
```

```
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk61_3_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk61_3_2_21
upk61_3_2_21
dumk61_3_2_21
;
bounds
imamk61_3_2_21 (>=lowk61_3_2_21 ,<=upk61_3_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group1_core_pension5_imputed3;
merge dd_1 dd_2;
by cunicah subhog_21;
drop lowk61_3_1_21 upk61_3_1_21
lowk61_3_2_21 upk61_3_2_21 ;
run;
proc freq; table imamk61_3_1_21; where dumk61_3_1_21 =1; run; *** imputed;
proc freq; table imamk61_3_2_21; where dumk61_3_2_21 =1; run; *** imputed;


****** run P5 section 4 - output dd_1;
data dd1;
set output.group1_core_pension5;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 imamk61_4_1_21 yrschool
lowk61_4_1_21 upk61_4_1_21
dumk61_4_1_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
```

```
count age_21;
mixed imamk61_4_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk61_4_1_21
upk61_4_1_21
dumk61_4_1_21
;
bounds
imamk61_4_1_21 (>=lowk61_4_1_21 ,<=upk61_4_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

****** run P5 section 4 - output dd_2;
data dd1;
set output.group1_core_pension5;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 imamk61_4_2_21 yrschool
lowk61_4_2_21 upk61_4_2_21
dumk61_4_2_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk61_4_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk61_4_2_21
upk61_4_2_21
dumk61_4_2_21
;
bounds
imamk61_4_2_21 (>=lowk61_4_2_21 ,<=upk61_4_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;
```

```
data imp.group1_core_pension5_imputed4;
merge dd_1 dd_2;
by cunicah subhog_21;
drop lowk61_4_1_21 upk61_4_1_21
lowk61_4_2_21 upk61_4_2_21 ;
run;
proc freq; table imamk61_4_1_21; where dumk61_4_1_21 =1; run; *** imputed;
proc freq; table imamk61_4_2_21; where dumk61_4_2_21 =1; run; *** imputed;

********** 6 ********************;

data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk80_1_1_21=k80_1_1_21; **** Imputation N=45;
if k79a_21 =2 and missing(k80_1_1_21) then imamk80_1_1_21=0;
if missing(k79a_21) and missing(k80_1_1_21) then imamk80_1_1_21=0;
if k79a_21=1 and k80_1_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk80_1_1_21=.;
imamk80_3_21=k80_3_21; **** Imputation N=15;
if k79c_21 =2 and missing(k80_3_21) then imamk80_3_21=0;
if missing(k79c_21) and missing(k80_3_21) then imamk80_3_21=0;
if k79c_21=1 and k80_3_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9,9999998) then imamk80_3_21=.;
imamk80_1_2_21=k80_1_2_21; **** Imputation N=15;
if k79a_21 in (2, 8, 9) and missing(k80_1_2_21) then imamk80_1_2_21=0;
if missing(k79a_21) and missing(k80_1_2_21) then imamk80_1_2_21=0;
if k79a_21=1 and k80_1_2_21=. then imamk80_1_2_21=0;
if k79a_21=1 and k80_1_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk80_1_2_21=.;
dumk80_1_1_21=missing(imamk80_1_1_21);
dumk80_1_2_21=missing(imamk80_1_2_21);
dumk80_3_21=missing(imamk80_3_21);
run;

proc freq data=bb2;
tables dumk80_1_1_21 dumk80_1_2_21 dumk80_3_21;
run;
proc means data=bb2;
var imamk80_1_1_21 imamk80_1_2_21 imamk80_3_21;
run;

data datak80; set bb2
(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21 imamk80_1_1_21
imamk80_1_2_21 imamk80_3_21 k79a_21 k79c_21 dumk80_1_1_21 dumk80_1_2_21
dumk80_3_21);
lowk80_1_1_21=1; upk80_1_1_21=20000;
if k79a_21 in (8,9) then lowk80_1_1_21=0;
lowk80_1_2_21=1; upk80_1_2_21=20000;
```

```
lowk80_3_21=1; upk80_3_21=4000000;
if k79c_21 in (8,9) then lowk80_3_21=0;
if imamk80_1_1_21 >=0 then do;
lowk80_1_1_21=imamk80_1_1_21;upk80_1_1_21=imamk80_1_1_21; end;
if imamk80_1_2_21 >=0 then do; lowk80_1_2_21=imamk80_1_2_21;
upk80_1_2_21=imamk80_1_2_21; end;
if imamk80_3_21 >=0 then do; lowk80_3_21=imamk80_3_21;
upk80_3_21=imamk80_3_21; end;
run;

data output.group1_core_pension6;
set datak80(drop=k79a_21 k79c_21);
run;

data dd1; set output.group1_core_pension6;
keep cunicah subhog_21 tipent_hh_21
sex_21 age_21 yrschool
imamk80_1_1_21 lowk80_1_1_21 upk80_1_1_21 dumk80_1_1_21
imamk80_1_2_21 lowk80_1_2_21 upk80_1_2_21 dumk80_1_2_21
;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk80_1_1_21 imamk80_1_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk80_1_1_21 upk80_1_1_21
lowk80_1_2_21 upk80_1_2_21
dumk80_1_1_21
dumk80_1_2_21
;
bounds
imamk80_1_1_21 (>=lowk80_1_1_21 ,<=upk80_1_1_21)
imamk80_1_2_21 (>=lowk80_1_2_21 ,<=upk80_1_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 1;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group1_core_pension6;
```

```
keep cunicah subhog_21 tipent_hh_21
sex_21 age_21 yrschool
imamk80_3_21 lowk80_3_21 upk80_3_21 dumk80_3_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk80_3_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk80_3_21 upk80_3_21
dumk80_3_21
;
bounds
imamk80_3_21 (>=lowk80_3_21 ,<=upk80_3_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data data imp.group1_core_pension6_imputed; merge dd_1 dd_2; by cunicah
subhog_21;
drop lowk80_1_1_21 upk80_1_1_21
lowk80_1_2_21 upk80_1_2_21
lowk80_3_21 upk80_3_21 ;
run;

***************7*****************;
data bb3; set bb1;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
k77a_21 k77b_21;
run;

data bb4; set bb3;
if age_21 in (888, 999) then age_21=.;
imamk77_21 = k77b_21; ***imputation = N=62;
if k77a_21 =2 and missing(k77b_21) then imamk77_21=0;
if missing(k77a_21) and missing(k77b_21) then imamk77_21=0; *N=0;
if k77a_21 in (8,9) and missing(k77b_21) then imamk77_21=.;
```

```
if k77a_21=1 and k77b_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk77_21=.;
dumk77_21=(missing(imamk77_21)); ***imputation indicator;
run;

proc means data=bb4 n mean std min max nmiss;
variable imamk77_21 ;
run;


data datak77; set bb4
(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21 imamk77_21
k77a_21 k77b_21 dumk77_21);
lowk77_21=1; upk77_21=100000;
if k77a_21 in (8,9) then lowk77_21=0;
if imamk77_21 >=0 then do; lowk77_21=imamk77_21;upk77_21=imamk77_21; end;
run;

data output.group1_core_pension7;
set datak77(drop=k77a_21 k77b_21);
run;

data dd1; set output.group1_core_pension7; **** Core nonproxy N=10718
var=14;
keep cunicah subhog_21 tipent_hh_21
sex_21 age_21 yrschool
imamk77_21 lowk77_21 upk77_21 dumk77_21
;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21;
count age_21;
mixed imamk77_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk77_21 upk77_21 dumk77_21;
bounds imamk77_21(<=upk77_21,>=lowk77_21)
yrschool(<=22, >=0)
age_21(<=107, >=17);
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;
```

```
data data imp.group1_core_pension7_imputed;
set dd_1;
drop lowk77_21 upk77_21;
run;

proc means data=output.group1_core_pension7 n mean std min max nmiss  ;
variable imamk77_21;
run;

proc means data=imp.group1_core_pension7_imputed n mean std min max nmiss  ;
variable imamk77_21;
run;

data group11;
set output.group1_core_pension7;
if imamk77_21=0 then imamk77_21=.;
run;

proc means data=group11 n mean std min max  ;
variable imamk77_21;
run;

data group12;
set imp.group1_core_pension7_imputed;
if imamk77_21=0 then imamk77_21=.;
run;

proc means data=group12 n mean std min max  ;
variable imamk77_21;
run;
;
```

```
/*******************************************************/
/* PROGRAM NAME : Imput2021_group1_proxy_J36b.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/5/2023 */
/* Impute missing value on core and proxy questionnaire */
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

data aa; set output.sect_g_j_k_sa_2021; *** core and proxy questionnaire
N=11401;
proc sort nodupkey; by cunicah subhog_21; run; *** no duplicate;

***** Proxy questionnaire N=683;
data aa1; set aa;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
j36a_21 j36b_21 j37a_21 j37b_21 j37c_21
;
if tipent_hh_21 in (2);
run;

/*proc freq; table j36a_21 j36b_21; run;*/

data aa2; set aa1;
imamj36b_21=j36b_21;**** Imputation N=5;
if j36a_21 =2 and missing(j36b_21) then imamj36b_21=0;
if j36a_21=1 and j36b_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamj36b_21=.;
if missing(imamj36b_21) and missing(j37a_21) then j37a_21=9;
dumj36b_21=1*(missing(imamj36b_21));
run;

/*proc freq; table imamj36b_21 j37a_21 j37b_21 J37c_21 dumj36b_21; run;*/
/*proc means data=aa2; var imamj36b_21;run;*/

***** define range of imputation;
%macro range(vname,va,vb,vc,rmax,r1,r1_2,r2_1,mix1);
data data&vname
(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21 imam&vname
dum&vname  low&vname up&vname &mix1 );
set aa2;
low&vname=1; up&vname=&rmax;
if &va=1 and &vc=1 then do;
low&vname=&r1_2; up&vname=&rmax;
end;
if &va=1 and &vc=2 then do;
```

```
low&vname=&r1; up&vname=&r1_2;
end;
if &va=1 and &vc=9 then do;
low&vname=&r1; up&vname=&rmax;
end;
if &va=2 and &vb=1 then do;
low&vname=&r2_1;
up&vname=&r1;
end;
if &va=2 and &vb=2 then do;
low&vname=1; up&vname=&r2_1;
end;
if &va=2 and &vb=9 then do;
low&vname=1; up&vname=&r1;
end;
if &va=9 then do;
low&vname=1; up&vname=&rmax;
end;
if imam&vname >=0 then do;
low&vname=imam&vname;
up&vname=imam&vname;
end;
if &mix1 in (8,9) then do;
low&vname=0; up&vname=&rmax;
end;
%mend range;
%range(j36b_21,j37a_21,j37b_21,j37c_21, 30000,6500,18000,2000,j36a_21); run;

data output.group1_proxy_j36b;
set dataj36b_21;
by cunicah subhog_21; run;

data dd1; set output.group1_proxy_j36b; **** proxy N=683 var=10;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamj36b_21
lowj36b_21 upj36b_21
dumj36b_21
;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamj36b_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
```

```
lowj36b_21 upj36b_21
dumj36b_21
;
bounds
imamj36b_21 (>=lowj36b_21 ,<=upj36b_21)
yrschool(<=22, >=0)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data data imp.group1_proxy_j36b_imputed;
set dd_1 ;
drop
lowj36b_21 upj36b_21
;
run;
/*
proc freq; table imamj36b_21; where dumj36b_21=1; run; *** n=5;
*/

*** print putput: prior imputation;
Title "Group 1 proxy J36b - before imputation (mean with zero)";
proc means data=output.Group1_proxy_J36b n mean std min max nmiss;
variable imamj36b_21 ; run;

Title "Group 1 proxy J36b - before imputation (mean without zero)";
data group1; set output.Group1_proxy_J36b;
if imamj36b_21 =0 then imamj36b_21 =.;
run;
proc means data=group1 mean std min max n nmiss ;
var imamj36b_21 ; run;

*** print putput: mean with zero;
Title "Group 1 proxy J36b - imputed (mean with zero)";
proc means n mean std min max nmiss data=imp.Group1_proxy_J36b_imputed;
var imamj36b_21 ;
run;
*** print output: mean without zero;
data group2; set imp.Group1_proxy_J36b_imputed;
if imamj36b_21 =0 then imamj36b_21 =.;
run;
Title "Group 1 proxy J36b - imputed (mean without zero)";
proc means data=group2 n mean std min max nmiss ;
var imamj36b_21 ; run;
```

```
/*******************************************************/
/* PROGRAM NAME : Imput2021_group1_proxy_pension.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/23/2023 */
/* Impute missing value on core and proxy questionnaire */
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';


/*
proc contents data=output.sect_g_j_k_sa_2018; run;
*/

data aa; set output.sect_g_j_k_sa_2021; *** core and proxy questionnaire
N=10,716;
proc sort nodupkey; by cunicah subhog_21; run; *** no duplicate;

***** proxy questionnaire N=683;
data bb1; set aa;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
k1_21
k10_1_21 k11_1_21 k12a1_21 k12b1_21 k12c1_21
k13_1_21 k14a1_21 k14b1_21 k14c1_21
k15_1_21 k16a1_21 k16b1_21 k16c1_21
K10_2_21 k11_2_21 k12a2_21 k12b2_21 k12c2_21
k13_2_21 k14a2_21 k14b2_21 k14c2_21
k15_2_21 k16a2_21 k16b2_21 k16c2_21
k26_1_21
k27_1_21 k28a1_21 k28b1_21 k28c1_21
k17_21
k29_1_21 k30a1_21 k30b1_21 k30c1_21
k31a_21 k35_1_21 k36_1_21 k37a1_21 k37b1_21 k37c1_21
k31b_21 k35_2_21 k36_2_21 k37a2_21 k37b2_21 k37c2_21
k31c_21 k35_3_21 k36_3_21 k37a3_21 k37b3_21 k37c3_21
k47_21 k47a1_21 k47b1_21 k47b2_21 k47b3_21
k48_21 k48a1_21 k48b1_21 k48b2_21 k48b3_21 k48a_monthly_21
k50_21 k50a1_21 k50b1_21 k50b2_21 k50b3_21
k51_21 k51a1_21 k51b1_21 k51b2_21 k51b3_21 k51a_monthly_21
k58a_21 k61_1_1_21 k62a1_1_21 k62b1_1_21 k62c1_1_21
k61_1_2_21 k62a1_2_21 k62b1_2_21 k62c1_2_21
k58b_21 k61_2_1_21 k62a2_1_21 k62b2_1_21 k62c2_1_21
k61_2_2_21 k62a2_2_21 k62b2_2_21 k62c2_2_21
k58c_21 k61_3_1_21 k62a3_1_21 k62b3_1_21 k62c3_1_21
k61_3_2_21 k62a3_2_21 k62b3_2_21 k62c3_2_21
k58d_21 k61_4_1_21 k62a4_1_21 k62b4_1_21 k62c4_1_21
k61_4_2_21 k62a4_2_21 k62b4_2_21 k62c4_2_21
```

```
k79a_21 k80_1_1_21 k80_1_2_21
k79c_21 k80_3_21 k77a_21 k77b_21;
if tipent_hh_21 in (2);
run;

****************** 1 *********;
data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk11_1_21=k11_1_21; **** Imputation N=11;
if k1_21 =2 and missing(k11_1_21) then imamk11_1_21=0;
if k1_21=1 and k10_1_21=2 and missing(k11_1_21) then imamk11_1_21=0;
if k1_21=1 and k10_1_21=1 and k11_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk11_1_21=.;
if missing(imamk11_1_21) and missing(k12a1_21) then k12a1_21=9;
imamk11_2_21=k11_2_21; **** Imputation N=0;
if k1_21 in (2,8,9) and missing(k11_2_21) then imamk11_2_21=0;
if k1_21=1 and (k10_2_21=2 or missing(k10_2_21)) and missing(k11_2_21) then
imamk11_2_21=0;
if k1_21=1 and k10_2_21=1 and k11_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then
imamk11_2_21=.;
if missing(imamk11_2_21) and missing(k12a2_21) then k12a2_21=9;
imamk13_1_21=k13_1_21; **** Imputation N=10;
if k1_21 =2 and missing(k13_1_21) then imamk13_1_21=0;
if k1_21=1 and k13_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then
imamk13_1_21=.;
if missing(imamk13_1_21) and missing(k14a1_21) then k14a1_21=9;
imamk13_2_21=k13_2_21; **** Imputation N=0;
if k1_21 in (2,8,9) and missing(k13_2_21) then imamk13_2_21=0;
if k1_21=1 and k13_2_21=. then imamk13_2_21=0;
if k1_21=1 and k13_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then
imamk13_2_21=.;
if missing(imamk13_2_21) and missing(k14a2_21) then k14a2_21=9;
imamk15_1_21=k15_1_21; **** Imputation N=15;
if k1_21 =2 and missing(k15_1_21) then imamk15_1_21=0;
if k1_21=1 and k15_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then
imamk15_1_21=.;
if missing(imamk15_1_21) and missing(k16a1_21) then k16a1_21=9;
imamk15_2_21=k15_2_21; **** Imputation N=0;
if k1_21 in (2,8,9) and missing(k15_2_21) then imamk15_2_21=0;
if k1_21=1 and k15_2_21=. then imamk15_2_21=0;
if k1_21=1 and k15_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then
```

```
imamk15_2_21=.;
if missing(imamk15_2_21) and missing(k16a2_21) then k16a2_21=9;
dumk11_1_21=1*(missing(imamk11_1_21));
dumk11_2_21=1*(missing(imamk11_2_21));
dumk13_1_21=1*(missing(imamk13_1_21));
dumk13_2_21=1*(missing(imamk13_2_21));
dumk15_1_21=1*(missing(imamk15_1_21));
dumk15_2_21=1*(missing(imamk15_2_21));
run;
/*
proc freq data=bb2;
tables dumk11_1_21 dumk11_2_21 dumk13_1_21 dumk13_2_21 dumk15_1_21
dumk15_2_21;
run;
*/
/* proc means data=bb2 n mean std min max nmiss;
variable imamk11_1_21 imamk11_2_21 imamk13_1_21 imamk13_2_21 imamk15_1_21
imamk15_2_21 ; run; */

***** define range of imputation;
%macro range(vname,va,vb,vc,rmax,r1,r1_2,r2_1,mix1,mix2);
data data&vname(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
imam&vname dum&vname low&vname up&vname &mix1 &mix2 );
set bb2;
low&vname=1; up&vname=&rmax;
if &va=1 and &vc=1 then do;
low&vname=&r1_2;up&vname=&rmax;
end;
if &va=1 and &vc=2 then do;
low&vname=&r1; up&vname=&r1_2;
end;
if &va=1 and &vc=9 then do;
low&vname=&r1; up&vname=&rmax;
end;
if &va=2 and &vb=1 then do;
low&vname=&r2_1; up&vname=&r1;
end;
if &va=2 and &vb=2 then do;
low&vname=1; up&vname=&r2_1;
end;
if &va=2 and &vb=9 then do;
low&vname=1; up&vname=&r1;
end;
if &va=9 then do;
low&vname=1; up&vname=&rmax;
end;
if imam&vname >=0 then do;
low&vname=imam&vname;
up&vname=imam&vname;
end;
if &mix1 in (8,9) then do;
low&vname=0;
```

```
up&vname=&rmax;
end;
if &mix2 in (8,9) then do;
low&vname=0;
up&vname=&rmax;
end;
%mend range;
%range(k11_1_21,k12a1_21,k12b1_21,k12c1_21,6600000,60000,180000,20000,k1_21,
k10_1_21); run;
%range(k11_2_21,k12a2_21,k12b2_21,k12c2_21,600000,60000,180000,20000,k10_2_2
1);run;
%range(k13_1_21,k14a1_21,k14b1_21,k14c1_21,5300000,60000,180000,20000,k1_21,
k14a1_21); run; ****k14a1,k14a2 missing, then range 0-max;
%range(k13_2_21,k14a2_21,k14b2_21,k14c2_21,540000,60000,180000,20000,k14a2_2
1);run;
%range(k15_1_21,k16a1_21,k16b1_21,k16c1_21,5000000,20000,60000,7500,k1_21,k1
6a1_21);run; ****k16a1,k16a2 missing, then rang 0-max;
%range(k15_2_21,k16a2_21,k16b2_21,k16c2_21,60000,20000,60000,7500,k16a2_21);
run;


data output.group1_proxy_pension1;
merge datak11_1_21(drop=k1_21 k10_1_21)
datak11_2_21(drop=k10_2_21)
datak13_1_21(drop=k1_21 k14a1_21)
datak13_2_21(drop=k14a2_21)
datak15_1_21(drop=k1_21 k16a1_21)
datak15_2_21(drop=k16a2_21) ;
run;

**** dd_1;
data dd1; set output.group1_proxy_pension1;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk11_1_21
dumk11_1_21
lowk11_1_21 upk11_1_21
;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk11_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk11_1_21 upk11_1_21
```

```
dumk11_1_21
;
bounds
imamk11_1_21 (>=lowk11_1_21 ,<=upk11_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

**** dd_2;
data dd1; set output.group1_proxy_pension1;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk11_2_21
dumk11_2_21
lowk11_2_21 upk11_2_21
;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk11_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk11_2_21 upk11_2_21
dumk11_2_21
;
bounds
imamk11_2_21 (>=lowk11_2_21 ,<=upk11_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

*** dd_3;
data dd1; set output.group1_proxy_pension1;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk13_1_21
```

```
dumk13_1_21
lowk13_1_21 upk13_1_21
;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_3;
categorical sex_21 ;
count age_21;
mixed imamk13_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk13_1_21 upk13_1_21
dumk13_1_21
;
bounds
imamk13_1_21 (>=lowk13_1_21 ,<=upk13_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

*** dd_4;
data dd1; set output.group1_proxy_pension1;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk13_2_21
dumk13_2_21
lowk13_2_21 upk13_2_21
;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_4;
categorical sex_21 ;
count age_21;
mixed imamk13_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
```

```
lowk13_2_21 upk13_2_21
dumk13_2_21
;
bounds
imamk13_2_21 (>=lowk13_2_21 ,<=upk13_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

*** dd_5;
data dd1; set output.group1_proxy_pension1;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk15_1_21
dumk15_1_21
lowk15_1_21 upk15_1_21
;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_5;
categorical sex_21 ;
count age_21;
mixed imamk15_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk15_1_21 upk15_1_21
dumk15_1_21
;
bounds
imamk15_1_21 (>=lowk15_1_21 ,<=upk15_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

*** dd_6;
data dd1; set output.group1_proxy_pension1;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
```

```
imamk15_2_21
dumk15_2_21
lowk15_2_21 upk15_2_21
;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_6;
categorical sex_21 ;
count age_21;
mixed imamk15_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk15_2_21 upk15_2_21
dumk15_2_21
;
bounds
imamk15_2_21 (>=lowk15_2_21 ,<=upk15_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data data imp.group1_proxy_pension1_imputed;
merge dd_1 dd_2 dd_3 dd_4 dd_5 dd_6; by cunicah subhog_21;
drop lowk11_1_21 upk11_1_21
lowk11_2_21 upk11_2_21
lowk13_1_21 upk13_1_21
lowk13_2_21 upk13_2_21
lowk15_1_21 upk15_1_21
lowk15_2_21 upk15_2_21;
run;

/* data temp; set imp.group1_proxy_pension1_imputed; run;
proc freq ; table imamk11_1_21 ; where dumk11_1_21=1; run;
proc freq; table imamk11_2_21; where dumk11_2_21=1; run;
proc freq; table imamk13_1_21; where dumk13_1_21 =1; run;
proc freq; table imamk13_2_21; where dumk13_2_21 =1; run;
proc freq; table imamk15_1_21; where dumk15_1_21 =1; run;
proc freq; table imamk15_2_21; where dumk15_2_21 =1; run;
proc means; var imamk11_1_21 imamk11_2_21 imamk13_1_21 imamk13_2_21
imamk15_1_21
imamk15_2_21; run; */
```

```
data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk27_1_21=k27_1_21; **** Imputation N=5;
if k17_21=2 and missing(k27_1_21) then imamk27_1_21=0;
if k17_21=1 and k26_1_21=2 and missing(k27_1_21) then imamk27_1_21=0;
if k17_21=1 and k26_1_21=1 and k27_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk27_1_21=.;
if missing(imamk27_1_21) and missing(k28a1_21) then k28a1_21=9;
imamk29_1_21=k29_1_21; **** Imputation N=35;
if k17_21=2 and missing(k29_1_21) then imamk29_1_21=0;
if k17_21=1 and k29_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk29_1_21=.;
if missing(imamk29_1_21) and missing(k30a1_21) then k30a1_21=9;
dumk27_1_21=1*(missing(imamk27_1_21));
dumk29_1_21=1*(missing(imamk29_1_21));
run;
/*
proc means data=bb2;
var imamk27_1_21 imamk29_1_21;
run;
proc freq data=bb2;
tables dumk27_1_21 dumk29_1_21;
run;
*/
%range(k27_1_21,k28a1_21,k28b1_21,k28c1_21,125000,6000,18000,2000,k17_21,k26
_1_21);run;
%range(k29_1_21,k30a1_21,k30b1_21,k30c1_21,400000,800,2500,200,k17_21,k30a1_
21);run;

data output.group1_proxy_pension2;
merge
datak27_1_21(drop=k17_21 k26_1_21)
datak29_1_21(drop=k17_21 k30a1_21);
run;

data dd1; set output.group1_proxy_pension2; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk27_1_21 imamk29_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
```

```
lowk27_1_21 upk27_1_21
lowk29_1_21 upk29_1_21
dumk27_1_21
dumk29_1_21
;
bounds
imamk27_1_21 (>=lowk27_1_21 ,<=upk27_1_21)
imamk29_1_21 (>=lowk29_1_21 ,<=upk29_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data data imp.group1_proxy_pension2_imputed;
set dd_1;
drop lowk27_1_21 upk27_1_21
lowk29_1_21 upk29_1_21;
run;
/*
proc freq; table imamk27_1_21; where dumk27_1_21 =1; run; **** imputed;
proc freq; table imamk29_1_21; where dumk29_1_21 =1; run; **** imputed; */

***************** 3 ***********;

data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk36_1_21=k36_1_21; **** Imputation N=21;
if k31a_21=2 and missing(k36_1_21) then imamk36_1_21=0;
if k31a_21=1 and k35_1_21=2 and missing(k36_1_21) then imamk36_1_21=0;
if k31a_21=1 and k35_1_21=1 and k36_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk36_1_21=.;
if missing(imamk36_1_21) and missing(k37a1_21) then k37a1_21=9;
imamk36_2_21=k36_2_21; **** Imputation N=2;
if k31b_21=2 and missing(k36_2_21) then imamk36_2_21=0;
if k31b_21=1 and k35_2_21=2 and missing(k36_2_21) then imamk36_2_21=0;
if k31b_21=1 and k35_2_21=1 and k36_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk36_2_21=.;
if missing(imamk36_2_21) and missing(k37a2_21) then k37a2_21=9;
imamk36_3_21=k36_3_21; **** Imputation N=3;
if k31c_21=2 and missing(k36_3_21) then imamk36_3_21=0;
if k31c_21=1 and k35_3_21=2 and missing(k36_3_21) then imamk36_3_21=0;
if k31c_21=1 and k35_3_21=1 and k36_3_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk36_3_21=.;
if missing(imamk36_3_21) and missing(k37a3_21) then k37a3_21=9;
dumk36_1_21=1*(missing(imamk36_1_21));
```

```
dumk36_2_21=1*(missing(imamk36_2_21));
dumk36_3_21=1*(missing(imamk36_3_21));
run;
/*
proc freq data=bb2;
tables dumk36_1_21 dumk36_2_21 dumk36_3_21;
run;
proc means data=bb2;
var imamk36_1_21 imamk36_2_21 imamk36_3_21;
run;
*/

%range(k36_1_21,k37a1_21,k37b1_21,k37c1_21,600000,400,2000,200,k31a_21,k35_1
_21);run;
%range(k36_2_21,k37a2_21,k37b2_21,k37c2_21,89893,400,2000,200,k31b_21,k35_2_
21);run;
%range(k36_3_21,k37a3_21,k37b3_21,k37c3_21,750000,400,2000,200,k31c_21,k35_3
_21);run;

data output.group1_proxy_pension3;
merge datak36_1_21 datak36_2_21 datak36_3_21 ;
run;

data dd1;
set output.group1_proxy_pension3;
keep cunicah subhog_21 tipent_hh_21
lowk36_1_21 upk36_1_21
dumk36_1_21
imamk36_1_21
yrschool sex_21 age_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk36_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk36_1_21 upk36_1_21
dumk36_1_21
;
bounds
imamk36_1_21 (>=lowk36_1_21 ,<=upk36_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
```

```
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1;
set output.group1_proxy_pension3;
keep cunicah subhog_21 tipent_hh_21
lowk36_2_21 upk36_2_21
dumk36_2_21
imamk36_2_21
yrschool sex_21 age_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk36_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk36_2_21 upk36_2_21
dumk36_2_21
;
bounds
imamk36_2_21 (>=lowk36_2_21 ,<=upk36_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1;
set output.group1_proxy_pension3;
keep cunicah subhog_21 tipent_hh_21
lowk36_3_21 upk36_3_21
dumk36_3_21
imamk36_3_21
yrschool sex_21 age_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
```

```
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_3;
categorical sex_21 ;
count age_21;
mixed imamk36_3_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk36_3_21 upk36_3_21
dumk36_3_21
;
bounds
imamk36_3_21 (>=lowk36_3_21 ,<=upk36_3_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data data imp.group1_proxy_pension3_imputed;
merge dd_1 dd_2 dd_3;
by cunicah subhog_21;
drop lowk36_1_21 upk36_1_21
lowk36_2_21 upk36_2_21
lowk36_3_21 upk36_3_21;
run;


****************** 4 ********************;
data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk47_21=k47a1_21; **** Imputation N=7;
if k47_21 = 2 and missing(k47a1_21) then imamk47_21=0;
if missing(k47_21) and missing(k47a1_21) then imamk47_21=0;
if k47_21 = 1 and k47a1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk47_21=.;
if missing(imamk47_21) and missing(k47b1_21) then k47b1_21=9;
imamk48_21=k48a_monthly_21; **** Imputation N=7;
if k48_21 = 2 and missing(k48a_monthly_21) then imamk48_21=0;
if missing(k48_21) and missing(k48a_monthly_21) then imamk48_21=0;
*if k48_21 = 1 and k48a_monthly_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk48_21=.;
if k48_21 = 1 and k48a1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk48_21=.;
```

```
if missing(imamk48_21) and missing(k48b1_21) then k48b1_21=9;
imamk50_21=k50a1_21; **** Imputation N=0;
if k50_21 = 2 and missing(k50a1_21) then imamk50_21=0;
if missing(k50_21) and missing(k50a1_21) then imamk50_21=0;
if k50_21 = 1 and k50a1_21
in(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,9999
999) then imamk50_21=.;
if missing(imamk50_21) and missing(k50b1_21) then k50b1_21=9;
imamk51_21=k51a_monthly_21; **** Imputation N=0;
if k51_21 =2 and missing(k51a_monthly_21) then imamk51_21=0;
if missing(k51_21) and missing(k51a_monthly_21) then imamk51_21=0;
if k51_21 =1 and k51a1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk51_21=.;
if missing(imamk51_21) and missing(k51b1_21) then k51b1_21=9;
dumk47_21=1*(missing(imamk47_21));
dumk48_21=1*(missing(imamk48_21));
dumk50_21=1*(missing(imamk50_21));
dumk51_21=1*(missing(imamk51_21));
run;

/*
proc freq data=bb2;
tables dumk47_21 dumk48_21 dumk50_21 dumk51_21;
run;
proc means data=bb2;
var imamk47_21 imamk48_21 imamk50_21 imamk51_21;
run;
*/
%range(k47_21,k47b1_21,k47b2_21,k47b3_21, 800000,7500,15000,2000,k47_21);
run;
%range(k48_21,k48b1_21,k48b2_21,k48b3_21, 100000,7500,15000,2000,k48_21);
run;
%range(k50_21,k50b1_21,k50b2_21,k50b3_21, 140000,7500,15000,2000,k50_21);
run;
%range(k51_21,k51b1_21,k51b2_21,k51b3_21, 100000,7500,15000,2000,k51_21);
run; *max=3333.33 < upper range of the bracket(15000), and max of k57(2nd
job bonus from spouse) is also <15000, so use bonus from primary job as
refernce;


/*
proc print data=Datak51_21; var cunicah lowk51_21 upk51_21; where
dumk51_21=1;
run;
*/

data output.group1_proxy_pension4;
merge
datak47_21(drop=k47_21)
datak48_21(drop=k48_21)
datak50_21(drop=k50_21)
```

```
datak51_21(drop=k51_21);
by cunicah subhog_21;
run;

data dd1; set output.group1_proxy_pension4;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
imamk47_21 imamk51_21
lowk47_21 upk47_21
lowk51_21 upk51_21
dumk47_21
dumk51_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk47_21 imamk51_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk47_21 upk47_21
lowk51_21 upk51_21
dumk47_21
dumk51_21
;
bounds
imamk47_21 (>=lowk47_21 ,<=upk47_21)
imamk51_21 (>=lowk51_21 ,<=upk51_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 1;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group1_proxy_pension4;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
imamk48_21 lowk48_21 upk48_21 dumk48_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
```

```
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk48_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk48_21 upk48_21
dumk48_21
;
bounds
imamk48_21 (>=lowk48_21 ,<=upk48_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 1;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group1_proxy_pension4;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
imamk50_21 lowk50_21 upk50_21 dumk50_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_3;
categorical sex_21 ;
count age_21;
mixed imamk50_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk50_21 upk50_21
dumk50_21
;
bounds
imamk50_21 (>=lowk50_21 ,<=upk50_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 1;
/*multiples 5;*/
seed 2018;
run;
```

```
data data imp.group1_proxy_pension4_imputed;
merge dd_1 dd_2 dd_3;
by cunicah subhog_21;
drop lowk47_21 upk47_21
lowk48_21 upk48_21
lowk50_21 upk50_21
lowk51_21 upk51_21 ; run;

data data imp.group1_core_pension4_imputed;
set dd_1;
drop lowk47_21 upk47_21
lowk48_21 upk48_21
lowk50_21 upk50_21
lowk51_21 upk51_21;
run;

/* data temp; set imp.group1_proxy_pension4_imputed; run;
proc freq; table imamk47_21; where dumk47_21 =1 ; run; *** imputed;
proc freq; table imamk48_21; where dumk48_21 =1; run; *** imputed;
proc freq; table imamk50_21; where dumk50_21 =1; run; *** imputed;
proc freq; table imamk51_21; where dumk51_21 =1; run; *** imputed; */

********* 5 *********;

data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk61_1_1_21=k61_1_1_21;**** Imputation N=29;
if k58a_21 =2 and missing(k61_1_1_21) then imamk61_1_1_21=0;
if missing(k58a_21) and missing(k61_1_1_21) then imamk61_1_1_21=0;
if k58a_21=1 and k61_1_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk61_1_1_21=.;
if missing(imamk61_1_1_21) and missing(k62a1_1_21) then k62a1_1_21=9;
imamk61_1_2_21=k61_1_2_21;**** Imputation N=2;
if k58a_21 in (2,8,9) and missing(k61_1_2_21) then imamk61_1_2_21=0;
if missing(k58a_21) and missing(k61_1_2_21) then imamk61_1_2_21=0;
if k58a_21 =1 and k61_1_2_21=. then imamk61_1_2_21=0;
if k58a_21=1 and k61_1_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk61_1_2_21=.;
if missing(imamk61_1_2_21) and missing(k62a1_2_21) then k62a1_2_21=9;
imamk61_2_1_21=k61_2_1_21;**** Imputation N=17;
if k58b_21 =2 and missing(k61_2_1_21) then imamk61_2_1_21=0;
if missing(k58b_21) and missing(k61_2_1_21) then imamk61_2_1_21=0;
if k58b_21=1 and k61_2_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk61_2_1_21=.;
if missing(imamk61_2_1_21) and missing(k62a2_1_21) then k62a2_1_21=9;
imamk61_2_2_21=k61_2_2_21;**** Imputation N=0;
if k58b_21 in (2,8,9) and missing(k61_2_2_21) then imamk61_2_2_21=0;
if missing(k58b_21) and missing(k61_2_2_21) then imamk61_2_2_21=0;
if k58b_21 =1 and k61_2_2_21=. then imamk61_2_2_21=0;
```

```
if k58b_21=1 and k61_2_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk61_2_2_21=.;
if missing(imamk61_2_2_21) and missing(k62a2_2_21) then k62a2_2_21=9;
imamk61_3_1_21=k61_3_1_21;**** Imputation N=0;
if k58c_21 =2 and missing(k61_3_1_21) then imamk61_3_1_21=0;
if missing(k58c_21) and missing(k61_3_1_21) then imamk61_3_1_21=0;
if k58c_21=1 and k61_3_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk61_3_1_21=.;
if missing(imamk61_3_1_21) and missing(k62a3_1_21) then k62a3_1_21=9;
imamk61_3_2_21=k61_3_2_21;**** Imputation N=0;
if k58c_21 in (2,8,9) and missing(k61_3_2_21) then imamk61_3_2_21=0;
if missing(k58c_21) and missing(k61_3_2_21) then imamk61_3_2_21=0;
if k58c_21 =1 and k61_3_2_21=. then imamk61_3_2_21=0;
if k58c_21=1 and k61_3_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk61_3_2_21=.;
if missing(imamk61_3_2_21) and missing(k62a3_2_21) then k62a3_2_21=9;
imamk61_4_1_21=k61_4_1_21;**** Imputation N=0;
if k58d_21 =2 and missing(k61_4_1_21) then imamk61_4_1_21=0;
if missing(k58d_21) and missing(k61_4_1_21) then imamk61_4_1_21=0;
if k58d_21=1 and k61_4_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk61_4_1_21=.;
if missing(imamk61_4_1_21) and missing(k62a4_1_21) then k62a4_1_21=9;
imamk61_4_2_21=k61_4_2_21;**** Imputation N=0;
if k58d_21 in (2,8,9) and missing(k61_4_2_21) then imamk61_4_2_21=0;
if missing(k58d_21) and missing(k61_4_2_21) then imamk61_4_2_21=0;
if k58d_21 =1 and k61_4_2_21=. then imamk61_4_2_21=0;
if k58d_21=1 and k61_4_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk61_4_2_21=.;
if missing(imamk61_4_2_21) and missing(k62a4_2_21) then k62a4_2_21=9;
dumk61_1_1_21=1*(missing(imamk61_1_1_21));
dumk61_1_2_21=1*(missing(imamk61_1_2_21));
dumk61_2_1_21=1*(missing(imamk61_2_1_21));
dumk61_2_2_21=1*(missing(imamk61_2_2_21));
dumk61_3_1_21=1*(missing(imamk61_3_1_21));
dumk61_3_2_21=1*(missing(imamk61_3_2_21));
dumk61_4_1_21=1*(missing(imamk61_4_1_21));
dumk61_4_2_21=1*(missing(imamk61_4_2_21));
run;

/*
proc freq data=bb2;
tables dumk61_1_1_21 dumk61_1_2_21 dumk61_2_1_21 dumk61_2_2_21 dumk61_3_1_21
dumk61_3_2_21 dumk61_4_1_21 dumk61_4_2_21;
run;
proc means data=bb2 max;
var imamk61_1_1_21 imamk61_1_2_21 imamk61_2_1_21 imamk61_2_2_21
imamk61_3_1_21 imamk61_3_2_21 imamk61_4_1_21 imamk61_4_2_21;
```

```
run;
*/

%range(k61_1_1_21,k62a1_1_21,k62b1_1_21,k62c1_1_21,
300000,2000,7500,950,k58a_21);run;
%range(k61_1_2_21,k62a1_2_21,k62b1_2_21,k62c1_2_21, 50000,2000,7500,950);
run;
%range(k61_2_1_21,k62a2_1_21,k62b2_1_21,k62c2_1_21,
88000,2000,7500,950,k58b_21);run;
%range(k61_2_2_21,k62a2_2_21,k62b2_2_21,k62c2_2_21, 8500,2000,7500,950);
run;
%range(k61_3_1_21,k62a3_1_21,k62b3_1_21,k62c3_1_21,
28000,2000,7500,950,k58c_21);run;
%range(k61_3_2_21,k62a3_2_21,k62b3_2_21,k62c3_2_21, 0,2000,7500,950); run;/*
no observation ; */
%range(k61_4_1_21,k62a4_1_21,k62b4_1_21,k62c4_1_21,
45000,2000,7500,950,k58d_21);run;
%range(k61_4_2_21,k62a4_2_21,k62b4_2_21,k62c4_2_21, 2500,2000,7500,950);
run;/* no observation ; */

data output.group1_proxy_pension5;
merge
datak61_1_1_21(drop=k58a_21) datak61_1_2_21
datak61_2_1_21(drop=k58b_21) datak61_2_2_21
datak61_3_1_21(drop=k58c_21) datak61_3_2_21
datak61_4_1_21(drop=k58d_21) datak61_4_2_21;
by cunicah subhog_21;
run;

****** run P5 section 1 - output dd_1;
data dd1;
set output.group1_proxy_pension5;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 imamk61_1_1_21 yrschool
lowk61_1_1_21 upk61_1_1_21
dumk61_1_1_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk61_1_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk61_1_1_21
upk61_1_1_21
dumk61_1_1_21
```

```
;
bounds
imamk61_1_1_21 (>=lowk61_1_1_21 ,<=upk61_1_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

****** run P5 section 1 - output dd_2;
data dd1;
set output.group1_proxy_pension5;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 imamk61_1_2_21 yrschool
lowk61_1_2_21 upk61_1_2_21
dumk61_1_2_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk61_1_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk61_1_2_21
upk61_1_2_21
dumk61_1_2_21
;
bounds
imamk61_1_2_21 (>=lowk61_1_2_21 ,<=upk61_1_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group1_proxy_pension5_imputed1; merge dd_1 dd_2; by cunicah
subhog_21;
drop lowk61_1_1_21 upk61_1_1_21
lowk61_1_2_21 upk61_1_2_21 ;
run;
```

```
proc freq; table imamk61_1_1_21; where dumk61_1_1_21 =1; run; *** imputed;
proc freq; table imamk61_1_2_21; where dumk61_1_2_21 =1; run; *** imputed;

****** run P5 section 2 - output dd_1;
data dd1;
set output.group1_proxy_pension5;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 imamk61_2_1_21 yrschool
lowk61_2_1_21 upk61_2_1_21
dumk61_2_1_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk61_2_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk61_2_1_21
upk61_2_1_21
dumk61_2_1_21
;
bounds
imamk61_2_1_21 (>=lowk61_2_1_21 ,<=upk61_2_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

****** run P5 section 2 - output dd_2;
data dd1;
set output.group1_proxy_pension5;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 imamk61_2_2_21 yrschool
lowk61_2_2_21 upk61_2_2_21
dumk61_2_2_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
```

```
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk61_2_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk61_2_2_21
upk61_2_2_21
dumk61_2_2_21
;
bounds
imamk61_2_2_21 (>=lowk61_2_2_21 ,<=upk61_2_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group1_proxy_pension5_imputed2;
merge dd_1 dd_2;
by cunicah subhog_21;
drop lowk61_2_1_21 upk61_2_1_21
lowk61_2_2_21 upk61_2_2_21 ;
run;
proc freq; table imamk61_2_1_21; where dumk61_2_1_21 =1; run; *** imputed;
proc freq; table imamk61_2_2_21; where dumk61_2_2_21 =1; run; *** imputed;

****** run P5 section 3 - output dd_1;
data dd1;
set output.group1_proxy_pension5;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 imamk61_3_1_21 yrschool
lowk61_3_1_21 upk61_3_1_21
dumk61_3_1_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk61_3_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk61_3_1_21
upk61_3_1_21
```

```
dumk61_3_1_21
;
bounds
imamk61_3_1_21 (>=lowk61_3_1_21 ,<=upk61_3_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

****** run P5 section 3 - output dd_2;
data dd1;
set output.group1_proxy_pension5;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 imamk61_3_2_21 yrschool
lowk61_3_2_21 upk61_3_2_21
dumk61_3_2_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk61_3_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk61_3_2_21
upk61_3_2_21
dumk61_3_2_21
;
bounds
imamk61_3_2_21 (>=lowk61_3_2_21 ,<=upk61_3_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group1_proxy_pension5_imputed3;
merge dd_1 dd_2;
by cunicah subhog_21;
drop lowk61_3_1_21 upk61_3_1_21
```

```
lowk61_3_2_21 upk61_3_2_21 ;
run;
proc freq; table imamk61_3_1_21; where dumk61_3_1_21 =1; run; *** imputed;
proc freq; table imamk61_3_2_21; where dumk61_3_2_21 =1; run; *** imputed;

****** run P5 section 4 - output dd_1;
data dd1;
set output.group1_proxy_pension5;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 imamk61_4_1_21 yrschool
lowk61_4_1_21 upk61_4_1_21
dumk61_4_1_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk61_4_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk61_4_1_21
upk61_4_1_21
dumk61_4_1_21
;
bounds
imamk61_4_1_21 (>=lowk61_4_1_21 ,<=upk61_4_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

****** run P5 section 4 - output dd_2;
data dd1;
set output.group1_proxy_pension5;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 imamk61_4_2_21 yrschool
lowk61_4_2_21 upk61_4_2_21
dumk61_4_2_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
```

```
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk61_4_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk61_4_2_21
upk61_4_2_21
dumk61_4_2_21
;
bounds
imamk61_4_2_21 (>=lowk61_4_2_21 ,<=upk61_4_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group1_proxy_pension5_imputed4;
merge dd_1 dd_2;
by cunicah subhog_21;
drop lowk61_4_1_21 upk61_4_1_21
lowk61_4_2_21 upk61_4_2_21 ;
run;
proc freq; table imamk61_4_1_21; where dumk61_4_1_21 =1; run; *** imputed;
proc freq; table imamk61_4_2_21; where dumk61_4_2_21 =1; run; *** imputed;

********** 6 ********************;

data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk80_1_1_21=k80_1_1_21; **** Imputation N=13;
if k79a_21 =2 and missing(k80_1_1_21) then imamk80_1_1_21=0;
if missing(k79a_21) and missing(k80_1_1_21) then imamk80_1_1_21=0;
if k79a_21=1 and k80_1_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk80_1_1_21=.;
imamk80_3_21=k80_3_21; **** Imputation N=1;
if k79c_21 =2 and missing(k80_3_21) then imamk80_3_21=0;
if missing(k79c_21) and missing(k80_3_21) then imamk80_3_21=0;
if k79c_21=1 and k80_3_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9,9999998) then imamk80_3_21=.;
imamk80_1_2_21=k80_1_2_21;
if k79a_21 in (2, 8, 9) and missing(k80_1_2_21) then imamk80_1_2_21=0;
if missing(k79a_21) and missing(k80_1_2_21) then imamk80_1_2_21=0;
if k79a_21=1 and k80_1_2_21=. then imamk80_1_2_21=0;
```

```
if k79a_21=1 and k80_1_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk80_1_2_21=.;
dumk80_1_1_21=missing(imamk80_1_1_21);
dumk80_1_2_21=missing(imamk80_1_2_21);
dumk80_3_21=missing(imamk80_3_21);
run;
/*
proc freq data=bb2;
tables dumk80_1_1_21 dumk80_1_2_21 dumk80_3_21;
run;
proc means data=bb2;
var imamk80_1_1_21 imamk80_1_2_21 imamk80_3_21;
run;
*/

data datak80; set bb2
(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21 imamk80_1_1_21
imamk80_1_2_21 imamk80_3_21 k79a_21 k79c_21 dumk80_1_1_21 dumk80_1_2_21
dumk80_3_21);
lowk80_1_1_21=1; upk80_1_1_21=20000;
if k79a_21 in (8,9) then lowk80_1_1_21=0;
lowk80_1_2_21=1; upk80_1_2_21=20000;
lowk80_3_21=1; upk80_3_21=4000000;
if k79c_21 in (8,9) then lowk80_3_21=0;
if imamk80_1_1_21 >=0 then do;
lowk80_1_1_21=imamk80_1_1_21;upk80_1_1_21=imamk80_1_1_21; end;
if imamk80_1_2_21 >=0 then do; lowk80_1_2_21=imamk80_1_2_21;
upk80_1_2_21=imamk80_1_2_21; end;
if imamk80_3_21 >=0 then do; lowk80_3_21=imamk80_3_21;
upk80_3_21=imamk80_3_21; end;
run;

data output.group1_proxy_pension6;
set datak80(drop=k79a_21 k79c_21);
run;

data dd1; set output.group1_proxy_pension6; **** Core nonproxy N=683 var=14;
keep cunicah subhog_21 tipent_hh_21
sex_21 age_21 yrschool
imamk80_1_1_21 lowk80_1_1_21 upk80_1_1_21 dumk80_1_1_21
imamk80_1_2_21 lowk80_1_2_21 upk80_1_2_21 dumk80_1_2_21
;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
```

```
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk80_1_1_21 imamk80_1_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk80_1_1_21 upk80_1_1_21
lowk80_1_2_21 upk80_1_2_21
dumk80_1_1_21
dumk80_1_2_21
;
bounds
imamk80_1_1_21 (>=lowk80_1_1_21 ,<=upk80_1_1_21)
imamk80_1_2_21 (>=lowk80_1_2_21 ,<=upk80_1_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 1;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group1_proxy_pension6;
keep cunicah subhog_21 tipent_hh_21
sex_21 age_21 yrschool
imamk80_3_21 lowk80_3_21 upk80_3_21 dumk80_3_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk80_3_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk80_3_21 upk80_3_21
dumk80_3_21
;
bounds
imamk80_3_21 (>=lowk80_3_21 ,<=upk80_3_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
```

```
run;

data data imp.group1_proxy_pension6_imputed; merge dd_1 dd_2; by cunicah
subhog_21;
drop lowk80_1_1_21 upk80_1_1_21
lowk80_1_2_21 upk80_1_2_21
lowk80_3_21 upk80_3_21 ;
run;

***************7*****************;
data bb3; set bb1;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
k77a_21 k77b_21;
run;

data bb4; set bb3;
if age_21 in (888, 999) then age_21=.;
imamk77_21 = k77b_21; ***imputation N=4;
if k77a_21 =2 and missing(k77b_21) then imamk77_21=0;
if missing(k77a_21) and missing(k77b_21) then imamk77_21=0; *N=0;
if k77a_21 in (8,9) and missing(k77b_21) then imamk77_21=.;
if k77a_21=1 and k77b_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk77_21=.;
dumk77_21=(missing(imamk77_21)); ***imputation indicator;
run;

proc means data=bb4 n mean std min max nmiss;
variable imamk77_21 ;
run;


data datak77; set bb4
(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21 imamk77_21
k77a_21 k77b_21 dumk77_21);
lowk77_21=1; upk77_21=100000;
if k77a_21 in (8,9) then lowk77_21=0;
if imamk77_21 >=0 then do; lowk77_21=imamk77_21;upk77_21=imamk77_21; end;
run;

data output.group1_proxy_pension7;
set datak77(drop=k77a_21 k77b_21);
run;

data dd1; set output.group1_proxy_pension7;
keep cunicah subhog_21 tipent_hh_21
sex_21 age_21 yrschool
imamk77_21 lowk77_21 upk77_21 dumk77_21
;
run;
```

```
options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21;
count age_21;
mixed imamk77_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk77_21 upk77_21 dumk77_21;
bounds imamk77_21(<=upk77_21,>=lowk77_21)
yrschool(<=22, >=0)
age_21(<=107, >=17);
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data data imp.group1_proxy_pension7_imputed;
set dd_1;
drop lowk77_21 upk77_21;
run;



proc means data=output.group1_proxy_pension4 n mean std min max nmiss  ;
variable imamk48_21;
run;

proc means data=imp.group1_proxy_pension7_imputed n mean std min max nmiss
;
variable imamk77_21;
run;

data group11;
set output.group1_proxy_pension7;
if imamk77_21=0 then imamk77_21=.;
run;

proc means data=group11 n mean std min max  ;
variable imamk77_21;
run;



data group14;
set imp.group1_proxy_pension7_imputed;
if imamk77_21=0 then imamk77_21=.;
```

```
run;

proc means data=group14 n mean std min max  ;
variable imamk77_21;
run;




;
```

```
/*******************************************************/
/* PROGRAM NAME : Imput2021_group1_report.SAS */
/* PROGRAMMED BY : Brandon O'Grady */
/* LAST UPDATEED : 5/25/2023 */
/* Descriptive Statistics of Derived (Un-imputed) and Imputed Variables
*/
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

******************** core/help ************************;
*** print output: prior imputation/ with zero;
Title "Group1 core help - before imputation (mean with zero)";
proc means data=output.group1_core_help n nmiss mean std min max ;
variable imamg18_21;
run;

*** print output: prior imputation/ without zero;
data group1; set output.group1_core_help;
if imamg18_21=0 then imamg18_21=.;
run;
Title "Group1 core help - before imputation (mean without zero)";
proc means data=group1 n nmiss mean std min max  ;
variable imamg18_21; run;

*** print output-imputed: mean with zero;
Title "Group1 core help - imputed (mean with zero)";
proc means n nmiss mean std min max data=imp.group1_core_help_imputed;
var imamg18_21;
run;

*** print output-imputed: mean without zero;
data group2; set imp.group1_core_help_imputed;
if imamg18_21=0 then imamg18_21=.;
run;
Title "Group1 core help - imputed (mean without zero)";
proc means data=group2 n mean std min max ;
var imamg18_21;
run;

******************** core/j36b ************************;
*** print putput: prior imputation;
Title "Group 1 core J36b - before imputation (mean with zero)";
proc means data=output.Group1_core_J36b n nmiss mean std min max;
variable imamj36b_21 ; run;
Title "Group 1 core J36b - before imputation (mean without zero)";
data group1; set output.Group1_core_J36b;
```

```
if imamj36b_21 =0 then imamj36b_21 =.;
run;
proc means data=group1 n mean std min max ;
var imamj36b_21 ; run;

*** print putput: mean with zero;
Title "Group 1 core J36b - imputed (mean with zero)";
proc means n nmiss mean std min max data=imp.Group1_core_J36b_imputed;
var imamj36b_21 ;
run;
*** print output: mean without zero;
data group2; set imp.Group1_core_J36b_imputed;
if imamj36b_21 =0 then imamj36b_21 =.;
run;
Title "Group 1 core J36b - imputed (mean without zero)";
proc means data=group2 n mean std min max ;
var imamj36b_21 ; run;

************* proxy/j36b ************************;
data out1;
set output.Group1_proxy_J36b;
by cunicah subhog_21;
rename imamj36b_21=amj36b_21;run;
data imp1;
set imp.Group1_proxy_j36b_imputed;
by cunicah subhog_21; run;

data out_imp1;
merge out1 imp1;
by cunicah subhog_21; run;

*** print putput;
Title "Group1 proxy J36b - mean with zero";
proc means data=out_imp1 n nmiss mean std min max ;
variable amj36b_21 imamj36b_21 ; run;

Title "Group1 proxy J36b - mean without zero";
data out_imp2; set out_imp1;
if imamj36b_21 =0 then imamj36b_21 =.;
if amj36b_21 =0 then amj36b_21 =.;
run;
proc means data=out_imp2 n mean std min max ;
variable amj36b_21 imamj36b_21 ;
run;

proc contents data=output.group1_core_pension4;
run;


************* core/pension ************************;
data out1;
merge output.group1_core_pension1 output.group1_core_pension2
```

```
output.group1_core_pension3 output.group1_core_pension4
output.group1_core_pension5 output.group1_core_pension6
output.group1_core_pension7 ;
by cunicah subhog_21;
rename imamk11_1_21=amk11_1_21 imamk11_2_21=amk11_2_21
imamk13_1_21=amk13_1_21 imamk13_2_21=amk13_2_21 imamk15_1_21=amk15_1_21
imamk15_2_21=amk15_2_21
imamk27_1_21=amk27_1_21 imamk29_1_21=amk29_1_21
imamk36_1_21=amk36_1_21 imamk36_2_21=amk36_2_21 imamk36_3_21=amk36_3_21
imamk47_21=amk47_21 imamk48_21=amk48_21 imamk50_21=amk50_21
imamk51_21=amk51_21
imamk61_1_1_21=amk61_1_1_21 imamk61_1_2_21=amk61_1_2_21
imamk61_2_1_21=amk61_2_1_21 imamk61_2_2_21=amk61_2_2_21
imamk61_3_1_21=amk61_3_1_21 imamk61_3_2_21=amk61_3_2_21
imamk61_4_1_21=amk61_4_1_21 imamk61_4_2_21=amk61_4_2_21
imamk77_21=amk77_21
imamk80_1_1_21=amk80_1_1_21 imamk80_1_2_21=amk80_1_2_21
imamk80_3_21=amk80_3_21;run;

proc contents data=out1;
run;


data imp1;
merge imp.group1_core_pension1_imputed imp.group1_core_pension2_imputed
imp.group1_core_pension3_imputed imp.group1_core_pension4_imputed
imp.group1_core_pension5_imputed1 imp.group1_core_pension5_imputed2
imp.group1_core_pension5_imputed3
imp.group1_core_pension5_imputed4 imp.group1_core_pension6_imputed
imp.group1_core_pension7_imputed;
by cunicah subhog_21; run;

proc contents data=Group1_pension4_imp;
run;

data out_imp1;
merge out1 imp1;
by cunicah subhog_21; run;

proc contents data=out_imp1;
run;


*** print putput;
Title "Group1 core pension - mean with zero";
proc means data=out_imp1 n nmiss mean std min max ;
variable amk11_1_21 imamk11_1_21 amk11_2_21 imamk11_2_21 amk13_1_21
imamk13_1_21 amk13_2_21 imamk13_2_21 amk15_1_21 imamk15_1_21 amk15_2_21
imamk15_2_21
amk27_1_21 imamk27_1_21 amk29_1_21 imamk29_1_21
amk36_1_21 imamk36_1_21 amk36_2_21 imamk36_2_21 amk36_3_21 imamk36_3_21
amk47_21 imamk47_21 amk48_21 amk50_21  amk51_21 imamk51_21
```

```
amk61_1_1_21 imamk61_1_1_21 amk61_1_2_21 imamk61_1_2_21
amk61_2_1_21 imamk61_2_1_21 amk61_2_2_21 imamk61_2_2_21
amk61_3_1_21 imamk61_3_1_21 amk61_3_2_21 imamk61_3_2_21
amk61_4_1_21 imamk61_4_1_21 amk61_4_2_21 imamk61_4_2_21
amk77_21 imamk77_21
amk80_1_1_21 imamk80_1_1_21 amk80_1_2_21 imamk80_1_2_21 amk80_3_21
imamk80_3_21; run;

Title "Group1 core pension - mean without zero";
data out_imp2; set out_imp1;
if imamk11_1_21 =0 then imamk11_1_21 =.;
if imamk11_2_21 =0 then imamk11_2_21 =.;
if imamk13_1_21 =0 then imamk13_1_21 =.;
if imamk13_2_21 =0 then imamk13_2_21 =.;
if imamk15_1_21 =0 then imamk15_1_21 =.;
if imamk15_2_21 =0 then imamk15_2_21 =.;
if imamk27_1_21 =0 then imamk27_1_21 =.;
if imamk29_1_21 =0 then imamk29_1_21 =.;
if imamk36_1_21 =0 then imamk36_1_21 =.;
if imamk36_2_21 =0 then imamk36_2_21 =.;
if imamk36_3_21 =0 then imamk36_3_21 =.;
if imamk47_21 =0 then imamk47_21 =.;
if imamk48_21 =0 then imamk48_21 =.;
if imamk50_21 =0 then imamk50_21 =.;
if imamk51_21 =0 then imamk51_21 =.;
if imamk61_1_1_21 =0 then imamk61_1_1_21 =.;
if imamk61_1_2_21 =0 then imamk61_1_2_21 =.;
if imamk61_2_1_21 =0 then imamk61_2_1_21 =.;
if imamk61_2_2_21 =0 then imamk61_2_2_21 =.;
if imamk61_3_1_21 =0 then imamk61_3_1_21 =.;
if imamk61_3_2_21 =0 then imamk61_3_2_21 =.;
if imamk61_4_1_21 =0 then imamk61_4_1_21 =.;
if imamk61_4_2_21 =0 then imamk61_4_2_21 =.;
if imamk77_21 =0 then imamk77_21 =.;
if imamk80_1_1_21 =0 then imamk80_1_1_21=.;
if imamk80_1_2_21 =0 then imamk80_1_2_21=.;
if imamk80_3_21 =0 then imamk80_3_21=.;

if amk11_1_21 =0 then amk11_1_21 =.;
if amk11_2_21 =0 then amk11_2_21 =.;
if amk13_1_21 =0 then amk13_1_21 =.;
if amk13_2_21 =0 then amk13_2_21 =.;
if amk15_1_21 =0 then amk15_1_21 =.;
if amk15_2_21 =0 then amk15_2_21 =.;
if amk27_1_21 =0 then amk27_1_21 =.;
if amk29_1_21 =0 then amk29_1_21 =.;
if amk36_1_21 =0 then amk36_1_21 =.;
if amk36_2_21 =0 then amk36_2_21 =.;
if amk36_3_21 =0 then amk36_3_21 =.;
if amk47_21 =0 then amk47_21 =.;
if amk48_21 =0 then amk48_21 =.;
if amk50_21 =0 then amk50_21 =.;
```

```
if amk51_21 =0 then amk51_21 =.;
if amk61_1_1_21 =0 then amk61_1_1_21 =.;
if amk61_1_2_21 =0 then amk61_1_2_21 =.;
if amk61_2_1_21 =0 then amk61_2_1_21 =.;
if amk61_2_2_21 =0 then amk61_2_2_21 =.;
if amk61_3_1_21 =0 then amk61_3_1_21 =.;
if amk61_3_2_21 =0 then amk61_3_2_21 =.;
if amk61_4_1_21 =0 then amk61_4_1_21 =.;
if amk61_4_2_21 =0 then amk61_4_2_21 =.;
if amk77_21 =0 then amk77_21 =.;
if amk80_1_1_21 =0 then amk80_1_1_21=.;
if amk80_1_2_21 =0 then amk80_1_2_21=.;
if amk80_3_21 =0 then amk80_3_21=.;
run;
proc means data=out_imp2 n mean std min max ;
variable amk11_1_21 imamk11_1_21 amk11_2_21 imamk11_2_21 amk13_1_21
imamk13_1_21 amk13_2_21 imamk13_2_21 amk15_1_21 imamk15_1_21 amk15_2_21
imamk15_2_21
amk27_1_21 imamk27_1_21 amk29_1_21 imamk29_1_21
amk36_1_21 imamk36_1_21 amk36_2_21 imamk36_2_21 amk36_3_21 imamk36_3_21
amk47_21 imamk47_21 amk48_21 imamk48_21 amk50_21 imamk50_21 amk51_21
imamk51_21
amk61_1_1_21 imamk61_1_1_21 amk61_1_2_21 imamk61_1_2_21
amk61_2_1_21 imamk61_2_1_21 amk61_2_2_21 imamk61_2_2_21
amk61_3_1_21 imamk61_3_1_21 amk61_3_2_21 imamk61_3_2_21
amk61_4_1_21 imamk61_4_1_21 amk61_4_2_21 imamk61_4_2_21
amk77_21 imamk77_21
amk80_1_1_21 imamk80_1_1_21 amk80_1_2_21 imamk80_1_2_21 amk80_3_21
imamk80_3_21;
run;

************* proxy/pension ************************;
data out1;
merge output.group1_proxy_pension1 output.group1_proxy_pension2
output.group1_proxy_pension3 output.group1_proxy_pension4
output.group1_proxy_pension5 output.group1_proxy_pension6
output.group1_proxy_pension7;
by cunicah subhog_21;
rename imamk11_1_21=amk11_1_21 imamk11_2_21=amk11_2_21
imamk13_1_21=amk13_1_21 imamk13_2_21=amk13_2_21 imamk15_1_21=amk15_1_21
imamk15_2_21=amk15_2_21
imamk27_1_21=amk27_1_21 imamk29_1_21=amk29_1_21
imamk36_1_21=amk36_1_21 imamk36_2_21=amk36_2_21 imamk36_3_21=amk36_3_21
imamk47_21=amk47_21 imamk48_21=amk48_21 imamk50_21=amk50_21
imamk51_21=amk51_21
imamk61_1_1_21=amk61_1_1_21 imamk61_1_2_21=amk61_1_2_21
imamk61_2_1_21=amk61_2_1_21 imamk61_2_2_21=amk61_2_2_21
imamk61_3_1_21=amk61_3_1_21 imamk61_3_2_21=amk61_3_2_21
imamk61_4_1_21=amk61_4_1_21 imamk61_4_2_21=amk61_4_2_21
imamk77_21=amk77_21
imamk80_1_1_21=amk80_1_1_21 imamk80_1_2_21=amk80_1_2_21
imamk80_3_21=amk80_3_21;run;
```

```
data imp1;
merge imp.group1_proxy_pension1_imputed imp.group1_proxy_pension2_imputed
imp.group1_proxy_pension3_imputed imp.group1_proxy_pension4_imputed
imp.group1_proxy_pension5_imputed1 imp.group1_proxy_pension5_imputed2
imp.group1_proxy_pension5_imputed3
imp.group1_proxy_pension5_imputed4 imp.group1_proxy_pension6_imputed
imp.group1_proxy_pension7_imputed;
by cunicah subhog_21; run;

data out_imp1;
merge out1 imp1;
by cunicah subhog_21; run;

*** print putput;
Title "Group1 proxy pension - mean with zero";
proc means data=out_imp1 n nmiss mean std min max ;
variable amk11_1_21 imamk11_1_21 amk11_2_21 imamk11_2_21 amk13_1_21
imamk13_1_21 amk13_2_21 imamk13_2_21 amk15_1_21 imamk15_1_21 amk15_2_21
imamk15_2_21
amk27_1_21 imamk27_1_21 amk29_1_21 imamk29_1_21
amk36_1_21 imamk36_1_21 amk36_2_21 imamk36_2_21 amk36_3_21 imamk36_3_21
amk47_21 imamk47_21 amk48_21 imamk48_21 amk50_21 imamk50_21 amk51_21
imamk51_21
amk61_1_1_21 imamk61_1_1_21 amk61_1_2_21 imamk61_1_2_21
amk61_2_1_21 imamk61_2_1_21 amk61_2_2_21 imamk61_2_2_21
amk61_3_1_21 imamk61_3_1_21 amk61_3_2_21 imamk61_3_2_21
amk61_4_1_21 imamk61_4_1_21 amk61_4_2_21 imamk61_4_2_21
amk77_21 imamk77_21
amk80_1_1_21 imamk80_1_1_21 amk80_1_2_21 imamk80_1_2_21 amk80_3_21
imamk80_3_21; run;

Title "Group1 proxy pension - mean without zero";
data out_imp2; set out_imp1;
if imamk11_1_21 =0 then imamk11_1_21 =.;
if imamk11_2_21 =0 then imamk11_2_21 =.;
if imamk13_1_21 =0 then imamk13_1_21 =.;
if imamk13_2_21 =0 then imamk13_2_21 =.;
if imamk15_1_21 =0 then imamk15_1_21 =.;
if imamk15_2_21 =0 then imamk15_2_21 =.;
if imamk27_1_21 =0 then imamk27_1_21 =.;
if imamk29_1_21 =0 then imamk29_1_21 =.;
if imamk36_1_21 =0 then imamk36_1_21 =.;
if imamk36_2_21 =0 then imamk36_2_21 =.;
if imamk36_3_21 =0 then imamk36_3_21 =.;
if imamk47_21 =0 then imamk47_21 =.;
if imamk48_21 =0 then imamk48_21 =.;
if imamk50_21 =0 then imamk50_21 =.;
if imamk51_21 =0 then imamk51_21 =.;
if imamk61_1_1_21 =0 then imamk61_1_1_21 =.;
if imamk61_1_2_21 =0 then imamk61_1_2_21 =.;
if imamk61_2_1_21 =0 then imamk61_2_1_21 =.;
if imamk61_2_2_21 =0 then imamk61_2_2_21 =.;
```

```
if imamk61_3_1_21 =0 then imamk61_3_1_21 =.;
if imamk61_3_2_21 =0 then imamk61_3_2_21 =.;
if imamk61_4_1_21 =0 then imamk61_4_1_21 =.;
if imamk61_4_2_21 =0 then imamk61_4_2_21 =.;
if imamk77_21=0 then imamk77_21 =.;
if imamk80_1_1_21 =0 then imamk80_1_1_21=.;
if imamk80_1_2_21 =0 then imamk80_1_2_21=.;
if imamk80_3_21 =0 then imamk80_3_21=.;

if amk11_1_21 =0 then amk11_1_21 =.;
if amk11_2_21 =0 then amk11_2_21 =.;
if amk13_1_21 =0 then amk13_1_21 =.;
if amk13_2_21 =0 then amk13_2_21 =.;
if amk15_1_21 =0 then amk15_1_21 =.;
if amk15_2_21 =0 then amk15_2_21 =.;
if amk27_1_21 =0 then amk27_1_21 =.;
if amk29_1_21 =0 then amk29_1_21 =.;
if amk36_1_21 =0 then amk36_1_21 =.;
if amk36_2_21 =0 then amk36_2_21 =.;
if amk36_3_21 =0 then amk36_3_21 =.;
if amk47_21 =0 then amk47_21 =.;
if amk48_21 =0 then amk48_21 =.;
if amk50_21 =0 then amk50_21 =.;
if amk51_21 =0 then amk51_21 =.;
if amk61_1_1_21 =0 then amk61_1_1_21 =.;
if amk61_1_2_21 =0 then amk61_1_2_21 =.;
if amk61_2_1_21 =0 then amk61_2_1_21 =.;
if amk61_2_2_21 =0 then amk61_2_2_21 =.;
if amk61_3_1_21 =0 then amk61_3_1_21 =.;
if amk61_3_2_21 =0 then amk61_3_2_21 =.;
if amk61_4_1_21 =0 then amk61_4_1_21 =.;
if amk61_4_2_21 =0 then amk61_4_2_21 =.;
if amk77_21 =0 then amk77_21 =.;
if amk80_1_1_21 =0 then amk80_1_1_21=.;
if amk80_1_2_21 =0 then amk80_1_2_21=.;
if amk80_3_21 =0 then amk80_3_21=.;
run;
proc means data=out_imp2 n mean std min max ;
variable amk11_1_21 imamk11_1_21 amk11_2_21 imamk11_2_21 amk13_1_21
imamk13_1_21 amk13_2_21 imamk13_2_21 amk15_1_21 imamk15_1_21 amk15_2_21
imamk15_2_21
amk27_1_21 imamk27_1_21 amk29_1_21 imamk29_1_21
amk36_1_21 imamk36_1_21 amk36_2_21 imamk36_2_21 amk36_3_21 imamk36_3_21
amk47_21 imamk47_21 amk48_21 imamk48_21 amk50_21 imamk50_21 amk51_21
imamk51_21
amk61_1_1_21 imamk61_1_1_21 amk61_1_2_21 imamk61_1_2_21
amk61_2_1_21 imamk61_2_1_21 amk61_2_2_21 imamk61_2_2_21
amk61_3_1_21 imamk61_3_1_21 amk61_3_2_21 imamk61_3_2_21
amk61_4_1_21 imamk61_4_1_21 amk61_4_2_21 imamk61_4_2_21
amk77_21 imamk77_21
amk80_1_1_21 imamk80_1_1_21 amk80_1_2_21 imamk80_1_2_21 amk80_3_21
imamk80_3_21;
```

```
run;

/*
*** print putput: prior imputation;
Title "Group1 core pension - before imputation (mean with zero)";
proc means data=out1 n nmiss mean std min max ;
variable imamk11_1_21 imamk11_2_21 imamk13_1_21 imamk13_2_21 imamk15_1_21
imamk15_2_21
imamk27_1_21 imamk29_1_21
imamk36_1_21 imamk36_2_21 imamk36_3_21
imamk47_21 imamk48_21 imamk50_21 imamk51_21
imamk61_1_1_21 imamk61_1_2_21
imamk61_2_1_21 imamk61_2_2_21
imamk61_3_1_21 imamk61_3_2_21
imamk61_4_1_21 imamk61_4_2_21
imamk80_1_1_21 imamk80_1_2_21 imamk80_3_21; run;

Title "Group1 core pension - before imputation (mean without zero)";
data out2; set out1;
if imamk11_1_21 =0 then imamk11_1_21 =.;
if imamk11_2_21 =0 then imamk11_2_21 =.;
if imamk13_1_21 =0 then imamk13_1_21 =.;
if imamk13_2_21 =0 then imamk13_2_21 =.;
if imamk15_1_21 =0 then imamk15_1_21 =.;
if imamk15_2_21 =0 then imamk15_2_21 =.;
if imamk27_1_21 =0 then imamk27_1_21 =.;
if imamk29_1_21 =0 then imamk29_1_21 =.;
if imamk36_1_21 =0 then imamk36_1_21 =.;
if imamk36_2_21 =0 then imamk36_2_21 =.;
if imamk36_3_21 =0 then imamk36_3_21 =.;
if imamk47_21 =0 then imamk47_21 =.;
if imamk48_21 =0 then imamk48_21 =.;
if imamk50_21 =0 then imamk50_21 =.;
if imamk51_21 =0 then imamk51_21 =.;
if imamk61_1_1_21 =0 then imamk61_1_1_21 =.;
if imamk61_1_2_21 =0 then imamk61_1_2_21 =.;
if imamk61_2_1_21 =0 then imamk61_2_1_21 =.;
if imamk61_2_2_21 =0 then imamk61_2_2_21 =.;
if imamk61_3_1_21 =0 then imamk61_3_1_21 =.;
if imamk61_3_2_21 =0 then imamk61_3_2_21 =.;
if imamk61_4_1_21 =0 then imamk61_4_1_21 =.;
if imamk61_4_2_21 =0 then imamk61_4_2_21 =.;
if imamk80_1_1_21 =0 then imamk80_1_1_21=.;
if imamk80_1_2_21 =0 then imamk80_1_2_21=.;
if imamk80_3_21 =0 then imamk80_3_21=.; run;
proc means data=out2 n mean std min max ;
variable imamk11_1_21 imamk11_2_21 imamk13_1_21 imamk13_2_21 imamk15_1_21
imamk15_2_21
imamk27_1_21 imamk29_1_21
imamk36_1_21 imamk36_2_21 imamk36_3_21
imamk47_21 imamk48_21 imamk50_21 imamk51_21
imamk61_1_1_21 imamk61_1_2_21
```

```
imamk61_2_1_21 imamk61_2_2_21
imamk61_3_1_21 imamk61_3_2_21
imamk61_4_1_21 imamk61_4_2_21
imamk80_1_1_21 imamk80_1_2_21 imamk80_3_21; run;
*** print imputed output: mean with zero;
Title "Group1 core pension - imputed (mean with zero)";
proc means mean std min max n nmiss data=imp1;
variable imamk11_1_15 imamk11_2_15 imamk13_1_15 imamk13_2_15 imamk15_1_15
imamk15_2_15
imamk27_1_15 imamk27_2_15 imamk29_1_15 imamk29_2_15 imamk36_1_15
imamk36_2_15 imamk36_3_15
imamk47_15 imamk48_15 imamk50_15 imamk51_15
imamk61_1_1_15 imamk61_1_2_15 imamk61_1_3_15
imamk61_2_1_15 imamk61_2_2_15 imamk61_2_3_15
imamk61_3_1_15 imamk61_3_2_15 imamk61_3_3_15
imamk61_4_1_15 imamk61_4_2_15 imamk61_4_3_15
imamk80_1_15 imamk80_2_15 imamk80_3_15; run;
run;
225
imput2015_group1_report
*** print output: mean without zero;
Title "Group1 core pension - imputed (mean without zero)";
data imp2; set imp1;
if imamk11_1_15 =0 then imamk11_1_15 =.;
if imamk11_2_15 =0 then imamk11_2_15 =.;
if imamk13_1_15 =0 then imamk13_1_15 =.;
if imamk13_2_15 =0 then imamk13_2_15 =.;
if imamk15_1_15 =0 then imamk15_1_15 =.;
if imamk15_2_15 =0 then imamk15_2_15 =.;
if imamk27_1_15 =0 then imamk27_1_15 =.;
if imamk27_2_15 =0 then imamk27_2_15 =.;
if imamk29_1_15 =0 then imamk29_1_15 =.;
if imamk29_2_15 =0 then imamk29_2_15 =.;
if imamk36_1_15 =0 then imamk36_1_15 =.;
if imamk36_2_15 =0 then imamk36_2_15 =.;
if imamk36_3_15 =0 then imamk36_3_15 =.;
if imamk47_15 =0 then imamk47_15 =.;
if imamk48_15 =0 then imamk48_15 =.;
if imamk50_15 =0 then imamk50_15 =.;
if imamk51_15 =0 then imamk51_15 =.;
if imamk61_1_1_15 =0 then imamk61_1_1_15 =.;
if imamk61_1_2_15 =0 then imamk61_1_2_15 =.;
if imamk61_1_3_15 =0 then imamk61_1_3_15 =.;
if imamk61_2_1_15 =0 then imamk61_2_1_15 =.;
if imamk61_2_2_15 =0 then imamk61_2_2_15 =.;
if imamk61_2_3_15 =0 then imamk61_2_3_15 =.;
if imamk61_3_1_15 =0 then imamk61_3_1_15 =.;
if imamk61_3_2_15 =0 then imamk61_3_2_15 =.;
if imamk61_3_3_15 =0 then imamk61_3_3_15 =.;
if imamk61_4_1_15 =0 then imamk61_4_1_15 =.;
if imamk61_4_2_15 =0 then imamk61_4_2_15 =.;
if imamk61_4_3_15 =0 then imamk61_4_3_15 =.;
```

```
if imamk80_1_15 =0 then imamk80_1_15=.;
if imamk80_2_15 =0 then imamk80_2_15=.;
if imamk80_3_15 =0 then imamk80_3_15=.; run;
proc means mean std min max n nmiss data=imp2;
variable imamk11_1_15 imamk11_2_15 imamk13_1_15 imamk13_2_15 imamk15_1_15
imamk15_2_15
imamk27_1_15 imamk27_2_15 imamk29_1_15 imamk29_2_15 imamk36_1_15
imamk36_2_15 imamk36_3_15
imamk47_15 imamk48_15 imamk50_15 imamk51_15
imamk61_1_1_15 imamk61_1_2_15 imamk61_1_3_15
imamk61_2_1_15 imamk61_2_2_15 imamk61_2_3_15
imamk61_3_1_15 imamk61_3_2_15 imamk61_3_3_15
imamk61_4_1_15 imamk61_4_2_15 imamk61_4_3_15
imamk80_1_15 imamk80_2_15 imamk80_3_15; run;
*/
```

GROUP 2. Spouse's

Total Income Components

```
/*******************************************************/
/* PROGRAM NAME : Impute2021_group2_core_pension.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/8/2023 */
/* Impute missing value on core and proxy questionnaire */
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';


data aa; set output.sect_g_j_k_sa_2021; *** core and proxy questionnaire
N=10,716;
proc sort nodupkey; by cunicah subhog_21; run; *** no duplicate;

proc contents data=aa;
run;
data aa1; set aa;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
k52b_21
k53_21 k53a_21 k53b1_21 k53b2_21 k53b3_21
k54_21 k54a_21 k54b1_21 k54b2_21 k54b3_21 k54a_monthly_21
k56_21 k56a_21 k56b1_21 k56b2_21 k56b3_21
k57_21 k57a_21 k57b1_21 k57b2_21 k57b3_21 k57a_monthly_21
k64c_21 k67_1_1_21 k68a1_1_21 k68b1_1_21 k68c1_1_21
k67_1_2_21 k68a1_2_21 k68b1_2_21 k68c1_2_21
k64d_21 k67_2_1_21 k68a2_1_21 k68b2_1_21 k68c2_1_21
k67_2_2_21 k68a2_2_21 k68b2_2_21 k68c2_2_21
k64e_21 k67_3_1_21 k68a3_1_21 k68b3_1_21 k68c3_1_21
k67_3_2_21 k68a3_2_21 k68b3_2_21 k68c3_2_21
k64f_21 k67_4_1_21 k68a4_1_21 k68b4_1_21 k68c4_1_21
k67_4_2_21 k68a4_2_21 k68b4_2_21 k68c4_2_21
k82c_21 k83_1_1_21 k83_1_2_21
k82e_21 k83_2_21
;
if tipent_hh_21 in (1) and k52b_21 ne .S; run;*****;

/*proc freq data=aa2; table k52b_21; run;*/

data aa2; set aa1;
if age_21 in (888, 999) then age_21=.;
imamk53_21=k53a_21; **** Imputation N=162;
if k53_21 =2 and missing(k53a_21) then imamk53_21=0;
if missing(k53_21) and missing(k53a_21) then imamk53_21=0;
if k53_21 =1 and k53a_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk53_21=.;
if missing(imamk53_21) and missing(k53b1_21) then k53b1_21=9;
```

```
imamk54_21=k54a_monthly_21;**** Imputation N=179;
if k54_21 =2 and missing(k54a_monthly_21) then imamk54_21=0;
if missing(k54_21) and missing(k54a_monthly_21) then imamk54_21=0;
if k54_21=1 and k54a_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk54_21=.;
if missing(imamk54_21) and missing(k54b1_21) then k54b1_21=9;
imamk56_21=k56a_21;**** Imputation N=4;
if k56_21 =2 and missing(k56a_21) then imamk56_21=0;
if missing(k56_21) and missing(k56a_21) then imamk56_21=0;
if k56_21=1 and k56a_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk56_21=.;
if missing(imamk56_21) and missing(k56b1_21) then k56b1_21=9;
imamk57_21=k57a_monthly_21;**** Imputation N=2;
if k57_21 =2 and missing(k57a_monthly_21) then imamk57_21=0;
if missing(k57_21) and missing(k57a_monthly_21) then imamk57_21=0;
if k57_21=1 and k57a_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk57_21=.;
if missing(imamk57_21) and missing(k57b1_21) then k57b1_21=9;
dumk53_21=missing(imamk53_21);
dumk54_21=missing(imamk54_21);
dumk56_21=missing(imamk56_21);
dumk57_21=missing(imamk57_21);
run;
/*proc freq; table dumk53_21 dumk54_21 dumk56_21 dumk57_21;run;*/

***** define range of imputation;
%macro range(vname,va,vb,vc,rmax,r1,r1_2,r2_1,mix1,mix2);
data data&vname
(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21 imam&vname
dum&vname low&vname up&vname &mix1 &mix2);
set aa2;
low&vname=1; up&vname=&rmax ;
if &va=1 and &vc=1 then do; low&vname=&r1_2;
up&vname=&rmax; end;
if &va=1 and &vc=2 then do; low&vname=&r1; up&vname=&r1_2;
end;
if &va=1 and &vc=9 then do; low&vname=&r1; up&vname=&rmax;
end;
if &va=2 and &vb=1 then do; low&vname=&r2_1;
up&vname=&r1; end;
if &va=2 and &vb=2 then do; low&vname=1; up&vname=&r2_1;
end;
if &va=2 and &vb=9 then do; low&vname=1; up&vname=&r1;
end;
if &va=9 then do; low&vname=1; up&vname=&rmax; end;
if imam&vname >=0 then do; low&vname=imam&vname; end;
if imam&vname >=0 then do; up&vname=imam&vname; end;
if &mix1 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
if &mix2 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
```

```
%mend range;
%range(k53_21,k53b1_21,k53b2_21,k53b3_21,120000,7500,15000,2000,k53_21);
run;
%range(k54_21,k54b1_21,k54b2_21,k54b3_21, 50000,7500,15000,2000,k54_21);
run;
%range(k56_21,k56b1_21,k56b2_21,k56b3_21, 30000,7500,15000,2000,k56_21);
run;
%range(k57_21,k57b1_21,k57b2_21,k57b3_21, 50000,7500,15000,2000,k57_21);
run; *max=2500 < upper range of the bracket (15000), so use bonus from
primary job (k54) as reference;
/*proc means data=aa2;var imamk53_21 imamk54_21 imamk56_21 imamk57_21;run;*/

************ 1 ***************;
data output.group2_core_pension1;
merge datak53_21(drop=k53_21)
datak54_21(drop=k54_21)
datak56_21(drop=k56_21)
datak57_21(drop=k57_21) ;
by cunicah subhog_21; run;
data dd1; set output.group2_core_pension1; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk53_21 imamk54_21 imamk56_21 imamk57_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk53_21 upk53_21
lowk54_21 upk54_21
lowk56_21 upk56_21
lowk57_21 upk57_21
dumk53_21
dumk54_21
dumk56_21
dumk57_21
;
bounds
imamk53_21 (>=lowk53_21 ,<=upk53_21)
imamk54_21 (>=lowk54_21 ,<=upk54_21)
imamk56_21 (>=lowk56_21 ,<=upk56_21)
imamk57_21 (>=lowk57_21 ,<=upk57_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 1;
```

```
/*multiples 5;*/
seed 2018;
run;

data imp.group2_core_pension1_imputed; set dd_1;
drop
lowk53_21 upk53_21
lowk54_21 upk54_21
lowk56_21 upk56_21
lowk57_21 upk57_21
; run;

/* data temp; set imp.group2_core_pension1_imputed; run;
proc freq; table imamk53_21; where dumk53_21=1; run;
proc freq; table imamk54_21; where dumk54_21=1; run;
proc freq; table imamk56_21; where dumk56_21=1; run;
proc freq; table imamk57_21; where dumk57_21=1; run; */

********** 2 ************************;

data aa2; set aa1;
if age_21 in (888, 999) then age_21=.;
imamk67_1_1_21=k67_1_1_21;**** Imputation N=154;
if k64c_21 =2 and missing(k67_1_1_21) then imamk67_1_1_21=0;
if missing(k64c_21) and missing(k67_1_1_21) then imamk67_1_1_21=0;
if k64c_21=1 and k67_1_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk67_1_1_21=.;
if missing(imamk67_1_1_21) and missing(k68a1_1_21) then k68a1_1_21=9;
imamk67_1_2_21=k67_1_2_21;**** Imputation N=6;
if k64c_21 in (2,8,9) and missing(k67_1_2_21) then imamk67_1_2_21=0;
if missing(k64c_21) and missing(k67_1_2_21) then imamk67_1_2_21=0;
if k64c_21 = 1 and k67_1_2_21=. then imamk67_1_2_21=0;
if k64c_21 = 1 and k67_1_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk67_1_2_21=.;
if missing(imamk67_1_2_21) and missing(k68a1_2_21) then k68a1_2_21=9;
imamk67_2_1_21=k67_2_1_21;**** Imputation N=10;
if k64d_21 =2 and missing(k67_2_1_21) then imamk67_2_1_21=0;
if missing(k64d_21) and missing(k67_2_1_21) then imamk67_2_1_21=0;
if k64d_21=1 and k67_2_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk67_2_1_21=.;
if missing(imamk67_2_1_21) and missing(k68a2_1_21) then k68a2_1_21=9;
imamk67_2_2_21=k67_2_2_21;**** Imputation N=0;
if k64d_21 in (2,8,9) and missing(k67_2_2_21) then imamk67_2_2_21=0;
if missing(k64d_21) and missing(k67_2_2_21) then imamk67_2_2_21=0;
if k64d_21 = 1 and k67_2_2_21=. then imamk67_2_2_21=0;
if k64d_21 = 1 and k67_2_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk67_2_2_21=.;
if missing(imamk67_2_2_21) and missing(k68a2_2_21) then k68a2_2_21=9;
```

```
imamk67_3_1_21=k67_3_1_21;**** Imputation N=10;
if k64e_21 =2 and missing(k67_3_1_21) then imamk67_3_1_21=0;
if missing(k64e_21) and missing(k67_3_1_21) then imamk67_3_1_21=0;
if k64e_21=1 and k67_3_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk67_3_1_21=.;
if missing(imamk67_3_1_21) and missing(k68a3_1_21) then k68a3_1_21=9;
imamk67_3_2_21=k67_3_2_21;**** Imputation N=0;
if k64e_21 in (2,8,9) and missing(k67_3_2_21) then imamk67_3_2_21=0;
if missing(k64e_21) and missing(k67_3_2_21) then imamk67_3_2_21=0;
if k64e_21 = 1 and k67_3_2_21=. then imamk67_3_2_21=0;
if k64e_21 = 1 and k67_3_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk67_3_2_21=.;
if missing(imamk67_3_2_21) and missing(k68a3_2_21) then k68a3_2_21=9;
imamk67_4_1_21=k67_4_1_21;**** Imputation N=11;
if k64f_21 =2 and missing(k67_4_1_21) then imamk67_4_1_21=0;
if missing(k64f_21) and missing(k67_4_1_21) then imamk67_4_1_21=0;
if k64f_21=1 and k67_4_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk67_4_1_21=.;
if missing(imamk67_4_1_21) and missing(k68a4_1_21) then k68a4_1_21=9;
imamk67_4_2_21=k67_4_2_21;**** Imputation N=0;
if k64f_21 in (2,8,9) and missing(k67_4_2_21) then imamk67_4_2_21=0;
if missing(k64f_21) and missing(k67_4_2_21) then imamk67_4_2_21=0;
if k64f_21 = 1 and k67_4_2_21=. then imamk67_4_2_21=0;
if k64f_21 = 1 and k67_4_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk67_4_2_21=.;
if missing(imamk67_4_2_21) and missing(k68a4_2_21) then k68a4_2_21=9;
dumk67_1_1_21=missing(imamk67_1_1_21);
dumk67_1_2_21=missing(imamk67_1_2_21);
dumk67_2_1_21=missing(imamk67_2_1_21);
dumk67_2_2_21=missing(imamk67_2_2_21);
dumk67_3_1_21=missing(imamk67_3_1_21);
dumk67_3_2_21=missing(imamk67_3_2_21);
dumk67_4_1_21=missing(imamk67_4_1_21);
dumk67_4_2_21=missing(imamk67_4_2_21);
run;

/* proc freq; table imamk67_1_1_21
imamk67_1_2_21
imamk67_2_1_21
imamk67_2_2_21
imamk67_3_1_21
imamk67_3_2_21
imamk67_4_1_21
imamk67_4_2_21; run; */

%range(k67_1_1_21,k68a1_1_21,k68b1_1_21,k68c1_1_21,80000,2000,7500,950,k64c_
21);run;
```

```
%range(k67_1_2_21,k68a1_2_21,k68b1_2_21,k68c1_2_21,16000,2000,7500,950);
run;
%range(k67_2_1_21,k68a2_1_21,k68b2_1_21,k68c2_1_21,22000,2000,7500,950,k64d_
21);run;
%range(k67_2_2_21,k68a2_2_21,k68b2_2_21,k68c2_2_21,22000,2000,7500,950);
run; *max=0, so use max value of k67_2_1_21;
%range(k67_3_1_21,k68a3_1_21,k68b3_1_21,k68c3_1_21,25000,2000,7500,950,k64e_
21);run;
%range(k67_3_2_21,k68a3_2_21,k68b3_2_21,k68c3_2_21,25000,2000,7500,950);
run; *max=0, so use max value of k67_3_1_21;
%range(k67_4_1_21,k68a4_1_21,k68b4_1_21,k68c4_1_21,30000,2000,7500,950,k64f_
21);run;
%range(k67_4_2_21,k68a4_2_21,k68b4_2_21,k68c4_2_21,30000,2000,7500,950);
run;*max=0, so use max value of k67_4_1_21;

/* proc means; var imamk67_1_1_21
imamk67_1_2_21
imamk67_2_1_21
imamk67_2_2_21
imamk67_3_1_21
imamk67_3_2_21
imamk67_4_1_21
imamk67_4_2_21; run; */

data output.group2_core_pension2;
merge datak67_1_1_21(drop=k64c_21) datak67_1_2_21
datak67_2_1_21(drop=k64d_21) datak67_2_2_21
datak67_3_1_21(drop=k64e_21) datak67_3_2_21
datak67_4_1_21(drop=k64f_21) datak67_4_2_21 ;
by cunicah subhog_21; run;

data dd1; set output.group2_core_pension2;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk67_1_1_21 lowk67_1_1_21 upk67_1_1_21 dumk67_1_1_21
imamk67_1_2_21 lowk67_1_2_21 upk67_1_2_21 dumk67_1_2_21; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk67_1_1_21 imamk67_1_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk67_1_1_21 upk67_1_1_21
lowk67_1_2_21 upk67_1_2_21
dumk67_1_1_21
dumk67_1_2_21
```

```
;
bounds
imamk67_1_1_21 (>=lowk67_1_1_21 ,<=upk67_1_1_21)
imamk67_1_2_21 (>=lowk67_1_2_21 ,<=upk67_1_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group2_core_pension2;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk67_2_1_21 lowk67_2_1_21 upk67_2_1_21 dumk67_2_1_21
imamk67_2_2_21 lowk67_2_2_21 upk67_2_2_21 dumk67_2_2_21; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk67_2_1_21 imamk67_2_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk67_2_1_21 upk67_2_1_21
lowk67_2_2_21 upk67_2_2_21
dumk67_2_1_21
dumk67_2_2_21
;
bounds
imamk67_2_1_21 (>=lowk67_2_1_21 ,<=upk67_2_1_21)
imamk67_2_2_21 (>=lowk67_2_2_21 ,<=upk67_2_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group2_core_pension2;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk67_3_1_21 lowk67_3_1_21 upk67_3_1_21 dumk67_3_1_21
imamk67_3_2_21 lowk67_3_2_21 upk67_3_2_21 dumk67_3_2_21; run;
```

```
options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_3;
categorical sex_21 ;
count age_21;
mixed imamk67_3_1_21 imamk67_3_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk67_3_1_21 upk67_3_1_21
lowk67_3_2_21 upk67_3_2_21
dumk67_3_1_21
dumk67_3_2_21
;
bounds
imamk67_3_1_21 (>=lowk67_3_1_21 ,<=upk67_3_1_21)
imamk67_3_2_21 (>=lowk67_3_2_21 ,<=upk67_3_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;


data dd1; set output.group2_core_pension2;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk67_4_1_21 lowk67_4_1_21 upk67_4_1_21 dumk67_4_1_21
imamk67_4_2_21 lowk67_4_2_21 upk67_4_2_21 dumk67_4_2_21; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_4;
categorical sex_21 ;
count age_21;
mixed imamk67_4_1_21 imamk67_4_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk67_4_1_21 upk67_4_1_21
lowk67_4_2_21 upk67_4_2_21
dumk67_4_1_21
dumk67_4_2_21
;
```

```
bounds
imamk67_4_1_21 (>=lowk67_4_1_21 ,<=upk67_4_1_21)
imamk67_4_2_21 (>=lowk67_4_2_21 ,<=upk67_4_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group2_core_pension2_imputed;
merge dd_1 dd_2 dd_3 dd_4;
by cunicah subhog_21;
drop
lowk67_1_1_21 upk67_1_1_21
lowk67_1_2_21 upk67_1_2_21
lowk67_2_1_21 upk67_2_1_21
lowk67_2_2_21 upk67_2_2_21
lowk67_3_1_21 upk67_3_1_21
lowk67_3_2_21 upk67_3_2_21
lowk67_4_1_21 upk67_4_1_21
lowk67_4_2_21 upk67_4_2_21;
run;

************** 3 ******************;

data aa2; set aa1;
imamk83_1_1_21=k83_1_1_21; **** Imputation N=21; **** nobrackets;
if k82c_21 =2 and missing(k83_1_1_21) then imamk83_1_1_21=0;
if missing(k82c_21) and missing(k83_1_1_21) then imamk83_1_1_21=0;
if k82c_21=1 and k83_1_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk83_1_1_21=.;
imamk83_2_21=k83_2_21; **** Imputation N=8;**** nobrackets;
if k82e_21 =2 and missing(k83_2_21) then imamk83_2_21=0;
if missing(k82e_21) and missing(k83_2_21) then imamk83_2_21=0;
if k82e_21=1 and k83_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk83_2_21=.;
imamk83_1_2_21=k83_1_2_21; **** Imputation N=11; **** nobrackets;
if k82c_21 in (2,8,9) and missing(k83_1_2_21) then imamk83_1_2_21=0;
if missing(k82c_21) and missing(k83_1_2_21) then imamk83_1_2_21=0;
if k82c_21=1 and k83_1_2_21=. then imamk83_1_2_21=0;
if k82c_21=1 and k83_1_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk83_1_2_21=.;
dumk83_1_1_21=missing(imamk83_1_1_21);
dumk83_1_2_21=missing(imamk83_1_2_21);
dumk83_2_21=missing(imamk83_2_21);
run;
```

```
/*
proc freq data=aa2;
tables dumk83_1_1_21 dumk83_1_2_21 dumk83_2_21;
run;

proc means data=aa2;
var imamk83_1_1_21 imamk83_1_2_21 imamk83_2_21;
run;
*/

data datak83; set aa2(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21
age_21 imamk83_1_1_21 imamk83_1_2_21 imamk83_2_21 k82c_21 k82e_21
dumk83_1_1_21 dumk83_1_2_21 dumk83_2_21);
lowk83_1_1_21=1; upk83_1_1_21=80000;
if k82c_21 in (8,9) then lowk83_1_1_21=0;
lowk83_1_2_21=1; upk83_1_2_21=2500;
lowk83_2_21=1; upk83_2_21=1500000;
if k82e_21 in (8,9) then lowk83_2_21=0;
if imamk83_1_1_21 >=0 then do; lowk83_1_1_21=imamk83_1_1_21;
upk83_1_1_21=imamk83_1_1_21; end;
if imamk83_1_2_21 >=0 then do; lowk83_1_2_21=imamk83_1_2_21;
upk83_1_2_21=imamk83_1_2_21; end;
if imamk83_2_21 >=0 then do; lowk83_2_21=imamk83_2_21;
upk83_2_21=imamk83_2_21; end;
run;
data output.group2_core_pension3;
set datak83(drop=k82c_21 k82e_21);
by cunicah subhog_21; run;

data dd1; set output.group2_core_pension3;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk83_1_1_21 lowk83_1_1_21 upk83_1_1_21 dumk83_1_1_21
imamk83_1_2_21 lowk83_1_2_21 upk83_1_2_21 dumk83_1_2_21
; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk83_1_1_21 imamk83_1_2_21  yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk83_1_1_21 upk83_1_1_21
lowk83_1_2_21 upk83_1_2_21
dumk83_1_1_21
dumk83_1_2_21
;
```

```
bounds
imamk83_1_1_21 (>=lowk83_1_1_21 ,<=upk83_1_1_21)
imamk83_1_2_21 (>=lowk83_1_2_21 ,<=upk83_1_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group2_core_pension3;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk83_2_21 lowk83_2_21 upk83_2_21 dumk83_2_21
; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk83_2_21  yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk83_2_21 upk83_2_21
dumk83_2_21
;
bounds
imamk83_2_21 (>=lowk83_2_21 ,<=upk83_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group2_core_pension3_imputed; merge dd_1 dd_2; by cunicah
subhog_21;
drop
lowk83_1_1_21 upk83_1_1_21
lowk83_1_2_21 upk83_1_2_21
lowk83_2_21 upk83_2_21;
run;

/* data temp; set imp.group2_core_pension3_imputed; run;
```

```
proc freq; table imamk83_1_1_21; where dumk83_1_1_21=1; run; **** imputed;
proc freq; table imamk83_1_2_21; where dumk83_1_2_21=1; run; *** not
imputed;
proc freq; table imamk83_2_21; where dumk83_2_21=1; run; **** not imputed;
*/


proc means data=output.group2_core_pension3 n mean std min max nmiss  ;
variable imamk83_2_21;
run;

proc means data=imp.group2_core_pension3_imputed n mean std min max nmiss  ;
variable imamk83_2_21;
run;

data group11;
set output.group2_core_pension3;
if imamk83_2_21=0 then imamk83_2_21=.;
run;

proc means data=group11 n mean std min max  ;
variable imamk83_2_21;
run;

data group14;
set imp.group2_core_pension3_imputed;
if imamk83_2_21=0 then imamk83_2_21=.;
run;

proc means data=group14 n mean std min max  ;
variable imamk83_2_21;
run;
;
```

```
/*******************************************************/
/* PROGRAM NAME : Impute2021_group2_proxy_pension.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/8/2023 */
/* Impute missing value on proxy and proxy questionnaire */
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

data aa; set output.sect_g_j_k_sa_2021; *** core and proxy questionnaire
N=10716;
proc sort nodupkey; by cunicah subhog_21; run; *** no duplicate;

data aa1; set aa;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
k52b_21
k53_21 k53a_21 k53b1_21 k53b2_21 k53b3_21
k54_21 k54a_21 k54b1_21 k54b2_21 k54b3_21 k54a_monthly_21
k56_21 k56a_21 k56b1_21 k56b2_21 k56b3_21
k57_21 k57a_21 k57b1_21 k57b2_21 k57b3_21 k57a_monthly_21
k64c_21 k67_1_1_21 k68a1_1_21 k68b1_1_21 k68c1_1_21
k67_1_2_21 k68a1_2_21 k68b1_2_21 k68c1_2_21
k64d_21 k67_2_1_21 k68a2_1_21 k68b2_1_21 k68c2_1_21
k67_2_2_21 k68a2_2_21 k68b2_2_21 k68c2_2_21
k64e_21 k67_3_1_21 k68a3_1_21 k68b3_1_21 k68c3_1_21
k67_3_2_21 k68a3_2_21 k68b3_2_21 k68c3_2_21
k64f_21 k67_4_1_21 k68a4_1_21 k68b4_1_21 k68c4_1_21
k67_4_2_21 k68a4_2_21 k68b4_2_21 k68c4_2_21
k82c_21 k83_1_1_21 k83_1_2_21
k82e_21 k83_2_21
;
if tipent_hh_21 in (2) and k52b_21 ne .S; run;***** 141;

/*proc freq data=aa1; table k52b_21; run;*/

data aa2; set aa1;
if age_21 in (888, 999) then age_21=.;
imamk53_21=k53a_21; **** Imputation N=3;
if k53_21 =2 and missing(k53a_21) then imamk53_21=0;
if missing(k53_21) and missing(k53a_21) then imamk53_21=0;
if k53_21 =1 and k53a_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk53_21=.;
if missing(imamk53_21) and missing(k53b1_21) then k53b1_21=9;
imamk54_21=k54a_monthly_21;**** Imputation N=2;
if k54_21 =2 and missing(k54a_monthly_21) then imamk54_21=0;
if missing(k54_21) and missing(k54a_monthly_21) then imamk54_21=0;
```

```
if k54_21=1 and k54a_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk54_21=.;
if missing(imamk54_21) and missing(k54b1_21) then k54b1_21=9;
imamk56_21=k56a_21;**** Imputation N=0;
if k56_21 =2 and missing(k56a_21) then imamk56_21=0;
if missing(k56_21) and missing(k56a_21) then imamk56_21=0;
if k56_21=1 and k56a_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk56_21=.;
if missing(imamk56_21) and missing(k56b1_21) then k56b1_21=9;
imamk57_21=k57a_monthly_21;**** Imputation N=0;
if k57_21 =2 and missing(k57a_monthly_21) then imamk57_21=0;
if missing(k57_21) and missing(k57a_monthly_21) then imamk57_21=0;
if k57_21=1 and k57a_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk57_21=.;
if missing(imamk57_21) and missing(k57b1_21) then k57b1_21=9;
dumk53_21=missing(imamk53_21);
dumk54_21=missing(imamk54_21);
dumk56_21=missing(imamk56_21);
dumk57_21=missing(imamk57_21);
run;
/*proc freq; table dumk53_21 dumk54_21 dumk56_21 dumk57_21;run;*/

***** define range of imputation;
%macro range(vname,va,vb,vc,rmax,r1,r1_2,r2_1,mix1,mix2);
data data&vname
(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21 imam&vname
dum&vname low&vname up&vname &mix1 &mix2);
set aa2;
low&vname=1; up&vname=&rmax ;
if &va=1 and &vc=1 then do; low&vname=&r1_2;
up&vname=&rmax; end;
if &va=1 and &vc=2 then do; low&vname=&r1; up&vname=&r1_2;
end;
if &va=1 and &vc=9 then do; low&vname=&r1; up&vname=&rmax;
end;
if &va=2 and &vb=1 then do; low&vname=&r2_1;
up&vname=&r1; end;
if &va=2 and &vb=2 then do; low&vname=1; up&vname=&r2_1;
end;
if &va=2 and &vb=9 then do; low&vname=1; up&vname=&r1;
end;
if &va=9 then do; low&vname=1; up&vname=&rmax; end;
if imam&vname >=0 then do; low&vname=imam&vname; end;
if imam&vname >=0 then do; up&vname=imam&vname; end;
if &mix1 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
if &mix2 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
%mend range;
%range(k53_21,k53b1_21,k53b2_21,k53b3_21,120000,7500,15000,2000,k53_21);
run;
```

```
%range(k54_21,k54b1_21,k54b2_21,k54b3_21, 50000,7500,15000,2000,k54_21);
run;
%range(k56_21,k56b1_21,k56b2_21,k56b3_21, 30000,7500,15000,2000,k56_21);
run; *imp n=0;
%range(k57_21,k57b1_21,k57b2_21,k57b3_21, 50000,7500,15000,2000,k57_21);
run; *imp n=0;
/*proc means data=aa2;var imamk53_21 imamk54_21 imamk56_21 imamk57_21;run;*/

************ 1 ***************;
data output.group2_proxy_pension1;
merge datak53_21(drop=k53_21)
datak54_21(drop=k54_21)
datak56_21(drop=k56_21)
datak57_21(drop=k57_21) ;
by cunicah subhog_21; run;
data dd1; set output.group2_proxy_pension1; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk53_21 imamk54_21 imamk56_21 imamk57_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk53_21 upk53_21
lowk54_21 upk54_21
lowk56_21 upk56_21
lowk57_21 upk57_21
dumk53_21
dumk54_21
dumk56_21
dumk57_21
;
bounds
imamk53_21 (>=lowk53_21 ,<=upk53_21)
imamk54_21 (>=lowk54_21 ,<=upk54_21)
imamk56_21 (>=lowk56_21 ,<=upk56_21)
imamk57_21 (>=lowk57_21 ,<=upk57_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 1;
/*multiples 5;*/
seed 2018;
run;
```

```
data imp.group2_proxy_pension1_imputed; set dd_1;
drop
lowk53_21 upk53_21
lowk54_21 upk54_21
lowk56_21 upk56_21
lowk57_21 upk57_21
; run;

/* data temp; set imp.group2_proxy_pension1_imputed; run;
proc freq; table imamk53_21; where dumk53_21=1; run;
proc freq; table imamk54_21; where dumk54_21=1; run;
proc freq; table imamk56_21; where dumk56_21=1; run;
proc freq; table imamk57_21; where dumk57_21=1; run; */


********** 2 ************************;

data aa2; set aa1;
if age_21 in (888, 999) then age_21=.;
imamk67_1_1_21=k67_1_1_21;**** Imputation N=4;
if k64c_21 =2 and missing(k67_1_1_21) then imamk67_1_1_21=0;
if missing(k64c_21) and missing(k67_1_1_21) then imamk67_1_1_21=0;
if k64c_21=1 and k67_1_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk67_1_1_21=.;
if missing(imamk67_1_1_21) and missing(k68a1_1_21) then k68a1_1_21=9;
imamk67_1_2_21=k67_1_2_21;**** Imputation N=0;
if k64c_21 in (2,8,9) and missing(k67_1_2_21) then imamk67_1_2_21=0;
if missing(k64c_21) and missing(k67_1_2_21) then imamk67_1_2_21=0;
if k64c_21 = 1 and k67_1_2_21=. then imamk67_1_2_21=0;
if k64c_21 = 1 and k67_1_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk67_1_2_21=.;
if missing(imamk67_1_2_21) and missing(k68a1_2_21) then k68a1_2_21=9;
imamk67_2_1_21=k67_2_1_21;**** Imputation N=0;
if k64d_21 =2 and missing(k67_2_1_21) then imamk67_2_1_21=0;
if missing(k64d_21) and missing(k67_2_1_21) then imamk67_2_1_21=0;
if k64d_21=1 and k67_2_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk67_2_1_21=.;
if missing(imamk67_2_1_21) and missing(k68a2_1_21) then k68a2_1_21=9;
imamk67_2_2_21=k67_2_2_21;**** Imputation N=0;
if k64d_21 in (2,8,9) and missing(k67_2_2_21) then imamk67_2_2_21=0;
if missing(k64d_21) and missing(k67_2_2_21) then imamk67_2_2_21=0;
if k64d_21 = 1 and k67_2_2_21=. then imamk67_2_2_21=0;
if k64d_21 = 1 and k67_2_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk67_2_2_21=.;
if missing(imamk67_2_2_21) and missing(k68a2_2_21) then k68a2_2_21=9;
imamk67_3_1_21=k67_3_1_21;**** Imputation N=0;
if k64e_21 =2 and missing(k67_3_1_21) then imamk67_3_1_21=0;
if missing(k64e_21) and missing(k67_3_1_21) then imamk67_3_1_21=0;
```

```
if k64e_21=1 and k67_3_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk67_3_1_21=.;
if missing(imamk67_3_1_21) and missing(k68a3_1_21) then k68a3_1_21=9;
imamk67_3_2_21=k67_3_2_21;**** Imputation N=0;
if k64e_21 in (2,8,9) and missing(k67_3_2_21) then imamk67_3_2_21=0;
if missing(k64e_21) and missing(k67_3_2_21) then imamk67_3_2_21=0;
if k64e_21 = 1 and k67_3_2_21=. then imamk67_3_2_21=0;
if k64e_21 = 1 and k67_3_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk67_3_2_21=.;
if missing(imamk67_3_2_21) and missing(k68a3_2_21) then k68a3_2_21=9;
imamk67_4_1_21=k67_4_1_21;**** Imputation N=0;
if k64f_21 =2 and missing(k67_4_1_21) then imamk67_4_1_21=0;
if missing(k64f_21) and missing(k67_4_1_21) then imamk67_4_1_21=0;
if k64f_21=1 and k67_4_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk67_4_1_21=.;
if missing(imamk67_4_1_21) and missing(k68a4_1_21) then k68a4_1_21=9;
imamk67_4_2_21=k67_4_2_21;**** Imputation N=0;
if k64f_21 in (2,8,9) and missing(k67_4_2_21) then imamk67_4_2_21=0;
if missing(k64f_21) and missing(k67_4_2_21) then imamk67_4_2_21=0;
if k64f_21 = 1 and k67_4_2_21=. then imamk67_4_2_21=0;
if k64f_21 = 1 and k67_4_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk67_4_2_21=.;
if missing(imamk67_4_2_21) and missing(k68a4_2_21) then k68a4_2_21=9;
dumk67_1_1_21=missing(imamk67_1_1_21);
dumk67_1_2_21=missing(imamk67_1_2_21);
dumk67_2_1_21=missing(imamk67_2_1_21);
dumk67_2_2_21=missing(imamk67_2_2_21);
dumk67_3_1_21=missing(imamk67_3_1_21);
dumk67_3_2_21=missing(imamk67_3_2_21);
dumk67_4_1_21=missing(imamk67_4_1_21);
dumk67_4_2_21=missing(imamk67_4_2_21);
run;

/* proc freq; table imamk67_1_1_21
imamk67_1_2_21
imamk67_2_1_21
imamk67_2_2_21
imamk67_3_1_21
imamk67_3_2_21
imamk67_4_1_21
imamk67_4_2_21; run; */

%range(k67_1_1_21,k68a1_1_21,k68b1_1_21,k68c1_1_21,80000,2000,7500,950,k64c_
21);run;
%range(k67_1_2_21,k68a1_2_21,k68b1_2_21,k68c1_2_21,16000,2000,7500,950);
run;*imp n=0;
%range(k67_2_1_21,k68a2_1_21,k68b2_1_21,k68c2_1_21,22000,2000,7500,950,k64d_
21);run;
```

```
%range(k67_2_2_21,k68a2_2_21,k68b2_2_21,k68c2_2_21,22000,2000,7500,950);
run; *imp n=0;
%range(k67_3_1_21,k68a3_1_21,k68b3_1_21,k68c3_1_21,25000,2000,7500,950,k64e_
21);run;
%range(k67_3_2_21,k68a3_2_21,k68b3_2_21,k68c3_2_21,25000,2000,7500,950);
run; *imp n=0;
%range(k67_4_1_21,k68a4_1_21,k68b4_1_21,k68c4_1_21,30000,2000,7500,950,k64f_
21);run;
%range(k67_4_2_21,k68a4_2_21,k68b4_2_21,k68c4_2_21,30000,2000,7500,950);
run;*imp n=0;

/* proc means; var imamk67_1_1_21
imamk67_1_2_21
imamk67_2_1_21
imamk67_2_2_21
imamk67_3_1_21
imamk67_3_2_21
imamk67_4_1_21
imamk67_4_2_21; run; */

data output.group2_proxy_pension2;
merge datak67_1_1_21(drop=k64c_21) datak67_1_2_21
datak67_2_1_21(drop=k64d_21) datak67_2_2_21
datak67_3_1_21(drop=k64e_21) datak67_3_2_21
datak67_4_1_21(drop=k64f_21) datak67_4_2_21 ;
by cunicah subhog_21; run; ****122 var=38;

data dd1; set output.group2_proxy_pension2;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk67_1_1_21 lowk67_1_1_21 upk67_1_1_21 dumk67_1_1_21
imamk67_1_2_21 lowk67_1_2_21 upk67_1_2_21 dumk67_1_2_21; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk67_1_1_21 imamk67_1_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk67_1_1_21 upk67_1_1_21
lowk67_1_2_21 upk67_1_2_21
dumk67_1_1_21
dumk67_1_2_21
;
bounds
imamk67_1_1_21 (>=lowk67_1_1_21 ,<=upk67_1_1_21)
imamk67_1_2_21 (>=lowk67_1_2_21 ,<=upk67_1_2_21)
```

```
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group2_proxy_pension2;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk67_2_1_21 lowk67_2_1_21 upk67_2_1_21 dumk67_2_1_21
imamk67_2_2_21 lowk67_2_2_21 upk67_2_2_21 dumk67_2_2_21; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk67_2_1_21 imamk67_2_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk67_2_1_21 upk67_2_1_21
lowk67_2_2_21 upk67_2_2_21
dumk67_2_1_21
dumk67_2_2_21
;
bounds
imamk67_2_1_21 (>=lowk67_2_1_21 ,<=upk67_2_1_21)
imamk67_2_2_21 (>=lowk67_2_2_21 ,<=upk67_2_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group2_proxy_pension2;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk67_3_1_21 lowk67_3_1_21 upk67_3_1_21 dumk67_3_1_21
imamk67_3_2_21 lowk67_3_2_21 upk67_3_2_21 dumk67_3_2_21; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
```

```
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_3;
categorical sex_21 ;
count age_21;
mixed imamk67_3_1_21 imamk67_3_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk67_3_1_21 upk67_3_1_21
lowk67_3_2_21 upk67_3_2_21
dumk67_3_1_21
dumk67_3_2_21
;
bounds
imamk67_3_1_21 (>=lowk67_3_1_21 ,<=upk67_3_1_21)
imamk67_3_2_21 (>=lowk67_3_2_21 ,<=upk67_3_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;


data dd1; set output.group2_proxy_pension2;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk67_4_1_21 lowk67_4_1_21 upk67_4_1_21 dumk67_4_1_21
imamk67_4_2_21 lowk67_4_2_21 upk67_4_2_21 dumk67_4_2_21; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_4;
categorical sex_21 ;
count age_21;
mixed imamk67_4_1_21 imamk67_4_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk67_4_1_21 upk67_4_1_21
lowk67_4_2_21 upk67_4_2_21
dumk67_4_1_21
dumk67_4_2_21
;
bounds
imamk67_4_1_21 (>=lowk67_4_1_21 ,<=upk67_4_1_21)
imamk67_4_2_21 (>=lowk67_4_2_21 ,<=upk67_4_2_21)
yrschool(<=22, >=0)
```

```
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group2_proxy_pension2_imputed;
merge dd_1 dd_2 dd_3 dd_4;
by cunicah subhog_21;
drop
lowk67_1_1_21 upk67_1_1_21
lowk67_1_2_21 upk67_1_2_21
lowk67_2_1_21 upk67_2_1_21
lowk67_2_2_21 upk67_2_2_21
lowk67_3_1_21 upk67_3_1_21
lowk67_3_2_21 upk67_3_2_21
lowk67_4_1_21 upk67_4_1_21
lowk67_4_2_21 upk67_4_2_21;
run;

************** 3 *****************;

data aa2; set aa1;
imamk83_1_1_21=k83_1_1_21; **** Imputation N=2; **** nobrackets;
if k82c_21 =2 and missing(k83_1_1_21) then imamk83_1_1_21=0;
if missing(k82c_21) and missing(k83_1_1_21) then imamk83_1_1_21=0;
if k82c_21=1 and k83_1_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk83_1_1_21=.;
imamk83_2_21=k83_2_21; **** Imputation N=0;**** nobrackets;
if k82e_21 =2 and missing(k83_2_21) then imamk83_2_21=0;
if missing(k82e_21) and missing(k83_2_21) then imamk83_2_21=0;
if k82e_21=1 and k83_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk83_2_21=.;
imamk83_1_2_21=k83_1_2_21; **** Imputation N=2; **** nobrackets;
if k82c_21 in (2,8,9) and missing(k83_1_2_21) then imamk83_1_2_21=0;
if missing(k82c_21) and missing(k83_1_2_21) then imamk83_1_2_21=0;
if k82c_21=1 and k83_1_2_21=. then imamk83_1_2_21=0;
if k82c_21=1 and k83_1_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk83_1_2_21=.;
dumk83_1_1_21=missing(imamk83_1_1_21);
dumk83_1_2_21=missing(imamk83_1_2_21);
dumk83_2_21=missing(imamk83_2_21);
run;
/*
proc freq data=aa2;
tables dumk83_1_1_21 dumk83_1_2_21 dumk83_2_21;
run;
```

```
proc means data=aa2;
var imamk83_1_1_21 imamk83_1_2_21 imamk83_2_21;
run;
*/

data datak83; set aa2(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21
age_21 imamk83_1_1_21 imamk83_1_2_21 imamk83_2_21 k82c_21 k82e_21
dumk83_1_1_21 dumk83_1_2_21 dumk83_2_21);
lowk83_1_1_21=1; upk83_1_1_21=80000;
if k82c_21 in (8,9) then lowk83_1_1_21=0;
lowk83_1_2_21=1; upk83_1_2_21=2500;
lowk83_2_21=1; upk83_2_21=1500000;
if k82e_21 in (8,9) then lowk83_2_21=0;
if imamk83_1_1_21 >=0 then do; lowk83_1_1_21=imamk83_1_1_21;
upk83_1_1_21=imamk83_1_1_21; end;
if imamk83_1_2_21 >=0 then do; lowk83_1_2_21=imamk83_1_2_21;
upk83_1_2_21=imamk83_1_2_21; end;
if imamk83_2_21 >=0 then do; lowk83_2_21=imamk83_2_21;
upk83_2_21=imamk83_2_21; end;
run;
data output.group2_proxy_pension3;
set datak83(drop=k82c_21 k82e_21);
by cunicah subhog_21; run;

data dd1; set output.group2_proxy_pension3;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk83_1_1_21 lowk83_1_1_21 upk83_1_1_21 dumk83_1_1_21
imamk83_1_2_21 lowk83_1_2_21 upk83_1_2_21 dumk83_1_2_21
; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk83_1_1_21 imamk83_1_2_21  yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk83_1_1_21 upk83_1_1_21
lowk83_1_2_21 upk83_1_2_21
dumk83_1_1_21
dumk83_1_2_21
;
bounds
imamk83_1_1_21 (>=lowk83_1_1_21 ,<=upk83_1_1_21)
imamk83_1_2_21 (>=lowk83_1_2_21 ,<=upk83_1_2_21)
yrschool(<=22, >=0)
```

```
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group2_proxy_pension3;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk83_2_21 lowk83_2_21 upk83_2_21 dumk83_2_21
; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk83_2_21  yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk83_2_21 upk83_2_21
dumk83_2_21
;
bounds
imamk83_2_21 (>=lowk83_2_21 ,<=upk83_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group2_proxy_pension3_imputed; merge dd_1 dd_2; by cunicah
subhog_21;
drop
lowk83_1_1_21 upk83_1_1_21
lowk83_1_2_21 upk83_1_2_21
lowk83_2_21 upk83_2_21;
run;

/* data temp; set imp.group2_proxy_pension3_imputed; run;
proc freq; table imamk83_1_1_21; where dumk83_1_1_21=1; run; **** imputed;
proc freq; table imamk83_1_2_21; where dumk83_1_2_21=1; run; *** not
imputed;
```

```
proc freq; table imamk83_2_21; where dumk83_2_21=1; run; **** not imputed;
*/

proc means data=output.group2_proxy_pension3 n mean std min max nmiss  ;
variable imamk83_2_21;
run;

proc means data=imp.group2_proxy_pension3_imputed n mean std min max nmiss
;
variable imamk83_2_21;
run;

data group11;
set output.group2_proxy_pension3;
if imamk83_2_21=0 then imamk83_2_21=.;
run;

proc means data=group11 n mean std min max  ;
variable imamk83_2_21;
run;

data group14;
set imp.group2_proxy_pension3_imputed;
if imamk83_2_21=0 then imamk83_2_21=.;
run;

proc means data=group14 n mean std min max  ;
variable imamk83_2_21;
run;


*/
```

```
/*******************************************************/
/* PROGRAM NAME : Imput2021_group2_report.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/22/2023 */
/* Descriptive Statistics of Derived (Un-imputed) and Imputed Variables
*/
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

************* core/pension ************************;
data out1;
merge output.Group2_core_pension1 output.Group2_core_pension2
output.group2_core_pension3;
by cunicah subhog_21;
rename imamk53_21=amk53_21 imamk54_21=amk54_21 imamk56_21=amk56_21
imamk57_21=amk57_21
imamk67_1_1_21=amk67_1_1_21 imamk67_1_2_21=amk67_1_2_21
imamk67_2_1_21=amk67_2_1_21 imamk67_2_2_21=amk67_2_2_21
imamk67_3_1_21=amk67_3_1_21 imamk67_3_2_21=amk67_3_2_21
imamk67_4_1_21=amk67_4_1_21 imamk67_4_2_21=amk67_4_2_21
imamk83_1_1_21=amk83_1_1_21 imamk83_1_2_21=amk83_1_2_21
imamk83_2_21=amk83_2_21;run;

data imp1;
merge imp.Group2_core_pension1_imputed imp.Group2_core_pension2_imputed
imp.Group2_core_pension3_imputed;
by cunicah subhog_21; run;
data out_imp1;
merge out1 imp1;
by cunicah subhog_21; run;

*** print putput;
Title "Group2 core pension - mean with zero";
proc means data=out_imp1 n nmiss mean std min max ;
variable amk53_21 imamk53_21 amk54_21 imamk54_21 amk56_21 imamk56_21
amk57_21 imamk57_21
amk67_1_1_21 imamk67_1_1_21 amk67_1_2_21 imamk67_1_2_21
amk67_2_1_21 imamk67_2_1_21 amk67_2_2_21 imamk67_2_2_21
amk67_3_1_21 imamk67_3_1_21 amk67_3_2_21 imamk67_3_2_21
amk67_4_1_21 imamk67_4_1_21 amk67_4_2_21 imamk67_4_2_21
amk83_1_1_21 imamk83_1_1_21 amk83_1_2_21 imamk83_1_2_21 amk83_2_21
imamk83_2_21
; run;

Title "Group2 core pension - mean without zero";
data out_imp2; set out_imp1;
```

```
if imamk53_21 =0 then imamk53_21 =.;
if imamk54_21 =0 then imamk54_21 =.;
if imamk56_21 =0 then imamk56_21 =.;
if imamk57_21 =0 then imamk57_21 =.;
if imamk67_1_1_21 =0 then imamk67_1_1_21 =.;
if imamk67_1_2_21 =0 then imamk67_1_2_21 =.;
if imamk67_2_1_21 =0 then imamk67_2_1_21 =.;
if imamk67_2_2_21 =0 then imamk67_2_2_21 =.;
if imamk67_3_1_21 =0 then imamk67_3_1_21 =.;
if imamk67_3_2_21 =0 then imamk67_3_2_21 =.;
if imamk67_4_1_21 =0 then imamk67_4_1_21 =.;
if imamk67_4_2_21 =0 then imamk67_4_2_21 =.;
if imamk83_1_1_21 =0 then imamk83_1_1_21 =.;
if imamk83_1_2_21 =0 then imamk83_1_2_21 =.;
if imamk83_2_21 =0 then imamk83_2_21 =.;

if amk53_21 =0 then amk53_21 =.;
if amk54_21 =0 then amk54_21 =.;
if amk56_21 =0 then amk56_21 =.;
if amk57_21 =0 then amk57_21 =.;
if amk67_1_1_21 =0 then amk67_1_1_21 =.;
if amk67_1_2_21 =0 then amk67_1_2_21 =.;
if amk67_2_1_21 =0 then amk67_2_1_21 =.;
if amk67_2_2_21 =0 then amk67_2_2_21 =.;
if amk67_3_1_21 =0 then amk67_3_1_21 =.;
if amk67_3_2_21 =0 then amk67_3_2_21 =.;
if amk67_4_1_21 =0 then amk67_4_1_21 =.;
if amk67_4_2_21 =0 then amk67_4_2_21 =.;
if amk83_1_1_21 =0 then amk83_1_1_21 =.;
if amk83_1_2_21 =0 then amk83_1_2_21 =.;
if amk83_2_21 =0 then amk83_2_21 =.;
run;
proc means data=out_imp2 n mean std min max ;
variable amk53_21 imamk53_21 amk54_21 imamk54_21 amk56_21 imamk56_21
amk57_21 imamk57_21
amk67_1_1_21 imamk67_1_1_21 amk67_1_2_21 imamk67_1_2_21
amk67_2_1_21 imamk67_2_1_21 amk67_2_2_21 imamk67_2_2_21
amk67_3_1_21 imamk67_3_1_21 amk67_3_2_21 imamk67_3_2_21
amk67_4_1_21 imamk67_4_1_21 amk67_4_2_21 imamk67_4_2_21
amk83_1_1_21 imamk83_1_1_21 amk83_1_2_21 imamk83_1_2_21 amk83_2_21
imamk83_2_21
; run;

************* proxy/pension ************************;
data out1;
merge output.Group2_proxy_pension1 output.Group2_proxy_pension2
output.group2_proxy_pension3;
by cunicah subhog_21;
rename imamk53_21=amk53_21 imamk54_21=amk54_21 imamk56_21=amk56_21
imamk57_21=amk57_21
imamk67_1_1_21=amk67_1_1_21 imamk67_1_2_21=amk67_1_2_21
imamk67_2_1_21=amk67_2_1_21 imamk67_2_2_21=amk67_2_2_21
```

```
imamk67_3_1_21=amk67_3_1_21 imamk67_3_2_21=amk67_3_2_21
imamk67_4_1_21=amk67_4_1_21 imamk67_4_2_21=amk67_4_2_21
imamk83_1_1_21=amk83_1_1_21 imamk83_1_2_21=amk83_1_2_21
imamk83_2_21=amk83_2_21;run;

data imp1;
merge imp.Group2_proxy_pension1_imputed imp.Group2_proxy_pension2_imputed
imp.Group2_proxy_pension3_imputed;
by cunicah subhog_21; run;
data out_imp1;
merge out1 imp1;
by cunicah subhog_21; run;

*** print putput;
Title "Group2 proxy pension - mean with zero";
proc means data=out_imp1 n nmiss mean std min max ;
variable amk53_21 imamk53_21 amk54_21 imamk54_21 amk56_21 imamk56_21
amk57_21 imamk57_21
amk67_1_1_21 imamk67_1_1_21 amk67_1_2_21 imamk67_1_2_21
amk67_2_1_21 imamk67_2_1_21 amk67_2_2_21 imamk67_2_2_21
amk67_3_1_21 imamk67_3_1_21 amk67_3_2_21 imamk67_3_2_21
amk67_4_1_21 imamk67_4_1_21 amk67_4_2_21 imamk67_4_2_21
amk83_1_1_21 imamk83_1_1_21 amk83_1_2_21 imamk83_1_2_21 amk83_2_21
imamk83_2_21
; run;

Title "Group2 proxy pension - mean without zero";
data out_imp2; set out_imp1;
if imamk53_21 =0 then imamk53_21 =.;
if imamk54_21 =0 then imamk54_21 =.;
if imamk56_21 =0 then imamk56_21 =.;
if imamk57_21 =0 then imamk57_21 =.;
if imamk67_1_1_21 =0 then imamk67_1_1_21 =.;
if imamk67_1_2_21 =0 then imamk67_1_2_21 =.;
if imamk67_2_1_21 =0 then imamk67_2_1_21 =.;
if imamk67_2_2_21 =0 then imamk67_2_2_21 =.;
if imamk67_3_1_21 =0 then imamk67_3_1_21 =.;
if imamk67_3_2_21 =0 then imamk67_3_2_21 =.;
if imamk67_4_1_21 =0 then imamk67_4_1_21 =.;
if imamk67_4_2_21 =0 then imamk67_4_2_21 =.;
if imamk83_1_1_21 =0 then imamk83_1_1_21 =.;
if imamk83_1_2_21 =0 then imamk83_1_2_21 =.;
if imamk83_2_21 =0 then imamk83_2_21 =.;

if amk53_21 =0 then amk53_21 =.;
if amk54_21 =0 then amk54_21 =.;
if amk56_21 =0 then amk56_21 =.;
if amk57_21 =0 then amk57_21 =.;
if amk67_1_1_21 =0 then amk67_1_1_21 =.;
if amk67_1_2_21 =0 then amk67_1_2_21 =.;
if amk67_2_1_21 =0 then amk67_2_1_21 =.;
if amk67_2_2_21 =0 then amk67_2_2_21 =.;
```

```
if amk67_3_1_21 =0 then amk67_3_1_21 =.;
if amk67_3_2_21 =0 then amk67_3_2_21 =.;
if amk67_4_1_21 =0 then amk67_4_1_21 =.;
if amk67_4_2_21 =0 then amk67_4_2_21 =.;
if amk83_1_1_21 =0 then amk83_1_1_21 =.;
if amk83_1_2_21 =0 then amk83_1_2_21 =.;
if amk83_2_21 =0 then amk83_2_21 =.;
run;
proc means data=out_imp2 n mean std min max ;
variable amk53_21 imamk53_21 amk54_21 imamk54_21 amk56_21 imamk56_21
amk57_21 imamk57_21
amk67_1_1_21 imamk67_1_1_21 amk67_1_2_21 imamk67_1_2_21
amk67_2_1_21 imamk67_2_1_21 amk67_2_2_21 imamk67_2_2_21
amk67_3_1_21 imamk67_3_1_21 amk67_3_2_21 imamk67_3_2_21
amk67_4_1_21 imamk67_4_1_21 amk67_4_2_21 imamk67_4_2_21
amk83_1_1_21 imamk83_1_1_21 amk83_1_2_21 imamk83_1_2_21 amk83_2_21
imamk83_2_21
; run;
```

GROUP 3. Individual (or Couple) Total Net Worth and Household Consumption Components

```
/*******************************************************/
/* PROGRAM NAME : Impute2021_group3_core_housing.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/8/2023*/
/* Impute missing value on core and proxy questionnaire */
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

data aa; set output.sect_g_j_k_sa_2021; *** core and proxy questionnaire
N=10716;
proc sort nodupkey; by cunicah subhog_21; run; *** no duplicate;

***** Core questionnaire N=10716;
data aa1; set aa;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
j25_21 j26_21 j27a_21 j27b_21 J27c_21
j26_21 j28_21 j29a_21 j29b_21 J29c_21
j22_21 j31_21 j32a_21 j32b_21 J32c_21
j33_21 j34_21 j35a_21 j35b_21 J35c_21
j19_21 ;
if tipent_hh_21 in (1); run;
proc freq; table dumj34_21; run;

data aa2; set aa1;
if age_21 in (888,999) then age_21=.;
imamj26_21=j26_21;**** Imputation N=56;
if j25_21 =1 and missing(j26_21) then imamj26_21=0;
if missing(j25_21) and missing(j26_21) then imamj26_21=0;
if 2<=j25_21<=9 and j26_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamj26_21=.;
if missing(imamj26_21) and missing(j27a_21) then j27a_21=9;
dumj26_21=missing(imamj26_21);
imamj28_21=j28_21;**** Imputation N=131;
if j25_21 =1 and missing(j28_21) then imamj28_21=0;
if missing(j25_21) and missing(j28_21) then imamj28_21=0;
if j26_21 <=0 and missing(j28_21) then imamj28_21=0;
if j26_21 >0 and j28_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9,88888888,99999999) then imamj28_21=.;
if missing(imamj28_21) and missing(j29a_21) then j29a_21=9;
dumj28_21=missing(imamj28_21);
imamj31_21=j31_21;**** Imputation N=2680;
if j19_21 =1 and missing(j31_21) then imamj31_21=0;
if j22_21 in (6,7) and missing(j31_21) then imamj31_21=0;
```

```
if j22_21 in (1,2,3,4,5) and j31_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9,9999998,88888888,99999999) then imamj31_21=.;
if missing(imamj31_21) and missing(j32a_21) then j32a_21=9;
dumj31_21=missing(imamj31_21);
imamj34_21=j34_21;**** Imputation N=313;
if j33_21 =2 and missing(j34_21) then imamj34_21=0;
if j33_21=1 and j34_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9,9999998,88888888,99999999,99990999,99999998) then imamj34_21=.;
if missing(imamj34_21) and missing(j35a_21) then j35a_21=9;
dumj34_21=missing(imamj34_21);
run;

***** define range of imputation;
%macro range(vname,va,vb,vc,rmax,r1,r1_2,r2_1,mix1,mix2);
data data&vname
(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21 imam&vname
dum&vname low&vname up&vname &mix1 &mix2);
set aa2;
low&vname=1; up&vname=&rmax ;
if &va=1 and &vc=1 then do; low&vname=&r1_2;
up&vname=&rmax; end;
if &va=1 and &vc=2 then do; low&vname=&r1; up&vname=&r1_2;
end;
if &va=1 and &vc=9 then do; low&vname=&r1; up&vname=&rmax;
end;
if &va=2 and &vb=1 then do; low&vname=&r2_1;
up&vname=&r1; end;
if &va=2 and &vb=2 then do; low&vname=1; up&vname=&r2_1;
end;
if &va=2 and &vb=9 then do; low&vname=1; up&vname=&r1;
end;
if &va=9 then do; low&vname=1; up&vname=&rmax; end;
if imam&vname >=0 then do; low&vname=imam&vname; end;
if imam&vname >=0 then do; up&vname=imam&vname; end;
if &mix1 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
if &mix2 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
%mend range;
%range(j26_21,j27a_21,j27b_21,J27c_21,990000,7500,20000,2000,j27a_21); run;
%range(j28_21,j29a_21,j29b_21,J29c_21,6000000,180000,400000,95000); run;
%range(j31_21,j32a_21,j32b_21,J32c_21,9800000,180000,950000,95000,j22_21);
run;
%range(j34_21,j35a_21,j35b_21,J35c_21,8000000,180000,950000,95000,j33_21);
run;
/*proc means data=aa2; var imamj26_21 imamj28_21 imamj31_21 imamj34_21;
run;*/

data output.group3_core_housing;
merge dataj26_21 dataj28_21 dataj31_21 dataj34_21;
by cunicah subhog_21; run;
```

```
data dd1; set output.group3_core_housing;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamj26_21
lowj26_21 upj26_21
dumj26_21
;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamj26_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowj26_21 upj26_21
dumj26_21
;
bounds
imamj26_21 (>=lowj26_21 ,<=upj26_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 1;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group3_core_housing;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamj28_21
lowj28_21 upj28_21
dumj28_21
;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
```

```
mixed imamj28_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowj28_21 upj28_21
dumj28_21
;
bounds
imamj28_21 (>=lowj28_21 ,<=upj28_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 1;
/*multiples 5;*/
seed 2018;
run;


data dd1; set output.group3_core_housing;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamj31_21 imamj34_21
lowj31_21 upj31_21
lowj34_21 upj34_21
dumj31_21
dumj34_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_3;
categorical sex_21 ;
count age_21;
mixed imamj31_21 imamj34_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowj31_21 upj31_21
lowj34_21 upj34_21
dumj31_21
dumj34_21
;
bounds
imamj31_21 (>=lowj31_21 ,<=upj31_21)
imamj34_21 (>=lowj34_21 ,<=upj34_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 1;
/*multiples 5;*/
```

```
seed 2018;
run;

data data imp.group3_core_housing_imputed;
merge dd_1 dd_2 dd_3;
by cunicah subhog_21;
drop
lowj26_21 upj26_21
lowj28_21 upj28_21
lowj31_21 upj31_21
lowj34_21 upj34_21 ; run;


proc means data=output.group3_core_housing n mean std min max nmiss  ;
variable imamj34_21;
run;

proc means data=imp.group3_core_housing_imputed n mean std min max nmiss  ;
variable imamj34_21;
run;

data group11;
set output.group3_core_housing;
if imamj34_21=0 then imamj34_21=.;
run;

proc means data=group11 n mean std min max  ;
variable imamj34_21;
run;

data group14;
set imp.group3_core_housing_imputed;
if imamj34_21=0 then imamj34_21=.;
run;

proc means data=group14 n mean std min max  ;
variable imamj34_21;
run;
```

```
/*******************************************************/
/* PROGRAM NAME : Imput2021_group3_core_pension.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 6/14/2023*/
/* Impute missing value on core and proxy questionnaire */
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

*for k8 imputations;
libname outputs 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2018';

data aa; set output.sect_g_j_k_sa_2021; *** core and proxy questionnaire
N=10716;
proc sort nodupkey; by cunicah subhog_21; run; *** no duplicate;

***** Core questionnaire N=10718;
data bb1; set aa;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
k17_21
k19_1_21 k20_1_21 k21a1_21 k21b1_21 k21c1_21
k24_1_21 k25a1_21 k25b1_21 k25c1_21
k31a_21 k33_1_21 k34a1_21 k34b1_21 k34c1_21
k31b_21 k33_2_21 k34a2_21 k34b2_21 k34c2_21
k31c_21 k33_3_21 k34a3_21 k34b3_21 k34c3_21
k38_21 k39_21
k40_21 k41a_21 k41b_21 k41c_21
k42_21 k43a_21 k43b_21 k43c_21
k44_21 k45a_21 k45b_21 k45c_21
k85_21 k86_21 k87a_21 k87b_21 k87c_21
k88_21 k89a_21 k89b_21 k89c_21
k1_21
k3_1_21 k4_1_21 k5a1_21 k5b1_21 k5c1_21
k3_2_21 k4_2_21 k5a2_21 k5b2_21 k5c2_21
k8_1_21 k9a1_21 k9b1_21 k9c1_21
k8_2_21 k9a2_21 k9b2_21 k9c2_21 ;
if tipent_hh_21 in (1); run;


******************** 1 **********************;
data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk20_1_21=k20_1_21;**** Imputation N=8;
if k17_21=2 and missing(k20_1_21) then imamk20_1_21=0;
if k17_21=1 and k19_1_21 =2 and missing(k20_1_21) then imamk20_1_21=0;
```

```
if k17_21=1 and k19_1_21 =1 and k20_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
8,9999999,99999999) then imamk20_1_21=.;
if missing(imamk20_1_21) and missing(k21a1_21) then k21a1_21=9;
imamk24_1_21=k24_1_21;**** Imputation N=176;
if k17_21=2 and missing(k24_1_21) then imamk24_1_21=0;
if k17_21=1 and k24_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
8,9999999,88888888,99999999) then imamk24_1_21=.;
if missing(imamk24_1_21) and missing(k25a1_21) then k25a1_21=9;
dumk20_1_21=missing(imamk20_1_21);
dumk24_1_21=missing(imamk24_1_21);
run;
/*proc freq; tables age_21 yrschool dumk20_1_21 dumk24_1_21;run;*/

***** define range of imputation;
%macro range(vname,va,vb,vc,rmax,r1,r1_2,r2_1,mix1,mix2);
data data&vname
(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21 imam&vname
dum&vname low&vname up&vname &mix1 &mix2);
set bb2;
low&vname=1; up&vname=&rmax ;
if &va=1 and &vc=1 then do; low&vname=&r1_2;
up&vname=&rmax; end;
if &va=1 and &vc=2 then do; low&vname=&r1; up&vname=&r1_2;
end;
if &va=1 and &vc=9 then do; low&vname=&r1; up&vname=&rmax;
end;
if &va=2 and &vb=1 then do; low&vname=&r2_1;
up&vname=&r1; end;
if &va=2 and &vb=2 then do; low&vname=1; up&vname=&r2_1;
end;
if &va=2 and &vb=9 then do; low&vname=1; up&vname=&r1;
end;
if &va=9 then do; low&vname=1; up&vname=&rmax; end;
if imam&vname >=0 then do; low&vname=imam&vname; end;
if imam&vname >=0 then do; up&vname=imam&vname; end;
if &mix1 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
if &mix2 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
%mend range;
%range(k20_1_21,k21a1_21,k21b1_21,k21c1_21,1500000,180000,500000,95000,k17_2
1,k19_1_21); run;
%range(k24_1_21,k25a1_21,k25b1_21,k25c1_21,9000000,180000,500000,95000,k17_2
1);run;
/*proc means data=bb2; var imamk20_1_21 imamk24_1_21; run;*/

data output.group3_core_pension1;
merge datak20_1_21  datak24_1_21 ;
by cunicah subhog_21;
drop k17_21 k19_1_21 ;
run;
```

```
****** 2*****************;
/*proc freq; tables dumk33_3_21;run;*/
data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk33_1_21=k33_1_21;**** Imputation N=176;
if k31a_21 =2 and missing(k33_1_21) then imamk33_1_21=0;
if k31a_21=1 and k33_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
8,9999999,88888888,99999999)then imamk33_1_21=.;
if missing(imamk33_1_21) and missing(k34a1_21) then k34a1_21=9;
imamk33_2_21=k33_2_21;**** Imputation N=10;
if k31b_21 =2 and missing(k33_2_21) then imamk33_2_21=0;
if k31b_21=1 and k33_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
8,9999999,88888888,99999999)then imamk33_2_21=.;
if missing(imamk33_2_21) and missing(k34a2_21) then k34a2_21=9;
imamk33_3_21=k33_3_21;**** Imputation N=13;
if k31c_21 =2 and missing(k33_3_21) then imamk33_3_21=0;
if k31c_21=1 and k33_3_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
8,9999999,88888888,99999999)then imamk33_3_21=.;
if missing(imamk33_3_21) and missing(k34a3_21) then k34a3_21=9;
dumk33_1_21=missing(imamk33_1_21);
dumk33_2_21=missing(imamk33_2_21);
dumk33_3_21=missing(imamk33_3_21);
run;

%range(k33_1_21,k34a1_21,k34b1_21,k34c1_21,8000000,25000,90000,12000,k31a_21
);run;
%range(k33_2_21,k34a2_21,k34b2_21,k34c2_21,600000,25000,90000,12000,k31b_21)
;run;
%range(k33_3_21,k34a3_21,k34b3_21,k34c3_21,5000000,25000,90000,12000,k31c_21
);run;
/*proc means data=bb2; var imamk33_1_21 imamk33_2_21 imamk33_3_21; run;*/

data output.group3_core_pension2;
merge datak33_1_21 datak33_2_21 datak33_3_21 ;
by cunicah subhog_21;
drop k31a_21 k31b_21 k31c_21;
run;

********** 3 ********************;
/*proc freq; tables dumk44_21;run;*/
data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk40_21=k40_21;**** Imputation N=38;
if k38_21=2 and missing(k40_21) then imamk40_21=0;
if k38_21=1 and k39_21 =2 and missing(k40_21) then imamk40_21=0;
if k38_21=1 and k39_21=1 and k40_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,8888888
,9999998,9999999,9999099) then imamk40_21=.;
if missing(imamk40_21) and missing(k41a_21) then k41a_21=9;
```

```
imamk42_21=k42_21;**** Imputation N=380;
if k38_21=2 and missing(k42_21) then imamk42_21=0;
if k38_21=1 and k42_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,8888888
,9999998,9999999,9999099) then imamk42_21=.;
if missing(imamk42_21) and missing(k43a_21) then k43a_21=9;
imamk44_21=k44_21;**** Imputation N=2055;
if k44_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,8888888
,9999998,9999999,9999099) then imamk44_21=.;
if k44_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,8888888
,9999998,9999999,9999099) then k44b_21=9; *** create a variable for mix
imputed;
if missing(imamk44_21) and missing(k45a_21) then k45a_21=9;
dumk40_21=missing(imamk40_21);
dumk42_21=missing(imamk42_21);
dumk44_21=missing(imamk44_21);
run;

%range(k40_21 ,k41a_21,k41b_21,k41c_21,
500000,180000,500000,95000,k38_21,k39_21);run;
%range(k42_21,k43a_21,k43b_21,k43c_21,6000000,180000,500000,95000,k38_21);
run;
%range(k44_21,k45a_21,k45b_21,k45c_21,9000000,180000,500000,95000,k44b_21);
run;
/*proc means data=bb2; var imamk40_21 imamk42_21 imamk44_21; run;*/

data output.group3_core_pension3;
merge datak40_21 datak42_21 datak44_21 ;
by cunicah subhog_21;
drop k38_21 k39_21 k44b_21; run;

****************** 4 ********************;
/*proc freq; tables dumk8_1_21;run;*/
data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk86_21=k86_21;**** Imputation N=66;
if k85_21 =2 and missing(k86_21) then imamk86_21=0;
if k85_21=1 and k86_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,8888888
,9999998,9999999,9999099) then imamk86_21=.;
if missing(imamk86_21) and missing(k87a_21) then k87a_21=9;
imamk88_21=k88_21;**** Imputation N=477;
if k88_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999989,999998,
8888888,9999998,9999999,9999099) then imamk88_21=.;
if k88_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999989,999998,
8888888,9999998,9999999,9999099) then k88_21b=9; *** create a variable for
mix imputed/no mix imp;
if missing(imamk88_21) and missing(k89a_21) then k89a_21=9;
```

```
imamk4_1_21=k4_1_21;**** Imputation N=62;
if k1_21 =2 and missing(k4_1_21) then imamk4_1_21=0;
if k1_21=1 and k3_1_21 =2 and missing(k4_1_21) then imamk4_1_21=0;
if k1_21=1 and k3_1_21=1 and k4_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,8888888
,9999998,9999999,9999099,88888888,99999999) then imamk4_1_21=.;
if missing(imamk4_1_21) and missing(k5a1_21) then k5a1_21=9;
imamk4_2_21=k4_2_21;**** Imputation N=0;
if k1_21 ne 1 and missing(k4_2_21) then imamk4_2_21=0;
if k3_2_21 =2 and missing(k4_2_21) then imamk4_2_21=0;
if k3_2_21 =. and missing(k4_2_21) then imamk4_2_21=0;
if k1_21 = 1 and k3_2_21 = 1 and k4_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,8888888
,9999998,9999999,9999099) then imamk4_2_21=.;
if missing(imamk4_2_21) and missing(k5a2_21) then k5a2_21=9;
imamk8_1_21=k8_1_21;**** Imputation N=1334;
if k1_21 =2 and missing(k8_1_21) then imamk8_1_21=0;
if k1_21=1 and k8_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,8888888
,9999998,9999999,9999099,88888888,99999998,99999999) then imamk8_1_21=.;
if missing(imamk8_1_21) and missing(k9a1_21) then k9a1_21=9;
imamk8_2_21=k8_2_21;**** Imputation N=0;
if k1_21 ne 1 and missing(k8_2_21) then imamk8_2_21=0;
if k1_21 =1 and k8_2_21=. then imamk8_2_21=0;
if k1_21 =1 and k8_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,8888888
,9999998,9999999,9999099,88888888,99999999) then imamk8_2_21=.;
if missing(imamk8_2_21) and missing(k9a2_21) then k9a2_21=9;
dumk86_21=missing(imamk86_21);
dumk88_21=missing(imamk88_21);
dumk4_1_21=missing(imamk4_1_21);
dumk4_2_21=missing(imamk4_2_21);
dumk8_1_21=missing(imamk8_1_21);
dumk8_2_21=missing(imamk8_2_21);
run;

%range(k86_21,k87a_21,k87b_21,k87c_21, 5000000,25000,90000,12000, k85_21);
run;
%range(k88_21,k89a_21,k89b_21,k89c_21, 5000000, 7500,12000, 4000); run;
%range(k4_1_21,k5a1_21,k5b1_21,k5c1_21,
5000000,150000,500000,50000,k1_21,k3_1_21); run;
%range(k4_2_21,k5a2_21,k5b2_21,k5c2_21,
400000,150000,500000,50000,k3_2_21);run;
%range(k8_1_21,k9a1_21,k9b1_21,k9c1_21, 9000000,150000,500000,50000,k1_21);
run;
%range(k8_2_21,k9a2_21,k9b2_21,k9c2_21, 5000000,150000,500000,50000); run;
/*proc means data=bb2; var imamk86_21 imamk88_21 imamk4_1_21 imamk4_2_21
imamk8_1_21 imamk8_2_21; run;*/

data output.group3_core_pension4;
merge datak86_21 datak88_21 datak4_1_21
datak4_2_21 datak8_1_21 datak8_2_21 ;
```

```
by cunicah subhog_21;
drop k85_21 k3_1_21 k3_2_21 ; run;



********* 1 ********************;
data dd1;
set output.group3_core_pension1; **** Core nonproxy N=10718 var=10;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk20_1_21 lowk20_1_21 upk20_1_21 dumk20_1_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk20_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk20_1_21 upk20_1_21
dumk20_1_21
;
bounds
imamk20_1_21 (>=lowk20_1_21 ,<=upk20_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group3_core_pension1; **** Core nonproxy N=10718
var=10;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk24_1_21  lowk24_1_21 upk24_1_21 dumk24_1_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
```

```
categorical sex_21 ;
count age_21;
mixed imamk24_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk24_1_21 upk24_1_21
dumk24_1_21
;
bounds
imamk24_1_21 (>=lowk24_1_21 ,<=upk24_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group3_core_pension1_imputed;
merge dd_1 dd_2;
by cunicah subhog_21;
drop
lowk20_1_21 upk20_1_21
lowk24_1_21 upk24_1_21
;
run;

*************** 2*********************;
data dd1; set output.group3_core_pension2;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk33_1_21 lowk33_1_21 upk33_1_21 dumk33_1_21; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk33_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk33_1_21 upk33_1_21
dumk33_1_21
;
bounds
imamk33_1_21 (>=lowk33_1_21 ,<=upk33_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
```

```
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group3_core_pension2;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk33_2_21 lowk33_2_21 upk33_2_21 dumk33_2_21; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk33_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk33_2_21 upk33_2_21
dumk33_2_21
;
bounds
imamk33_2_21 (>=lowk33_2_21 ,<=upk33_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group3_core_pension2;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk33_3_21 lowk33_3_21 upk33_3_21 dumk33_3_21; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_3;
categorical sex_21 ;
count age_21;
mixed imamk33_3_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
```

```
lowk33_3_21 upk33_3_21
dumk33_3_21
;
bounds
imamk33_3_21 (>=lowk33_3_21 ,<=upk33_3_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group3_core_pension2_imputed;
merge dd_1 dd_2 dd_3;
by cunicah subhog_21;
drop
lowk33_1_21 upk33_1_21
lowk33_2_21 upk33_2_21
lowk33_3_21 upk33_3_21
; run;

************************ 3 ************************;
data dd1; set output.group3_core_pension3;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk40_21 lowk40_21 upk40_21 dumk40_21; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk40_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk40_21 upk40_21
dumk40_21
;
bounds
imamk40_21 (>=lowk40_21 ,<=upk40_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
```

```
run;

data dd1; set output.group3_core_pension3;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk42_21 lowk42_21 upk42_21 dumk42_21
imamk44_21 lowk44_21 upk44_21 dumk44_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk42_21 imamk44_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk42_21 upk42_21
lowk44_21 upk44_21
dumk42_21
dumk44_21
;
bounds
imamk42_21 (>=lowk42_21 ,<=upk42_21)
imamk44_21 (>=lowk44_21 ,<=upk44_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group3_core_pension3_imputed;
merge dd_1 dd_2; by cunicah subhog_21;
drop
lowk40_21 upk40_21
lowk42_21 upk42_21
lowk44_21 upk44_21
; run;

************* 4************************;
data dd1; set output.group3_core_pension4;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk86_21 lowk86_21 upk86_21 dumk86_21 ;
run;
```

```
options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk86_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk86_21 upk86_21
dumk86_21
;
bounds
imamk86_21 (>=lowk86_21 ,<=upk86_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group3_core_pension4;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk88_21 lowk88_21 upk88_21 dumk88_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk88_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk88_21 upk88_21
dumk88_21
;
bounds
imamk88_21 (>=lowk88_21 ,<=upk88_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
```

```
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group3_core_pension4;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk4_1_21 lowk4_1_21 upk4_1_21 dumk4_1_21 ;
run;



options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_3;
categorical sex_21 ;
count age_21;
mixed imamk4_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk4_1_21 upk4_1_21
dumk4_1_21
;
bounds
imamk4_1_21 (>=lowk4_1_21 ,<=upk4_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group3_core_pension4;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk4_2_21 lowk4_2_21 upk4_2_21 dumk4_2_21 ;
run;



options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
```

```
datain dd1;
dataout dd_4;
categorical sex_21 ;
count age_21;
mixed imamk4_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk4_2_21 upk4_2_21
dumk4_2_21
;
bounds
imamk4_2_21 (>=lowk4_2_21 ,<=upk4_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group3_core_pension4;
id = 1;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool id
imamk8_1_21 lowk8_1_21 upk8_1_21 dumk8_1_21 k1_21;
run;



data dd; set input.master_follow_up_file_2021; keep cunicah subhog_21
subhog_18 np; run;


data dd1a;
set outputs.group3_core_pension4;
keep cunicah subhog_18 tipent_hh_18 sex_18 age_18 yrschool
imamk8_1_18 lowk8_1_18 upk8_1_18 dumk8_1_18;
run;

data merged_dataset;
merge dd1 (in=dataset1) dd (in=dataset2);
by cunicah subhog_21;
keep cunicah subhog_21 subhog_18 tipent_hh_21 sex_21 age_21 yrschool
imamk8_1_21 lowk8_1_21 upk8_1_21 dumk8_1_21 id k1_21;
if id ne 1 then delete;
run;

proc sort out=temp nodupkey; by cunicah subhog_21 ; run;



proc sort data=temp;
    by cunicah subhog_18;
```

```
run;

data merged_dataset1;
merge temp (in=dataset1) dd1a (in=dataset2);
by cunicah subhog_18;
keep cunicah subhog_21 subhog_18 tipent_hh_21 sex_21 age_21 yrschool
imamk8_1_21 lowk8_1_21 upk8_1_21 dumk8_1_21
tipent_hh_18 sex_18 age_18 yrschool
imamk8_1_18 lowk8_1_18 upk8_1_18 dumk8_1_18 k1_21;
if dataset2 and not dataset1 then delete;
run;


proc means data = merged_dataset1; var k1_21; run;

data dd1;
set merged_dataset1;
if imamk8_1_21 =. and k1_21 in (1,3) then imamk8_1_21=imamk8_1_18;
if lowk8_1_21 =. and k1_21 in (1,3) then lowk8_1_21=lowk8_1_18;
if upk8_1_21=. and k1_21 in (1,3) then upk8_1_21=upk8_1_18;
if dumk8_1_21=. and k1_21 in (1,3) then dumk8_1_21=dumk8_1_18;
*if k1_21 in (2, 8, 9) then imamk8_1_18 =.;
run;

proc means data = merged_dataset1; var k1_21; run;

*using 2018 data for imputations;
options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_5;
categorical sex_21 ;
count age_21;
mixed imamk8_1_18 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk8_1_21 upk8_1_21
dumk8_1_21
;
bounds
imamk8_1_21 (>=lowk8_1_21 ,<=upk8_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;
```

```
proc means data = dd_5; var imamk8_1_21; run;

data dd1; set output.group3_core_pension4;
id = 1;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk8_2_21 lowk8_2_21 upk8_2_21 dumk8_2_21 k1_21 id;
run;

data dd; set input.master_follow_up_file_2021; keep cunicah subhog_21
subhog_18 np; run;


data dd1a;
set outputs.group3_core_pension4;
keep cunicah subhog_18 tipent_hh_18 sex_18 age_18 yrschool
imamk8_2_18 lowk8_2_18 upk8_2_18 dumk8_2_18;
run;

data merged_dataset;
merge dd1 (in=dataset1) dd (in=dataset2);
by cunicah subhog_21;
keep cunicah subhog_21 subhog_18 tipent_hh_21 sex_21 age_21 yrschool
imamk8_2_21 lowk8_2_21 upk8_2_21 dumk8_2_21 id k1_21;
if id ne 1 then delete;
run;

proc sort out=temp nodupkey; by cunicah subhog_21 ; run;

proc sort data=temp;
by cunicah subhog_18;
run;

data merged_dataset1;
merge temp (in=dataset1) dd1a (in=dataset2);
by cunicah subhog_18;
keep cunicah subhog_21 subhog_18 tipent_hh_21 sex_21 age_21 yrschool
imamk8_2_21 lowk8_2_21 upk8_2_21 dumk8_2_21
tipent_hh_18 sex_18 age_18 yrschool
imamk8_2_18 lowk8_2_18 upk8_2_18 dumk8_2_18;
if dataset2 and not dataset1 then delete;
run;

proc contents data = merged_dataset1; run;

data dd1;
set merged_dataset1;
if imamk8_2_21 =. and k1_21 = 3 then imamk8_2_21=imamk8_2_18;
if lowk8_2_21 =. and k1_21 = 3 then lowk8_2_21=lowk8_2_18;
if upk8_2_21=. and k1_21 = 3 then upk8_2_21=upk8_2_18;
if dumk8_2_21=. and k1_21 = 3 then dumk8_2_21=dumk8_2_18;
*if k1_21 in (2, 8, 9) then imamk8_2_18 =.;
```

```
run;


*using 2018 data for imputations;
options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_6;
categorical sex_21 ;
count age_21;
mixed imamk8_2_18 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk8_2_21 upk8_2_21
dumk8_2_21
;
bounds
imamk8_2_21 (>=lowk8_2_21 ,<=upk8_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

proc sort data=dd_5;
by cunicah subhog_21;
run;
proc sort data=dd_6;
by cunicah subhog_21;
run;

data data imp.group3_core_pension4_imputed; merge dd_1 dd_2 dd_3 dd_4 dd_5
dd_6; by
cunicah subhog_21;
drop
lowk86_21 upk86_21
lowk88_21 upk88_21
lowk4_1_21 upk4_1_21
lowk4_2_21 upk4_2_21
lowk8_1_21 upk8_1_21
lowk8_2_21 upk8_2_21
k1_21 age_18 dumk8_1_18 dumk8_2_18 imamk8_1_18 imamk8_2_18 lowk8_1_18
lowk8_2_18 sex_18 subhog_18 tipent_hh_18 upk8_1_18 upk8_2_18
; run;

proc contents data = imp.group3_core_pension4_imputed; run;
```

```
proc means data=output.group3_core_pension4 n mean std min max nmiss  ;
variable imamk8_1_21;
run;

proc means data=imp.group3_core_pension4_imputed n mean std min max nmiss  ;
variable imamk8_1_21;
run;

data group11;
set output.group3_core_pension4;
if imamk8_1_21=0 then imamk8_1_21=.;
run;

proc means data=group11 n mean std min max  ;
variable imamk8_1_21;
run;

data group14;
set imp.group3_core_pension4_imputed;
if imamk8_1_21=0 then imamk8_1_21=.;
run;

proc means data=group14 n mean std min max  ;
variable imamk8_1_21;
run;
;
```

```
/*******************************************************/
/* PROGRAM NAME : Imput2021_group3_proxy_housing.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/8/2023 */
/* Impute missing value on proxy and proxy questionnaire */
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

data aa; set output.sect_g_j_k_sa_2021; *** core and proxy questionnaire
N=10716;
proc sort nodupkey; by cunicah subhog_21; run; *** no duplicate;

***** proxy questionnaire N=753;
data aa1; set aa;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
j25_21 j26_21 j27a_21 j27b_21 J27c_21
j26_21 j28_21 j29a_21 j29b_21 J29c_21
j22_21 j31_21 j32a_21 j32b_21 J32c_21
j33_21 j34_21 j35a_21 j35b_21 J35c_21
j19_21 ;
if tipent_hh_21 in (2); run;

/*proc freq; table dumj26_21 dumj28_21 dumj31_21 dumj34_21; run;*/
data aa2; set aa1;
if age_21 in (888,999) then age_21=.;
imamj26_21=j26_21;**** Imputation N=2;
if j25_21 =1 and missing(j26_21) then imamj26_21=0;
if missing(j25_21) and missing(j26_21) then imamj26_21=0;
if 2<=j25_21<=9 and j26_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamj26_21=.;
if missing(imamj26_21) and missing(j27a_21) then j27a_21=9;
dumj26_21=missing(imamj26_21);
imamj28_21=j28_21;**** Imputation N=4;
if j25_21 =1 and missing(j28_21) then imamj28_21=0;
if missing(j25_21) and missing(j28_21) then imamj28_21=0;
if j26_21 <=0 and missing(j28_21) then imamj28_21=0;
if j26_21 >0 and j28_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9,88888888,99999999) then imamj28_21=.;
if missing(imamj28_21) and missing(j29a_21) then j29a_21=9;
dumj28_21=missing(imamj28_21);
imamj31_21=j31_21;**** Imputation N=235;
if j19_21 =1 and missing(j31_21) then imamj31_21=0;
if j22_21 in (6,7) and missing(j31_21) then imamj31_21=0;
```

```
if j22_21 in (1,2,3,4,5) and j31_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9,9999998,88888888,99999999) then imamj31_21=.;
if missing(imamj31_21) and missing(j32a_21) then j32a_21=9;
dumj31_21=missing(imamj31_21);
imamj34_21=j34_21;**** Imputation N=27;
if j33_21 =2 and missing(j34_21) then imamj34_21=0;
if j33_21=1 and j34_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9,9999998,88888888,99999999,99990999,99999998) then imamj34_21=.;
if missing(imamj34_21) and missing(j35a_21) then j35a_21=9;
dumj34_21=missing(imamj34_21);
run;

***** define range of imputation;
%macro range(vname,va,vb,vc,rmax,r1,r1_2,r2_1,mix1,mix2);
data data&vname
(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21 imam&vname
dum&vname low&vname up&vname &mix1 &mix2);
set aa2;
low&vname=1; up&vname=&rmax ;
if &va=1 and &vc=1 then do; low&vname=&r1_2;
up&vname=&rmax; end;
if &va=1 and &vc=2 then do; low&vname=&r1; up&vname=&r1_2;
end;
if &va=1 and &vc=9 then do; low&vname=&r1; up&vname=&rmax;
end;
if &va=2 and &vb=1 then do; low&vname=&r2_1;
up&vname=&r1; end;
if &va=2 and &vb=2 then do; low&vname=1; up&vname=&r2_1;
end;
if &va=2 and &vb=9 then do; low&vname=1; up&vname=&r1;
end;
if &va=9 then do; low&vname=1; up&vname=&rmax; end;
if imam&vname >=0 then do; low&vname=imam&vname; end;
if imam&vname >=0 then do; up&vname=imam&vname; end;
if &mix1 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
if &mix2 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
%mend range;
%range(j26_21,j27a_21,j27b_21,J27c_21,990000,7500,20000,2000,j27a_21); run;
%range(j28_21,j29a_21,j29b_21,J29c_21,6000000,180000,400000,95000); run;
%range(j31_21,j32a_21,j32b_21,J32c_21,9800000,180000,950000,95000,j22_21);
run;
%range(j34_21,j35a_21,j35b_21,J35c_21,8000000,180000,950000,95000,j33_21);
run;
/*proc means data=aa2; var imamj26_21 imamj28_21 imamj31_21 imamj34_21;
run;*/

data output.group3_proxy_housing;
merge dataj26_21 dataj28_21 dataj31_21 dataj34_21;
by cunicah subhog_21; run;
```

```
data dd1; set output.group3_proxy_housing;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamj26_21
lowj26_21 upj26_21
dumj26_21
;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamj26_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowj26_21 upj26_21
dumj26_21
;
bounds
imamj26_21 (>=lowj26_21 ,<=upj26_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group3_proxy_housing;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamj28_21
lowj28_21 upj28_21
dumj28_21
;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
```

```
mixed imamj28_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowj28_21 upj28_21
dumj28_21
;
bounds
imamj28_21 (>=lowj28_21 ,<=upj28_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group3_proxy_housing;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamj31_21 imamj34_21
lowj31_21 upj31_21
lowj34_21 upj34_21
dumj31_21
dumj34_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_3;
categorical sex_21 ;
count age_21;
mixed imamj31_21 imamj34_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowj31_21 upj31_21
lowj34_21 upj34_21
dumj31_21
dumj34_21
;
bounds
imamj31_21 (>=lowj31_21 ,<=upj31_21)
imamj34_21 (>=lowj34_21 ,<=upj34_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 1;
/*multiples 5;*/
seed 2018;
```

```
run;

data data imp.group3_proxy_housing_imputed;
merge dd_1 dd_2 dd_3;
by cunicah subhog_21;
drop
lowj26_21 upj26_21
lowj28_21 upj28_21
lowj31_21 upj31_21
lowj34_21 upj34_21 ; run;


proc means data=output.group3_proxy_housing n mean std min max nmiss  ;
variable imamj34_21;
run;

proc means data=imp.group3_proxy_housing_imputed n mean std min max nmiss  ;
variable imamj34_21;
run;

data group11;
set output.group3_proxy_housing;
if imamj34_21=0 then imamj34_21=.;
run;

proc means data=group11 n mean std min max  ;
variable imamj34_21;
run;

data group14;
set imp.group3_proxy_housing_imputed;
if imamj34_21=0 then imamj34_21=.;
run;

proc means data=group14 n mean std min max  ;
variable imamj34_21;
run;

;
```

```
/*******************************************************/
/* PROGRAM NAME : Imput2021_group3_proxy_pension.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 6/14/2023 */
/* Impute missing value on proxy and proxy questionnaire */
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

*for k8 imputations;
libname outputs 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2018';

data aa; set output.sect_g_j_k_sa_2021; *** core and proxy questionnaire
N=10716;
proc sort nodupkey; by cunicah subhog_21; run; *** no duplicate;

***** proxy questionnaire N=753;
data bb1; set aa;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
k17_21
k19_1_21 k20_1_21 k21a1_21 k21b1_21 k21c1_21
k24_1_21 k25a1_21 k25b1_21 k25c1_21
k31a_21 k33_1_21 k34a1_21 k34b1_21 k34c1_21
k31b_21 k33_2_21 k34a2_21 k34b2_21 k34c2_21
k31c_21 k33_3_21 k34a3_21 k34b3_21 k34c3_21
k38_21 k39_21
k40_21 k41a_21 k41b_21 k41c_21
k42_21 k43a_21 k43b_21 k43c_21
k44_21 k45a_21 k45b_21 k45c_21
k85_21 k86_21 k87a_21 k87b_21 k87c_21
k88_21 k89a_21 k89b_21 k89c_21
k1_21
k3_1_21 k4_1_21 k5a1_21 k5b1_21 k5c1_21
k3_2_21 k4_2_21 k5a2_21 k5b2_21 k5c2_21
k8_1_21 k9a1_21 k9b1_21 k9c1_21
k8_2_21 k9a2_21 k9b2_21 k9c2_21 ;
if tipent_hh_21 in (2); run;

******************** 1 *********************;
data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk20_1_21=k20_1_21;**** Imputation N=5;
if k17_21=2 and missing(k20_1_21) then imamk20_1_21=0;
if k17_21=1 and k19_1_21 =2 and missing(k20_1_21) then imamk20_1_21=0;
```

```
if k17_21=1 and k19_1_21 =1 and k20_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
8,9999999,99999999) then imamk20_1_21=.;
if missing(imamk20_1_21) and missing(k21a1_21) then k21a1_21=9;
imamk24_1_21=k24_1_21;**** Imputation N=20;
if k17_21=2 and missing(k24_1_21) then imamk24_1_21=0;
if k17_21=1 and k24_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
8,9999999,88888888,99999999) then imamk24_1_21=.;
if missing(imamk24_1_21) and missing(k25a1_21) then k25a1_21=9;
dumk20_1_21=missing(imamk20_1_21);
dumk24_1_21=missing(imamk24_1_21);
run;
/*proc freq; tables age_21 yrschool dumk20_1_21 dumk24_1_21;run;*/

***** define range of imputation;
%macro range(vname,va,vb,vc,rmax,r1,r1_2,r2_1,mix1,mix2);
data data&vname
(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21 imam&vname
dum&vname low&vname up&vname &mix1 &mix2);
set bb2;
low&vname=1; up&vname=&rmax ;
if &va=1 and &vc=1 then do; low&vname=&r1_2;
up&vname=&rmax; end;
if &va=1 and &vc=2 then do; low&vname=&r1; up&vname=&r1_2;
end;
if &va=1 and &vc=9 then do; low&vname=&r1; up&vname=&rmax;
end;
if &va=2 and &vb=1 then do; low&vname=&r2_1;
up&vname=&r1; end;
if &va=2 and &vb=2 then do; low&vname=1; up&vname=&r2_1;
end;
if &va=2 and &vb=9 then do; low&vname=1; up&vname=&r1;
end;
if &va=9 then do; low&vname=1; up&vname=&rmax; end;
if imam&vname >=0 then do; low&vname=imam&vname; end;
if imam&vname >=0 then do; up&vname=imam&vname; end;
if &mix1 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
if &mix2 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
%mend range;
%range(k20_1_21,k21a1_21,k21b1_21,k21c1_21,1500000,180000,500000,95000,k17_2
1,k19_1_21); run;
%range(k24_1_21,k25a1_21,k25b1_21,k25c1_21,9000000,180000,500000,95000,k17_2
1);run;
/*proc means data=bb2; var imamk20_1_21 imamk24_1_21; run;*/

data output.group3_proxy_pension1;
merge datak20_1_21  datak24_1_21 ;
by cunicah subhog_21;
drop k17_21 k19_1_21 ;
run;
```

```
****** 2*****************;
/*proc freq; tables dumk33_1_21 dumk33_2_21 dumk33_3_21;run;*/
data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk33_1_21=k33_1_21;**** Imputation N=36;
if k31a_21 =2 and missing(k33_1_21) then imamk33_1_21=0;
if k31a_21=1 and k33_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
8,9999999,88888888,99999999)then imamk33_1_21=.;
if missing(imamk33_1_21) and missing(k34a1_21) then k34a1_21=9;
imamk33_2_21=k33_2_21;**** Imputation N=2;
if k31b_21 =2 and missing(k33_2_21) then imamk33_2_21=0;
if k31b_21=1 and k33_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
8,9999999,88888888,99999999)then imamk33_2_21=.;
if missing(imamk33_2_21) and missing(k34a2_21) then k34a2_21=9;
imamk33_3_21=k33_3_21;**** Imputation N=3;
if k31c_21 =2 and missing(k33_3_21) then imamk33_3_21=0;
if k31c_21=1 and k33_3_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
8,9999999,88888888,99999999)then imamk33_3_21=.;
if missing(imamk33_3_21) and missing(k34a3_21) then k34a3_21=9;
dumk33_1_21=missing(imamk33_1_21);
dumk33_2_21=missing(imamk33_2_21);
dumk33_3_21=missing(imamk33_3_21);
run;

%range(k33_1_21,k34a1_21,k34b1_21,k34c1_21,8000000,25000,90000,12000,k31a_21
);run;
%range(k33_2_21,k34a2_21,k34b2_21,k34c2_21,600000,25000,90000,12000,k31b_21)
;run;
%range(k33_3_21,k34a3_21,k34b3_21,k34c3_21,5000000,25000,90000,12000,k31c_21
);run;
/*proc means data=bb2; var imamk33_1_21 imamk33_2_21 imamk33_3_21; run;*/

data output.group3_proxy_pension2;
merge datak33_1_21 datak33_2_21 datak33_3_21 ;
by cunicah subhog_21;
drop k31a_21 k31b_21 k31c_21;
run;

********** 3 ********************;
/*proc freq; tables dumk40_21 dumk42_21 dumk44_21;run;*/
data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk40_21=k40_21;**** Imputation N=2;
if k38_21=2 and missing(k40_21) then imamk40_21=0;
if k38_21=1 and k39_21 =2 and missing(k40_21) then imamk40_21=0;
if k38_21=1 and k39_21=1 and k40_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,8888888
,9999998,9999999,9999099) then imamk40_21=.;
if missing(imamk40_21) and missing(k41a_21) then k41a_21=9;
```

```
imamk42_21=k42_21;**** Imputation N=16;
if k38_21=2 and missing(k42_21) then imamk42_21=0;
if k38_21=1 and k42_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,8888888
,9999998,9999999,9999099) then imamk42_21=.;
if missing(imamk42_21) and missing(k43a_21) then k43a_21=9;
imamk44_21=k44_21;**** Imputation N=177;
if k44_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,8888888
,9999998,9999999,9999099) then imamk44_21=.;
if k44_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,8888888
,9999998,9999999,9999099) then k44b_21=9; *** create a variable for mix
imputed;
if missing(imamk44_21) and missing(k45a_21) then k45a_21=9;
dumk40_21=missing(imamk40_21);
dumk42_21=missing(imamk42_21);
dumk44_21=missing(imamk44_21);
run;

%range(k40_21 ,k41a_21,k41b_21,k41c_21,
500000,180000,500000,95000,k38_21,k39_21);run;
%range(k42_21,k43a_21,k43b_21,k43c_21,6000000,180000,500000,95000,k38_21);
run;
%range(k44_21,k45a_21,k45b_21,k45c_21,9000000,180000,500000,95000,k44b_21);
run;
/*proc means data=bb2; var imamk40_21 imamk42_21 imamk44_21; run;*/

data output.group3_proxy_pension3;
merge datak40_21 datak42_21 datak44_21 ;
by cunicah subhog_21;
drop k38_21 k39_21 k44b_21; run;

****************** 4 ********************;

data bb2; set bb1;
if age_21 in (888, 999) then age_21=.;
imamk86_21=k86_21;**** Imputation N=17;
if k85_21 =2 and missing(k86_21) then imamk86_21=0;
if k85_21=1 and k86_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,8888888
,9999998,9999999,9999099) then imamk86_21=.;
if missing(imamk86_21) and missing(k87a_21) then k87a_21=9;
imamk88_21=k88_21;**** Imputation N=76;
if k88_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999989,999998,
8888888,9999998,9999999,9999099) then imamk88_21=.;
if k88_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999989,999998,
8888888,9999998,9999999,9999099) then k88_21b=9; *** create a variable for
mix imputed/no mix imp;
if missing(imamk88_21) and missing(k89a_21) then k89a_21=9;
```

```
imamk4_1_21=k4_1_21;**** Imputation N=5;
if k1_21 =2 and missing(k4_1_21) then imamk4_1_21=0;
if k1_21=1 and k3_1_21 =2 and missing(k4_1_21) then imamk4_1_21=0;
if k1_21=1 and k3_1_21=1 and k4_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,8888888
,9999998,9999999,9999099,88888888,99999999) then imamk4_1_21=.;
if missing(imamk4_1_21) and missing(k5a1_21) then k5a1_21=9;
imamk4_2_21=k4_2_21;**** Imputation N=0;
if k1_21 ne 1 and missing(k4_2_21) then imamk4_2_21=0;
if k3_2_21 =2 and missing(k4_2_21) then imamk4_2_21=0;
if k3_2_21 =. and missing(k4_2_21) then imamk4_2_21=0;
if k1_21 = 1 and k3_2_21 = 1 and k4_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,8888888
,9999998,9999999,9999099) then imamk4_2_21=.;
if missing(imamk4_2_21) and missing(k5a2_21) then k5a2_21=9;
imamk8_1_21=k8_1_21;**** Imputation N=56;
if k1_21 =2 and missing(k8_1_21) then imamk8_1_21=0;
if k1_21=1 and k8_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,8888888
,9999998,9999999,9999099,88888888,99999998,99999999) then imamk8_1_21=.;
if missing(imamk8_1_21) and missing(k9a1_21) then k9a1_21=9;
imamk8_2_21=k8_2_21;**** Imputation N=0;
if k1_21 ne 1 and missing(k8_2_21) then imamk8_2_21=0;
if k1_21 =1 and k8_2_21=. then imamk8_2_21=0;
if k1_21 =1 and k8_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,8888888
,9999998,9999999,9999099,88888888,99999999) then imamk8_2_21=.;
if missing(imamk8_2_21) and missing(k9a2_21) then k9a2_21=9;
dumk86_21=missing(imamk86_21);
dumk88_21=missing(imamk88_21);
dumk4_1_21=missing(imamk4_1_21);
dumk4_2_21=missing(imamk4_2_21);
dumk8_1_21=missing(imamk8_1_21);
dumk8_2_21=missing(imamk8_2_21);
run;
/*proc freq; tables dumk86_21 dumk88_21 dumk4_1_21 dumk4_2_21 dumk8_1_21
dumk8_2_21;run;*/

%range(k86_21,k87a_21,k87b_21,k87c_21, 5000000,25000,90000,12000, k85_21);
run;
%range(k88_21,k89a_21,k89b_21,k89c_21, 5000000, 7500,12000, 4000); run;
%range(k4_1_21,k5a1_21,k5b1_21,k5c1_21,
5000000,150000,500000,50000,k1_21,k3_1_21); run;
%range(k4_2_21,k5a2_21,k5b2_21,k5c2_21,
400000,150000,500000,50000,k3_2_21);run;
%range(k8_1_21,k9a1_21,k9b1_21,k9c1_21, 9000000,150000,500000,50000,k1_21);
run;
%range(k8_2_21,k9a2_21,k9b2_21,k9c2_21, 5000000,150000,500000,50000); run;
/*proc means data=bb2; var imamk86_21 imamk88_21 imamk4_1_21 imamk4_2_21
imamk8_1_21 imamk8_2_21; run;*/

data output.group3_proxy_pension4;
```

```
merge datak86_21 datak88_21 datak4_1_21
datak4_2_21 datak8_1_21 datak8_2_21 ;
by cunicah subhog_21;
drop k85_21 k3_1_21 k3_2_21 ; run;

********* 1 ********************;
data dd1;
set output.group3_proxy_pension1; **** proxy N=683 var=10;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk20_1_21 lowk20_1_21 upk20_1_21 dumk20_1_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk20_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk20_1_21 upk20_1_21
dumk20_1_21
;
bounds
imamk20_1_21 (>=lowk20_1_21 ,<=upk20_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group3_proxy_pension1; **** proxy N=683 var=10;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk24_1_21  lowk24_1_21 upk24_1_21 dumk24_1_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
```

```
count age_21;
mixed imamk24_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk24_1_21 upk24_1_21
dumk24_1_21
;
bounds
imamk24_1_21 (>=lowk24_1_21 ,<=upk24_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group3_proxy_pension1_imputed;
merge dd_1 dd_2;
by cunicah subhog_21;
drop
lowk20_1_21 upk20_1_21
lowk24_1_21 upk24_1_21
;
run;

*************** 2*********************;
data dd1; set output.group3_proxy_pension2;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk33_1_21 lowk33_1_21 upk33_1_21 dumk33_1_21; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk33_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk33_1_21 upk33_1_21
dumk33_1_21
;
bounds
imamk33_1_21 (>=lowk33_1_21 ,<=upk33_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
```

```
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group3_proxy_pension2;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk33_2_21 lowk33_2_21 upk33_2_21 dumk33_2_21; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk33_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk33_2_21 upk33_2_21
dumk33_2_21
;
bounds
imamk33_2_21 (>=lowk33_2_21 ,<=upk33_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group3_proxy_pension2;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk33_3_21 lowk33_3_21 upk33_3_21 dumk33_3_21; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_3;
categorical sex_21 ;
count age_21;
mixed imamk33_3_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk33_3_21 upk33_3_21
```

```
dumk33_3_21
;
bounds
imamk33_3_21 (>=lowk33_3_21 ,<=upk33_3_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group3_proxy_pension2_imputed;
merge dd_1 dd_2 dd_3;
by cunicah subhog_21;
drop
lowk33_1_21 upk33_1_21
lowk33_2_21 upk33_2_21
lowk33_3_21 upk33_3_21
; run;

********************** 3 ************************;
data dd1; set output.group3_proxy_pension3;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk40_21 lowk40_21 upk40_21 dumk40_21; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk40_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk40_21 upk40_21
dumk40_21
;
bounds
imamk40_21 (>=lowk40_21 ,<=upk40_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;
```

```
data dd1; set output.group3_proxy_pension3;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk42_21 lowk42_21 upk42_21 dumk42_21
imamk44_21 lowk44_21 upk44_21 dumk44_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk42_21 imamk44_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk42_21 upk42_21
lowk44_21 upk44_21
dumk42_21
dumk44_21
;
bounds
imamk42_21 (>=lowk42_21 ,<=upk42_21)
imamk44_21 (>=lowk44_21 ,<=upk44_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group3_proxy_pension3_imputed;
merge dd_1 dd_2; by cunicah subhog_21;
drop
lowk40_21 upk40_21
lowk42_21 upk42_21
lowk44_21 upk44_21
; run;

************* 4************************;
data dd1; set output.group3_proxy_pension4;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk86_21 lowk86_21 upk86_21 dumk86_21 ;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
```

```
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21 ;
count age_21;
mixed imamk86_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk86_21 upk86_21
dumk86_21
;
bounds
imamk86_21 (>=lowk86_21 ,<=upk86_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group3_proxy_pension4;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk88_21 lowk88_21 upk88_21 dumk88_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21 ;
count age_21;
mixed imamk88_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk88_21 upk88_21
dumk88_21
;
bounds
imamk88_21 (>=lowk88_21 ,<=upk88_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
```

```
seed 2018;
run;

data dd1; set output.group3_proxy_pension4;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk4_1_21 lowk4_1_21 upk4_1_21 dumk4_1_21 ;
run;



options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_3;
categorical sex_21 ;
count age_21;
mixed imamk4_1_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk4_1_21 upk4_1_21
dumk4_1_21
;
bounds
imamk4_1_21 (>=lowk4_1_21 ,<=upk4_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group3_proxy_pension4;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk4_2_21 lowk4_2_21 upk4_2_21 dumk4_2_21 ;
run;



options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_4;
categorical sex_21 ;
```

```
count age_21;
mixed imamk4_2_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk4_2_21 upk4_2_21
dumk4_2_21
;
bounds
imamk4_2_21 (>=lowk4_2_21 ,<=upk4_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data dd1; set output.group3_proxy_pension4;
id = 1;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool id
imamk8_1_21 lowk8_1_21 upk8_1_21 dumk8_1_21 k1_21;
run;



data dd; set input.master_follow_up_file_2021; keep cunicah subhog_21
subhog_18 np; run;


data dd1a;
set outputs.group3_proxy_pension4;
keep cunicah subhog_18 tipent_hh_18 sex_18 age_18 yrschool
imamk8_1_18 lowk8_1_18 upk8_1_18 dumk8_1_18;
run;

data merged_dataset;
merge dd1 (in=dataset1) dd (in=dataset2);
by cunicah subhog_21;
keep cunicah subhog_21 subhog_18 tipent_hh_21 sex_21 age_21 yrschool
imamk8_1_21 lowk8_1_21 upk8_1_21 dumk8_1_21 id k1_21;
if id ne 1 then delete;
run;

proc sort out=temp nodupkey; by cunicah subhog_21 ; run;



proc sort data=temp;
    by cunicah subhog_18;
run;

data merged_dataset1;
```

```
merge temp (in=dataset1) dd1a (in=dataset2);
by cunicah subhog_18;
keep cunicah subhog_21 subhog_18 tipent_hh_21 sex_21 age_21 yrschool
imamk8_1_21 lowk8_1_21 upk8_1_21 dumk8_1_21
tipent_hh_18 sex_18 age_18 yrschool
imamk8_1_18 lowk8_1_18 upk8_1_18 dumk8_1_18 k1_21;
if dataset2 and not dataset1 then delete;
run;


proc means data = merged_dataset1; var k1_21; run;

data dd1;
set merged_dataset1;
if imamk8_1_21 =. and k1_21 in (1,3) then imamk8_1_21=imamk8_1_18;
if lowk8_1_21 =. and k1_21 in (1,3) then lowk8_1_21=lowk8_1_18;
if upk8_1_21=. and k1_21 in (1,3) then upk8_1_21=upk8_1_18;
if dumk8_1_21=. and k1_21 in (1,3) then dumk8_1_21=dumk8_1_18;
*if k1_21 in (2, 8, 9) then imamk8_1_18 =.;
run;

proc means data = merged_dataset1; var k1_21; run;

*using 2018 data for imputations;
options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_5;
categorical sex_21 ;
count age_21;
mixed imamk8_1_18 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk8_1_21 upk8_1_21
dumk8_1_21
;
bounds
imamk8_1_21 (>=lowk8_1_21 ,<=upk8_1_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

proc means data = dd_5; var imamk8_1_21; run;
```

```
data dd1; set output.group3_proxy_pension4;
id = 1;
keep cunicah subhog_21 tipent_hh_21 sex_21 age_21 yrschool
imamk8_2_21 lowk8_2_21 upk8_2_21 dumk8_2_21 k1_21 id;
run;

data dd; set input.master_follow_up_file_2021; keep cunicah subhog_21
subhog_18 np; run;


data dd1a;
set outputs.group3_proxy_pension4;
keep cunicah subhog_18 tipent_hh_18 sex_18 age_18 yrschool
imamk8_2_18 lowk8_2_18 upk8_2_18 dumk8_2_18;
run;

data merged_dataset;
merge dd1 (in=dataset1) dd (in=dataset2);
by cunicah subhog_21;
keep cunicah subhog_21 subhog_18 tipent_hh_21 sex_21 age_21 yrschool
imamk8_2_21 lowk8_2_21 upk8_2_21 dumk8_2_21 id k1_21;
if id ne 1 then delete;
run;

proc sort out=temp nodupkey; by cunicah subhog_21 ; run;

proc sort data=temp;
by cunicah subhog_18;
run;

data merged_dataset1;
merge temp (in=dataset1) dd1a (in=dataset2);
by cunicah subhog_18;
keep cunicah subhog_21 subhog_18 tipent_hh_21 sex_21 age_21 yrschool
imamk8_2_21 lowk8_2_21 upk8_2_21 dumk8_2_21
tipent_hh_18 sex_18 age_18 yrschool
imamk8_2_18 lowk8_2_18 upk8_2_18 dumk8_2_18;
if dataset2 and not dataset1 then delete;
run;

proc contents data = merged_dataset1; run;

data dd1;
set merged_dataset1;
if imamk8_2_21 =. and k1_21 = 3 then imamk8_2_21=imamk8_2_18;
if lowk8_2_21 =. and k1_21 = 3 then lowk8_2_21=lowk8_2_18;
if upk8_2_21=. and k1_21 = 3 then upk8_2_21=upk8_2_18;
if dumk8_2_21=. and k1_21 = 3 then dumk8_2_21=dumk8_2_18;
*if k1_21 in (2, 8, 9) then imamk8_2_18 =.;
run;
```

```
*using 2018 data for imputations;
options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_6;
categorical sex_21 ;
count age_21;
mixed imamk8_2_18 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk8_2_21 upk8_2_21
dumk8_2_21
;
bounds
imamk8_2_21 (>=lowk8_2_21 ,<=upk8_2_21)
yrschool(<=22, >=0)
age_21(<=107, >=17)
;
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

proc sort data=dd_5;
by cunicah subhog_21;
run;
proc sort data=dd_6;
by cunicah subhog_21;
run;
data data imp.group3_proxy_pension4_imputed; merge dd_1 dd_2 dd_3 dd_4 dd_5
dd_6; by
cunicah subhog_21;
drop
lowk86_21 upk86_21
lowk88_21 upk88_21
lowk4_1_21 upk4_1_21
lowk4_2_21 upk4_2_21
lowk8_1_21 upk8_1_21
lowk8_2_21 upk8_2_21
k1_21 age_18 dumk8_1_18 dumk8_2_18 imamk8_1_18 imamk8_2_18 lowk8_1_18
lowk8_2_18 sex_18 subhog_18 tipent_hh_18 upk8_1_18 upk8_2_18
; run;


proc contents data = imp.group3_proxy_pension4_imputed; run;
```

```
proc means data=output.group3_proxy_pension4 n mean std min max nmiss  ;
variable imamk8_1_21;
run;

proc means data=imp.group3_proxy_pension4_imputed n mean std min max nmiss
;
variable imamk8_1_21;
run;

data group11;
set output.group3_proxy_pension4;
if imamk8_1_21=0 then imamk8_1_21=.;
run;

proc means data=group11 n mean std min max  ;
variable imamk8_1_21;
run;

data group14;
set imp.group3_proxy_pension4_imputed;
if imamk8_1_21=0 then imamk8_1_21=.;
run;

proc means data=group14 n mean std min max  ;
variable imamk8_1_21;
run;
;
;
```

```
/*******************************************************/
/* PROGRAM NAME : Imput2021_group3_report.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/22/2023 */
/* Descriptive Statistics of Derived (Un-imputed) and Imputed Variables
*/
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';


*************** core/housing ***************************;
data out1;
merge output.Group3_core_housing;
by cunicah subhog_21;
rename imamj26_21=amj26_21 imamj28_21=amj28_21 imamj31_21=amj31_21
imamj34_21=amj34_21;run;

data imp1;
merge imp.Group3_core_housing_imputed;
by cunicah subhog_21; run;
data out_imp1;
merge out1 imp1;
by cunicah subhog_21; run;

*** print putput;
Title "Group3 core housing - mean with zero";
proc means data=out_imp1 n nmiss mean std min max ;
variable amj26_21 imamj26_21 amj28_21 imamj28_21 amj31_21 imamj31_21
amj34_21 imamj34_21;
; run;

Title "Group3 core housing - mean without zero";
data out_imp2; set out_imp1;
if imamj26_21 =0 then imamj26_21 =.;
if imamj28_21 =0 then imamj28_21 =.;
if imamj31_21 =0 then imamj31_21 =.;
if imamj34_21 =0 then imamj34_21 =.;

if amj26_21 =0 then amj26_21 =.;
if amj28_21 =0 then amj28_21 =.;
if amj31_21 =0 then amj31_21 =.;
if amj34_21 =0 then amj34_21 =.;
run;
proc means data=out_imp2 n mean std min max ;
variable amj26_21 imamj26_21 amj28_21 imamj28_21 amj31_21 imamj31_21
amj34_21 imamj34_21
```

```
; run;

****************** core /pension ******************;
data out1; merge output.group3_core_pension1 output.group3_core_pension2
output.group3_core_pension3 output.group3_core_pension4;
by cunicah subhog_21;
rename imamk20_1_21=amk20_1_21 imamk24_1_21=amk24_1_21
imamk33_1_21=amk33_1_21 imamk33_2_21=amk33_2_21 imamk33_3_21=amk33_3_21
imamk40_21=amk40_21 imamk42_21=amk42_21 imamk44_21=amk44_21
imamk86_21=amk86_21 imamk88_21=amk88_21 imamk4_1_21=amk4_1_21
imamk4_2_21=amk4_2_21 imamk8_1_21=amk8_1_21 imamk8_2_21=amk8_2_21
;
run;

data imp1;
merge imp.group3_core_pension1_imputed imp.group3_core_pension2_imputed
imp.group3_core_pension3_imputed
imp.group3_core_pension4_imputed;
by cunicah subhog_21; run;
data out_imp1;
merge out1 imp1;
by cunicah subhog_21; run;

*** print putput;
Title "Group3 core pension - mean with zero";
proc means data=out_imp1 n nmiss mean std min max ;
variable amk20_1_21 imamk20_1_21 amk24_1_21 imamk24_1_21
amk33_1_21 imamk33_1_21 amk33_2_21 imamk33_2_21 amk33_3_21 imamk33_3_21
amk40_21 imamk40_21 amk42_21 imamk42_21 amk44_21 imamk44_21
amk86_21 imamk86_21 amk88_21 imamk88_21 amk4_1_21 imamk4_1_21 amk4_2_21
imamk4_2_21 amk8_1_21 imamk8_1_21 amk8_2_21 imamk8_2_21
; run;

Title "Group3 core pension - mean without zero";
data out_imp2; set out_imp1;
if imamk20_1_21 =0 then imamk20_1_21 =.;
if imamk24_1_21 =0 then imamk24_1_21 =.;
if imamk33_1_21 =0 then imamk33_1_21 =.;
if imamk33_2_21 =0 then imamk33_2_21 =.;
if imamk33_3_21 =0 then imamk33_3_21 =.;
if imamk40_21 =0 then imamk40_21 =.;
if imamk42_21 =0 then imamk42_21 =.;
if imamk44_21 =0 then imamk44_21 =.;
if imamk86_21 =0 then imamk86_21 =.;
if imamk88_21 =0 then imamk88_21 =.;
if imamk4_1_21 =0 then imamk4_1_21 =.;
if imamk4_2_21 =0 then imamk4_2_21 =.;
if imamk8_1_21 =0 then imamk8_1_21 =.;
if imamk8_2_21 =0 then imamk8_2_21 =.;

if amk20_1_21 =0 then amk20_1_21 =.;
if amk24_1_21 =0 then amk24_1_21 =.;
```

```
if amk33_1_21 =0 then amk33_1_21 =.;
if amk33_2_21 =0 then amk33_2_21 =.;
if amk33_3_21 =0 then amk33_3_21 =.;
if amk40_21 =0 then amk40_21 =.;
if amk42_21 =0 then amk42_21 =.;
if amk44_21 =0 then amk44_21 =.;
if amk86_21 =0 then amk86_21 =.;
if amk88_21 =0 then amk88_21 =.;
if amk4_1_21 =0 then amk4_1_21 =.;
if amk4_2_21 =0 then amk4_2_21 =.;
if amk8_1_21 =0 then amk8_1_21 =.;
if amk8_2_21 =0 then amk8_2_21 =.;
run;
proc means data=out_imp2 n mean std min max ;
variable amk20_1_21 imamk20_1_21 amk24_1_21 imamk24_1_21
amk33_1_21 imamk33_1_21 amk33_2_21 imamk33_2_21 amk33_3_21 imamk33_3_21
amk40_21 imamk40_21 amk42_21 imamk42_21 amk44_21 imamk44_21
amk86_21 imamk86_21 amk88_21 imamk88_21 amk4_1_21 imamk4_1_21 amk4_2_21
imamk4_2_21 amk8_1_21 imamk8_1_21 amk8_2_21 imamk8_2_21
; run;

***************** proxy/ Housing ****************************;
data out1;
merge output.Group3_proxy_housing;
by cunicah subhog_21;
rename imamj26_21=amj26_21 imamj28_21=amj28_21 imamj31_21=amj31_21
imamj34_21=amj34_21;run;

data imp1;
merge imp.Group3_proxy_housing_imputed;
by cunicah subhog_21; run;
data out_imp1;
merge out1 imp1;
by cunicah subhog_21; run;

*** print putput;
Title "Group3 proxy housing - mean with zero";
proc means data=out_imp1 n nmiss mean std min max ;
variable amj26_21 imamj26_21 amj28_21 imamj28_21 amj31_21 imamj31_21
amj34_21 imamj34_21;
; run;

Title "Group3 proxy housing - mean without zero";
data out_imp2; set out_imp1;
if imamj26_21 =0 then imamj26_21 =.;
if imamj28_21 =0 then imamj28_21 =.;
if imamj31_21 =0 then imamj31_21 =.;
if imamj34_21 =0 then imamj34_21 =.;

if amj26_21 =0 then amj26_21 =.;
if amj28_21 =0 then amj28_21 =.;
if amj31_21 =0 then amj31_21 =.;
```

```
if amj34_21 =0 then amj34_21 =.;
run;
proc means data=out_imp2 n mean std min max ;
variable amj26_21 imamj26_21 amj28_21 imamj28_21 amj31_21 imamj31_21
amj34_21 imamj34_21
; run;

****************** proxy /pension *****************;
data out1; merge output.group3_proxy_pension1 output.group3_proxy_pension2
output.group3_proxy_pension3 output.group3_proxy_pension4;
by cunicah subhog_21;
rename imamk20_1_21=amk20_1_21 imamk24_1_21=amk24_1_21
imamk33_1_21=amk33_1_21 imamk33_2_21=amk33_2_21 imamk33_3_21=amk33_3_21
imamk40_21=amk40_21 imamk42_21=amk42_21 imamk44_21=amk44_21
imamk86_21=amk86_21 imamk88_21=amk88_21 imamk4_1_21=amk4_1_21
imamk4_2_21=amk4_2_21 imamk8_1_21=amk8_1_21 imamk8_2_21=amk8_2_21
;
run;

data imp1;
merge imp.group3_proxy_pension1_imputed imp.group3_proxy_pension2_imputed
imp.group3_proxy_pension3_imputed
imp.group3_proxy_pension4_imputed;
by cunicah subhog_21; run;
data out_imp1;
merge out1 imp1;
by cunicah subhog_21; run;

*** print putput;
Title "Group3 proxy pension - mean with zero";
proc means data=out_imp1 n nmiss mean std min max ;
variable amk20_1_21 imamk20_1_21 amk24_1_21 imamk24_1_21
amk33_1_21 imamk33_1_21 amk33_2_21 imamk33_2_21 amk33_3_21 imamk33_3_21
amk40_21 imamk40_21 amk42_21 imamk42_21 amk44_21 imamk44_21
amk86_21 imamk86_21 amk88_21 imamk88_21 amk4_1_21 imamk4_1_21 amk4_2_21
imamk4_2_21 amk8_1_21 imamk8_1_21 amk8_2_21 imamk8_2_21
; run;

Title "Group3 proxy pension - mean without zero";
data out_imp2; set out_imp1;
if imamk20_1_21 =0 then imamk20_1_21 =.;
if imamk24_1_21 =0 then imamk24_1_21 =.;
if imamk33_1_21 =0 then imamk33_1_21 =.;
if imamk33_2_21 =0 then imamk33_2_21 =.;
if imamk33_3_21 =0 then imamk33_3_21 =.;
if imamk40_21 =0 then imamk40_21 =.;
if imamk42_21 =0 then imamk42_21 =.;
if imamk44_21 =0 then imamk44_21 =.;
if imamk86_21 =0 then imamk86_21 =.;
if imamk88_21 =0 then imamk88_21 =.;
if imamk4_1_21 =0 then imamk4_1_21 =.;
if imamk4_2_21 =0 then imamk4_2_21 =.;
```

```
if imamk8_1_21 =0 then imamk8_1_21 =.;
if imamk8_2_21 =0 then imamk8_2_21 =.;

if amk20_1_21 =0 then amk20_1_21 =.;
if amk24_1_21 =0 then amk24_1_21 =.;
if amk33_1_21 =0 then amk33_1_21 =.;
if amk33_2_21 =0 then amk33_2_21 =.;
if amk33_3_21 =0 then amk33_3_21 =.;
if amk40_21 =0 then amk40_21 =.;
if amk42_21 =0 then amk42_21 =.;
if amk44_21 =0 then amk44_21 =.;
if amk86_21 =0 then amk86_21 =.;
if amk88_21 =0 then amk88_21 =.;
if amk4_1_21 =0 then amk4_1_21 =.;
if amk4_2_21 =0 then amk4_2_21 =.;
if amk8_1_21 =0 then amk8_1_21 =.;
if amk8_2_21 =0 then amk8_2_21 =.;
run;
proc means data=out_imp2 n mean std min max ;
variable amk20_1_21 imamk20_1_21 amk24_1_21 imamk24_1_21
amk33_1_21 imamk33_1_21 amk33_2_21 imamk33_2_21 amk33_3_21 imamk33_3_21
amk40_21 imamk40_21 amk42_21 imamk42_21 amk44_21 imamk44_21
amk86_21 imamk86_21 amk88_21 imamk88_21 amk4_1_21 imamk4_1_21 amk4_2_21
imamk4_2_21 amk8_1_21 imamk8_1_21 amk8_2_21 imamk8_2_21
; run;
;
```

GROUP 4. Hospitalizations and other utilization of health care services

```
/*******************************************************/
/* PROGRAM NAME : imput2021_group4_core.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/8/2023 */
/* impute missing value on core and proxy questionnaire */
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

data aa; set input.sect_a_c_d_e_pc_f_h_i_2021; ***core and proxy
questionnaire n=15739 var=955;
proc sort out=temp nodupkey; by cunicah np; run; ***no duplicate;
proc freq ;table tipent_21; run;
/*proc contents data=aa;
run;
proc means data=aa;
var age_21;
run;*/
**** Core N=15739;
data aa1; set aa;
keep cunicah np age_21 sex_21 yrschool tipent_21 subhog_21
d4_21
d6_21 d7a_21 d7b_21 d7c_21
d8_1_21 d9_1_21 d10a1_21 d10b1_21 d10c1_21
d8_2_21 d9_2_21 d10a2_21 d10b2_21 d10c2_21
d8_3_21 d9_3_21 d10a3_21 d10b3_21 d10c3_21
d11_21 d12a_21 d12b_a_21 d12b_b_21 d12b_c_21;
if tipent_21 in (1,2); *1,2=direct;
run;
proc sort; by cunicah np; run;
/*
proc freq data=aa1;
tables sex_21 age_21 yrschool;
run;

proc freq data=aa2;
tables imamd12a_21;
run;

data tmp;
set aa2;
if d9_1_21m ^=9 and missing(imamd9_1_21);
run;
*/
***** define missing value;
data aa2; set aa1;
if age_21 in (888,999) then age_21=.;
```

```
if yrschool in (88,99) then yrschool=.;
amd_school=yrschool;
amd_age=age_21;
imamd6_21=d6_21; *total expense for hosp;**** N=66;
if d4_21=0 and missing(d6_21) then imamd6_21=0; *d4_21: #nights in hosp;
if d4_21 in(888,999) then d4_21m=9; **** create mix output variable; *=9
then 0 is possible;
if d4_21 >0 and d4_21 <888 and d6_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888) then imamd6_21=.;
if missing(imamd6_21) and missing(d7a_21) then d7a_21=9; *d7a_21:more than
$7500? 9=DK;
imamd9_1_21=d9_1_21; *total expense for dentist visit;**** N=106;
if d8_1_21=0 and missing(d9_1_21) then imamd9_1_21=0;
if d8_1_21>0 and d9_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777) then
imamd9_1_21=.;
if missing(imamd9_1_21) & d9_1_21 not in (777777) & (missing(d10a1_21) or
d10a1_21=9) & (missing(d10b1_21) or d10b1_21=9) & (missing(d10c1_21) or
d10c1_21=9) then d9_1_21m=9; *** create a mix output variable;
if missing(imamd9_1_21) and missing(d10a1_21) then d10a1_21=9; *d10a1_21:
more than $2000? 9=DK;
imamd9_2_21=d9_2_21; *total expense for outpatient service;**** N=19;
if d8_2_21=0 and missing(d9_2_21) then imamd9_2_21=0;
if d8_2_21>0 and d9_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777) then
imamd9_2_21=.;
if missing(imamd9_2_21) & d9_2_21 not in (777777) & (missing(d10a2_21) or
d10a2_21=9) & (missing(d10b2_21) or d10b2_21=9) & (missing(d10c2_21) or
d10c2_21=9) then d9_2_21m=9;;
if missing(imamd9_2_21) and missing(d10a2_21) then d10a2_21=9;
imamd9_3_21=d9_3_21; *total expense for medical visit;**** N=192;
if d8_3_21=0 and missing(d9_3_21) then imamd9_3_21=0;
if d8_3_21>0 and d9_3_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777) then
imamd9_3_21=.;
if missing(imamd9_3_21) & d9_3_21 not in (777777) & (missing(d10a3_21) or
d10a3_21=9) & (missing(d10b3_21) or d10b3_21=9) & (missing(d10c3_21) or
d10c3_21=9) then d9_3_21m=9;
if missing(imamd9_3_21) and missing(d10a3_21) then d10a3_21=9;
imamd12a_21=d12a_21;*monthly expense for medications;**** N=246;
if d12a_21 in (9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,
777777) then imamd12a_21=.;
if missing(imamd12a_21) & d12a_21 not in (777777) & (missing(d12b_a_21) or
d12b_a_21=9) & (missing(d12b_b_21) or d12b_b_21=9) & (missing(d12b_c_21) or
d12b_c_21=9) then d12a_21m=9;
if missing(imamd12a_21) and missing(d12b_a_21) then d12b_a_21=9;
dumd6_21=1*(missing(imamd6_21));
dumd9_1_21=1*(missing(imamd9_1_21));
dumd9_2_21=1*(missing(imamd9_2_21));
dumd9_3_21=1*(missing(imamd9_3_21));
dumd12a_21=1*(missing(imamd12a_21));
run;
```

```
***** define range of imputation;
%macro range(vname,va,vb,vc,rmax,r1,r1_2,r2_1,mix1,mix2);
data data&vname
(keep=cunicah np subhog_21 tipent_21 yrschool sex_21 age_21 imam&vname
dum&vname
low&vname up&vname &mix1 &mix2);
set aa2;
low&vname=1; up&vname=&rmax ;
if imam&vname >=0 then do; low&vname=imam&vname; end;
if imam&vname >=0 then do; up&vname=imam&vname; end;
if &va=1 and &vc=1 then do; low&vname=&r1_2; up&vname=&rmax; end;
if &va=1 and &vc=2 then do; low&vname=&r1; up&vname=&r1_2; end;
if &va=1 and &vc=9 then do; low&vname=&r1; up&vname=&rmax; end;
if &va=2 and &vb=1 then do; low&vname=&r2_1; up&vname=&r1; end;
if &va=2 and &vb=2 then do; low&vname=1; up&vname=&r2_1; end;
if &va=2 and &vb=9 then do; low&vname=1; up&vname=&r1; end;
if &va=9 then do; low&vname=1; up&vname=&rmax; end;
if &mix1 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
if &mix2 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
%mend range;
%range(d6_21,d7a_21,d7b_21,d7c_21,350000,7500,30000,4000,d4_21m); run;
%range(d9_1_21,d10a1_21,d10b1_21,d10c1_21, 600000,2000,15000,400,d9_1_21m);
run;
%range(d9_2_21,d10a2_21,d10b2_21,d10c2_21,200000,2000,15000,400,d9_2_21m);
run;
%range(d9_3_21,d10a3_21,d10b3_21,d10c3_21,200000,2000,15000,400,d9_3_21m);
run;
%range(d12a_21,d12b_a_21,d12b_b_21,d12b_c_21,800000,400,2000,200,d12a_21m);
run;
/*proc means data=aa2; var imamd6_21 imamd9_1_21 imamd9_2_21 imamd9_3_21
imamd12a_21; run;*/

data output.group4_core_health; merge datad6_21 datad9_1_21 datad9_2_21
datad9_3_21 datad12a_21;
by cunicah np;
drop d4_21m d9_1_21m d9_2_21m d9_3_21m d12a_21m;
label
imamd6_21="total hospital expense"
imamd9_1_21="total expense for dentist visit(s)"
imamd9_2_21="total expense for outpatient procedures"
imamd9_3_21="total expense for medical visits"
imamd12a_21="monthly medication expense";
run;

data dd1; set output.group4_core_health; run;
/*
proc freq data=dd1;
tables age_21;
run;
*/
```

```
options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21;
count age_21;
mixed imamd6_21 imamd9_1_21 imamd9_2_21 imamd9_3_21 imamd12a_21 yrschool;
transfer cunicah np tipent_21
lowd6_21 upd6_21 lowd9_1_21 upd9_1_21 lowd9_2_21 upd9_2_21 lowd9_3_21
upd9_3_21 lowd12a_21 upd12a_21
dumd6_21
dumd9_1_21
dumd9_2_21
dumd9_3_21
dumd12a_21 ;
bounds imamd6_21(<=upd6_21,>=lowd6_21)
imamd9_1_21(<=upd9_1_21,>=lowd9_1_21)
imamd9_2_21(<=upd9_2_21,>=lowd9_2_21)
imamd9_3_21(<=upd9_3_21,>=lowd9_3_21)
imamd12a_21(<=upd12a_21,>=lowd12a_21)
yrschool(<=22, >=0)
age_21(<=107, >=17);
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
*multiples 5;
seed 2018;
run;

/* proc freq; table imamd6_21; where dumd6_21=1; run; *** n=66 imputed;
proc freq; table imamd9_1_21; where dumd9_1_21=1; run; *** n=106 imputed;
proc freq; table imamd9_2_21; where dumd9_2_21=1; run; *** n=19 imputed;
proc freq; table imamd9_3_21; where dumd9_3_21=1; run; *** n=192 imputed;
proc freq; table imamd12a_21; where dumd12a_21=1; run; *** n=246 imputed;
*/
/*
proc freq data=dd_1;
tables imamd9_1_21;
run;
*/
data imp.group4_core_health_imputed; set dd_1;
drop
lowd6_21 upd6_21 lowd9_1_21 upd9_1_21 lowd9_2_21 upd9_2_21 lowd9_3_21
upd9_3_21 lowd12a_21 upd12a_21;
run;


proc means data=output.group4_core_health n mean std min max nmiss  ;
variable imamd12a_21;
```

```
run;

proc means data=imp.group4_core_health_imputed n mean std min max nmiss  ;
variable imamd12a_21;
run;

data group11;
set output.group4_core_health;
if imamd12a_21=0 then imamd12a_21=.;
run;

proc means data=group11 n mean std min max  ;
variable imamd12a_21;
run;

data group14;
set imp.group4_core_health_imputed;
if imamd12a_21=0 then imamd12a_21=.;
run;

proc means data=group14 n mean std min max  ;
variable imamd12a_21;
run;

;
```

```
/*******************************************************/
/* PROGRAM NAME : impute2021_group4_proxy.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/8/23 */
/* impute missing value on core and proxy questionnaire */
/*******************************************************/
libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

data aa; set input.sect_a_c_d_e_pc_f_h_i_2021; ***core and proxy
questionnaire n=15739
 var=985;
proc sort out=temp nodupkey; by cunicah np; run; ***no duplicate;
proc freq ;table tipent_21; run;
/*proc contents data=aa;
run;
proc means data=aa;
var age_21;
run;*/
**** proxy N=1,328;
data aa1; set aa;
keep cunicah np age_21 sex_21 yrschool tipent_21 subhog_21
d4_21
d6_21 d7a_21 d7b_21 d7c_21
d8_1_21 d9_1_21 d10a1_21 d10b1_21 d10c1_21
d8_2_21 d9_2_21 d10a2_21 d10b2_21 d10c2_21
d8_3_21 d9_3_21 d10a3_21 d10b3_21 d10c3_21
d11_21 d12a_21 d12b_a_21 d12b_b_21 d12b_c_21;
if tipent_21 in (3,4); *1,2=direct;
run;
proc sort; by cunicah np; run;
/*
proc freq data=aa1;
tables sex_21 age_21 yrschool;
run;

proc freq data=aa2;
tables imamd12a_21;
run;

data tmp;
set aa2;
if d9_1_21m ^=9 and missing(imamd9_1_21);
run;
*/
***** define missing value;
data aa2; set aa1;
if age_21 in (888,999) then age_21=.;
```

```
if yrschool in (88,99) then yrschool=.;
amd_school=yrschool;
amd_age=age_21;
imamd6_21=d6_21; *total expense for hosp;**** N=20;
if d4_21=0 and missing(d6_21) then imamd6_21=0; *d4_21: #nights in hosp;
if d4_21 in(888,999) then d4_21m=9; **** create mix output variable; *=9
then 0 is possible;
if d4_21 >0 and d4_21 <888 and d6_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888) then imamd6_21=.;
if missing(imamd6_21) and missing(d7a_21) then d7a_21=9; *d7a_21:more than
$7500? 9=DK;
imamd9_1_21=d9_1_21; *total expense for dentist visit;**** N=38;
if d8_1_21=0 and missing(d9_1_21) then imamd9_1_21=0;
if d8_1_21>0 and d9_1_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777) then
imamd9_1_21=.;
if missing(imamd9_1_21) & d9_1_21 not in (777777) & (missing(d10a1_21) or
d10a1_21=9) & (missing(d10b1_21) or d10b1_21=9) & (missing(d10c1_21) or
d10c1_21=9) then d9_1_21m=9; *** create a mix output variable;
if missing(imamd9_1_21) and missing(d10a1_21) then d10a1_21=9; *d10a1_21:
more than $2000? 9=DK;
imamd9_2_21=d9_2_21; *total expense for outpatient service;**** N=4;
if d8_2_21=0 and missing(d9_2_21) then imamd9_2_21=0;
if d8_2_21>0 and d9_2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777) then
imamd9_2_21=.;
if missing(imamd9_2_21) & d9_2_21 not in (777777) & (missing(d10a2_21) or
d10a2_21=9) & (missing(d10b2_21) or d10b2_21=9) & (missing(d10c2_21) or
d10c2_21=9) then d9_2_21m=9;;
if missing(imamd9_2_21) and missing(d10a2_21) then d10a2_21=9;
imamd9_3_21=d9_3_21; *total expense for medical visit;**** N=43;
if d8_3_21=0 and missing(d9_3_21) then imamd9_3_21=0;
if d8_3_21>0 and d9_3_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777) then
imamd9_3_21=.;
if missing(imamd9_3_21) & d9_3_21 not in (777777) & (missing(d10a3_21) or
d10a3_21=9) & (missing(d10b3_21) or d10b3_21=9) & (missing(d10c3_21) or
d10c3_21=9) then d9_3_21m=9;
if missing(imamd9_3_21) and missing(d10a3_21) then d10a3_21=9;
imamd12a_21=d12a_21;*monthly expense for medications;**** N=59;
if d12a_21 in (9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,
777777) then imamd12a_21=.;
if missing(imamd12a_21) & d12a_21 not in (777777) & (missing(d12b_a_21) or
d12b_a_21=9) & (missing(d12b_b_21) or d12b_b_21=9) & (missing(d12b_c_21) or
d12b_c_21=9) then d12a_21m=9;
if missing(imamd12a_21) and missing(d12b_a_21) then d12b_a_21=9;
dumd6_21=1*(missing(imamd6_21));
dumd9_1_21=1*(missing(imamd9_1_21));
dumd9_2_21=1*(missing(imamd9_2_21));
dumd9_3_21=1*(missing(imamd9_3_21));
dumd12a_21=1*(missing(imamd12a_21));
run;
```

```
/*
proc freq data=aa2;
tables age_21 yrschool dumd6_21 dumd9_1_21 dumd9_2_21 dumd9_3_21 dumd12a_21;
run;
*/
***** define range of imputation;
%macro range(vname,va,vb,vc,rmax,r1,r1_2,r2_1,mix1,mix2);
data data&vname
(keep=cunicah np subhog_21 tipent_21 yrschool sex_21 age_21 imam&vname
dum&vname
low&vname up&vname &mix1 &mix2);
set aa2;
low&vname=1; up&vname=&rmax ;
if imam&vname >=0 then do; low&vname=imam&vname; end;
if imam&vname >=0 then do; up&vname=imam&vname; end;
if &va=1 and &vc=1 then do; low&vname=&r1_2; up&vname=&rmax; end;
if &va=1 and &vc=2 then do; low&vname=&r1; up&vname=&r1_2; end;
if &va=1 and &vc=9 then do; low&vname=&r1; up&vname=&rmax; end;
if &va=2 and &vb=1 then do; low&vname=&r2_1; up&vname=&r1; end;
if &va=2 and &vb=2 then do; low&vname=1; up&vname=&r2_1; end;
if &va=2 and &vb=9 then do; low&vname=1; up&vname=&r1; end;
if &va=9 then do; low&vname=1; up&vname=&rmax; end;
if &mix1 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
if &mix2 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
%mend range;
%range(d6_21,d7a_21,d7b_21,d7c_21,180000,7500,30000,4000,d4_21m); run;
%range(d9_1_21,d10a1_21,d10b1_21,d10c1_21, 45000,2000,15000,400,d9_1_21m);
run;
%range(d9_2_21,d10a2_21,d10b2_21,d10c2_21,36000,2000,15000,400,d9_2_21m);
run;
%range(d9_3_21,d10a3_21,d10b3_21,d10c3_21,180000,2000,15000,400,d9_3_21m);
run;
%range(d12a_21,d12b_a_21,d12b_b_21,d12b_c_21,96000,400,2000,200,d12a_21m);
run;
/*proc means data=aa2; var imamd6_21 imamd9_1_21 imamd9_2_21 imamd9_3_21
imamd12a_21; run;*/

data output.group4_proxy_health; merge datad6_21 datad9_1_21 datad9_2_21
datad9_3_21 datad12a_21;
by cunicah np;
drop d4_21m d9_1_21m d9_2_21m d9_3_21m d12a_21m;
label
imamd6_21="total hospital expense"
imamd9_1_21="total expense for dentist visit(s)"
imamd9_2_21="total expense for outpatient procedures"
imamd9_3_21="total expense for medical visits"
imamd12a_21="monthly medication expense";
run;

data dd1; set output.group4_proxy_health; run;
/*
proc freq data=dd1;
```

```
tables age_21;
run;
*/
options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21;
count age_21;
mixed imamd6_21 imamd9_1_21 imamd9_2_21 imamd9_3_21 imamd12a_21 yrschool;
transfer cunicah np tipent_21
lowd6_21 upd6_21 lowd9_1_21 upd9_1_21 lowd9_2_21 upd9_2_21 lowd9_3_21
upd9_3_21 lowd12a_21 upd12a_21
dumd6_21
dumd9_1_21
dumd9_2_21
dumd9_3_21
dumd12a_21 ;
bounds imamd6_21(<=upd6_21,>=lowd6_21)
imamd9_1_21(<=upd9_1_21,>=lowd9_1_21)
imamd9_2_21(<=upd9_2_21,>=lowd9_2_21)
imamd9_3_21(<=upd9_3_21,>=lowd9_3_21)
imamd12a_21(<=upd12a_21,>=lowd12a_21)
yrschool(<=22, >=0)
age_21(<=107, >=17);
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
*multiples 5;
seed 2018;
run;

/* proc freq; table imamd6_21; where dumd6_21=1; run; *** n=20 imputed;
proc freq; table imamd9_1_21; where dumd9_1_21=1; run; *** n=38 imputed;
proc freq; table imamd9_2_21; where dumd9_2_21=1; run; *** n=4 imputed;
proc freq; table imamd9_3_21; where dumd9_3_21=1; run; *** n=43 imputed;
proc freq; table imamd12a_21; where dumd12a_21=1; run; *** n=59 imputed;
*/
/*
proc freq data=dd_1;
tables imamd9_1_21;
run;
*/
data imp.group4_proxy_health_imputed; set dd_1;
drop
lowd6_21 upd6_21 lowd9_1_21 upd9_1_21 lowd9_2_21 upd9_2_21 lowd9_3_21
upd9_3_21 lowd12a_21 upd12a_21;
run;
```

```
proc means data=output.group4_proxy_health n mean std min max nmiss  ;
variable imamd9_3_21;
run;

proc means data=imp.group4_proxy_health_imputed n mean std min max nmiss  ;
variable imamd9_3_21;
run;

data group11;
set output.group4_proxy_health;
if imamd9_3_21=0 then imamd9_3_21=.;
run;

proc means data=group11 n mean std min max  ;
variable imamd9_3_21;
run;

data group14;
set imp.group4_proxy_health_imputed;
if imamd9_3_21=0 then imamd9_3_21=.;
run;

proc means data=group14 n mean std min max  ;
variable imamd9_3_21;
run;
;
```

```
/*************************************************/
/* PROGRAM NAME : Imput2021_group4_kin.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/8/2023 */
/* Impute missing value on Next-of-Kin questionnaire */
/*************************************************/
libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

data bb; set output.sect_sa_sb_sc_sd_se_sh_si_2021; ***Next-of-Kin
questionnaire;
proc sort out=temp nodupkey; by cunicah np; run;
proc contents data=bb;
run;
/*
proc contents data=input.Sect_sa_sb_sc_sd_se_sh_si_2021;
run;
*/
data bb1; set bb;**** n=1,799;
keep cunicah np d_age_21 yob sex_21 yrschool
sd3_21 sd5_21 sd6a_21 sd6b_21 sd6c_21
sd7_21 sd8_21 sd9a_21 sd9b_21 sd9c_21
sd10a_21 sd10b1_21 sd10b2_21 sd10b3_21
sd11a_21
sd12a_21 sd12b_21 sd12c_21
sd13a_21 sd13b_21 sd13c_21;
*if tipent_15 in (5);
run;
proc sort; by cunicah np; run;

/*proc freq data=bb1; table yrschool; run;

data tmp;
set bb2;
if d_age_21=.;
run;*/

proc freq; tables d_age_21;run;

***** define missing value;
data bb2; set bb1;
if d_age_21 in (888, 999) then d_age_21=.;
if d_age_21 < 0 then d_age_21=.;
imamsd5_21=sd5_21;**** impute n=91;
if sd3_21=0 and missing(sd5_21) then imamsd5_21=0;
if sd3_21>=888 and missing(sd5_21) then sd3_21m =9; ***mix imp variables;
```

```
if 888 > sd3_21 >0 and sd5_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,888889,
888887) then do;
imamsd5_21=.;
sd5_21m=9; ***mix imp var;
end;
if missing(imamsd5_21) and missing(sd6a_21) then sd6a_21=9;
imamsd8_21=sd8_21;**** impute n=146;
if sd7_21=0 and missing(sd8_21) then imamsd8_21=0;
if sd7_21 >0 and sd8_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,888889)
then imamsd8_21=.;
if sd7_21 >0 and sd8_21 in (888888,999999) then sd8_21m=9; **** mix imp
variables;
if missing(imamsd8_21) and missing(sd9a_21) then sd9a_21=9;
imamsd10a_21=sd10a_21;**** impute n=184;
if sd10a_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,999998,888889)
then imamsd10a_21=.;
if sd10a_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,999998,888889) then
sd10a_21m=9; ***mix imp var;
if missing(imamsd10a_21) and missing(sd10b1_21) then sd10b1_15=9;
imamsd12a_21=.;**** impute n=1489;
if sd11a_21 = 8 then imamsd12a_21=0;
if sd11a_21 in (88,99) then sd11a_21m=9;
if sd12a_21=7 then imamsd12a_21=0;
if sd12a_21=9 then sd12a_21m=9;
imamsd13a_21=.;
if sd13a_21=7 then imamsd13a_21=0;
if sd13a_21 =9 then sd13a_21m=9; *** mix imp var;
dumsd5_21=missing(imamsd5_21);
dumsd8_21=missing(imamsd8_21);
dumsd10a_21=missing(imamsd10a_21);
dumsd12a_21=missing(imamsd12a_21);
dumsd13a_21=missing(imamsd13a_21);
*define range of imputation for age;
if cunicah=14058 and np=10 then do;
lowd_age_21=(2018-yob);
upd_age_21=(2021-yob);
end;
run;

***** define range of imputation;
%macro range(vname,va,vb,vc,rmax,r1,r1_2,r2_1,mix1,mix2);
data data&vname
(keep=cunicah np yrschool sex_21 d_age_21 lowd_age_21 upd_age_21 imam&vname
dum&vname low&vname up&vname
&mix1 &mix2);
set bb2;
low&vname=1; up&vname=&rmax ;
if &va=1 and &vc=1 then do; low&vname=&r1_2; up&vname=&rmax; end;
```

```
if &va=1 and &vc=2 then do; low&vname=&r1; up&vname=&r1_2;end;
if &va=1 and &vc=9 then do; low&vname=&r1; up&vname=&rmax;end;
if &va=2 and &vb=1 then do; low&vname=&r2_1;up&vname=&r1; end;
if &va=2 and &vb=2 then do; low&vname=1; up&vname=&r2_1;end;
if &va=2 and &vb=9 then do; low&vname=1; up&vname=&r1;end;
if &va=9 then do; low&vname=1; up&vname=&rmax; end;
if imam&vname >=0 then do; low&vname=imam&vname; end;
if imam&vname >=0 then do; up&vname=imam&vname; end;
if &mix1 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
if &mix2 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
%mend range;

%range(sd5_21,sd6a_21,sd6b_21,sd6c_21,700000,6000,24000,3000,sd3_21m,sd5_21m
);run;
%range(sd8_21,sd9a_21,sd9b_21,sd9c_21,428000,1500,12000, 300,sd8_21m); run;
%range(sd10a_21,sd10b1_21,sd10b2_21,sd10b3_21,150000,300,1500,150,sd10a_21m)
; run;
%range(sd12a_21,sd12a_21,sd12b_21,sd12c_21,24000,6000,24000,3000,sd11a_21m,s
d12a_21m); run;
%range(sd13a_21,sd13a_21,sd13b_21,sd13c_21,24000,6000,24000,3000,sd13a_21m);
run;
/*
proc means data=bb2;
var imamsd5_21 imamsd8_21 imamsd10a_21;
run;
*/
proc sort data=datasd5_21;
by cunicah np;;
run;

proc sort data=datasd8_21;
by cunicah np;;
run;

proc sort data=datasd10a_21;
by cunicah np;;
run;

proc sort data=datasd12a_21;
by cunicah np;;
run;

proc sort data=datasd13a_21;
by cunicah np;;
run;

data output.group4_kin_health;
merge datasd5_21 datasd8_21 datasd10a_21 datasd12a_21 datasd13a_21;
by cunicah np;
drop sd3_21m sd5_21m sd8_21m sd10a_21m sd11a_21m sd12a_21m sd13a_21m;
run;
```

```
data dd1;
set output.group4_kin_health;
keep cunicah np d_age_21 lowd_age_21 upd_age_21 sex_21 yrschool
imamsd5_21 dumsd5_21 lowsd5_21 upsd5_21
imamsd8_21 dumsd8_21 lowsd8_21 upsd8_21
imamsd10a_21 dumsd10a_21 lowsd10a_21 upsd10a_21;
*define range of imputation for age;
if cunicah=15431 and np=20 then do;
d_age_21 = 51;
end;
if cunicah=15634 and np=20 then do;
d_age_21 = 57;
end;
if cunicah=17656 and np=20 then do;
d_age_21 = 60;
end;
run;

proc means data=dd1;
var yrschool;
run;

proc freq data=dd1;
table d_age_21;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21;
count d_age_21;
mixed imamsd5_21 imamsd8_21 imamsd10a_21 yrschool;
transfer cunicah np
lowd_age_21 upd_age_21
lowsd5_21 upsd5_21 lowsd8_21 upsd8_21 lowsd10a_21 upsd10a_21
dumsd5_21 dumsd8_21 dumsd10a_21;
bounds imamsd5_21(<=upsd5_21,>=lowsd5_21)
imamsd8_21(<=upsd8_21,>=lowsd8_21)
imamsd10a_21(<=upsd10a_21,>=lowsd10a_21)
yrschool(<=22, >=0)
d_age_21(<=upd_age_21, >=lowd_age_21);
INTERACT d_age_21*sex_21 d_age_21*d_age_21 sex_21*yrschool
yrschool*yrschool;
iterations 10;
*multiples 5;
seed 2018;
run;
```

```
data dd1; set output.group4_kin_health;
keep cunicah np d_age_21 lowd_age_21 upd_age_21 sex_21 yrschool
imamsd12a_21 dumsd12a_21 lowsd12a_21 upsd12a_21
imamsd13a_21 dumsd13a_21 lowsd13a_21 upsd13a_21;
*define range of imputation for age;
if cunicah=15431 and np=20 then do;
d_age_21 = 51;
end;
if cunicah=15634 and np=20 then do;
d_age_21 = 57;
end;
if cunicah=17656 and np=20 then do;
d_age_21 = 60;
end;
run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_2;
categorical sex_21;
count d_age_21;
mixed imamsd12a_21 imamsd13a_21 yrschool;
transfer cunicah np
lowd_age_21 upd_age_21
lowsd12a_21 upsd12a_21 lowsd13a_21 upsd13a_21
dumsd12a_21 dumsd13a_21;
bounds imamsd12a_21(<=upsd12a_21,>=lowsd12a_21)
imamsd13a_21(<=upsd13a_21,>=lowsd13a_21)
yrschool(<=22, >=0)
d_age_21(<=upd_age_21, >=lowd_age_21);
INTERACT d_age_21*sex_21 d_age_21*d_age_21 sex_21*yrschool
yrschool*yrschool;
iterations 10;
*multiples 5;
seed 2018;
run;

data imp.group4_kin_health_imputed; merge dd_1 dd_2; by cunicah np;
drop
lowd_age_21 upd_age_21 lowsd5_21 upsd5_21 lowsd8_21 upsd8_21 lowsd10a_21
upsd10a_21
lowsd12a_21 upsd12a_21 lowsd13a_21 upsd13a_21 ;
run;
```

```
proc means data=output.group4_kin_health n mean std min max nmiss  ;
variable imamsd5_21;
run;

proc means data=imp.group4_kin_health_imputed n mean std min max nmiss  ;
variable imamsd5_21;
run;

data group11;
set output.group4_kin_health;
if imamsd5_21=0 then imamsd5_21=.;
run;

proc means data=group11 n mean std min max  ;
variable imamsd5_21;
run;

data group14;
set imp.group4_kin_health_imputed;
if imamsd5_21=0 then imamsd5_21=.;
run;

proc means data=group14 n mean std min max  ;
variable imamsd5_21;
run;


;
```

```
/*******************************************************/
/* PROGRAM NAME : Imput2021_group4_report.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/22/2023 */
/* Descriptive Statistics of Derived (Un-imputed) and Imputed Variables
*/
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

************** core **************;
data out1;
merge output.group4_core_health;
by cunicah np;
rename imamd6_21=amd6_21 imamd9_1_21=amd9_1_21 imamd9_2_21=amd9_2_21
imamd9_3_21=amd9_3_21 imamd12a_21=amd12a_21;
run;

data imp1;
merge imp.Group4_core_health_imputed;
by cunicah np; run;
data out_imp1;
merge out1 imp1;
by cunicah np;
run;

*** print putput;
Title "Group4 core health - mean with zero";
proc means data=out_imp1 n nmiss mean std min max ;
variable amd6_21 imamd6_21 amd9_1_21 imamd9_1_21 amd9_2_21 imamd9_2_21
amd9_3_21 imamd9_3_21 amd12a_21 imamd12a_21;
; run;

Title "Group4 core health - mean without zero";
data out_imp2; set out_imp1;
if imamd6_21 =0 then imamd6_21 =.;
if imamd9_1_21 =0 then imamd9_1_21 =.;
if imamd9_2_21 =0 then imamd9_2_21 =.;
if imamd9_3_21 =0 then imamd9_3_21 =.;
if imamd12a_21 =0 then imamd12a_21 =.;

if amd6_21 =0 then amd6_21 =.;
if amd9_1_21 =0 then amd9_1_21 =.;
if amd9_2_21 =0 then amd9_2_21 =.;
if amd9_3_21 =0 then amd9_3_21 =.;
if amd12a_21 =0 then amd12a_21 =.;
run;
```

```
proc means data=out_imp2 n mean std min max ;
variable amd6_21 imamd6_21 amd9_1_21 imamd9_1_21 amd9_2_21 imamd9_2_21
amd9_3_21 imamd9_3_21 amd12a_21 imamd12a_21;
; run;

*************** proxy **************;
data out1;
set output.Group4_proxy_health;
by cunicah np;
rename imamd6_21=amd6_21 imamd9_1_21=amd9_1_21 imamd9_2_21=amd9_2_21
imamd9_3_21=amd9_3_21 imamd12a_21=amd12a_21;
run;
data imp1;
merge imp.Group4_proxy_health_imputed;
by cunicah np; run;
data out_imp1;
merge out1 imp1;
by cunicah np;
run;

*** print putput;
Title "Group4 proxy health - mean with zero";
proc means data=out_imp1 n nmiss mean std min max ;
variable amd6_21 imamd6_21 amd9_1_21 imamd9_1_21 amd9_2_21 imamd9_2_21
amd9_3_21 imamd9_3_21 amd12a_21 imamd12a_21;
; run;

Title "Group4 proxy health - mean without zero";
data out_imp2; set out_imp1;
if imamd6_21 =0 then imamd6_21 =.;
if imamd9_1_21 =0 then imamd9_1_21 =.;
if imamd9_2_21 =0 then imamd9_2_21 =.;
if imamd9_3_21 =0 then imamd9_3_21 =.;
if imamd12a_21 =0 then imamd12a_21 =.;

if amd6_21 =0 then amd6_21 =.;
if amd9_1_21 =0 then amd9_1_21 =.;
if amd9_2_21 =0 then amd9_2_21 =.;
if amd9_3_21 =0 then amd9_3_21 =.;
if amd12a_21 =0 then amd12a_21 =.;
run;
proc means data=out_imp2 n mean std min max ;
variable amd6_21 imamd6_21 amd9_1_21 imamd9_1_21 amd9_2_21 imamd9_2_21
amd9_3_21 imamd9_3_21 amd12a_21 imamd12a_21;
; run;

********************** Kin ********************************;
data out1;
set output.group4_kin_health;
by cunicah np;
rename imamsd5_21=amsd5_21 imamsd8_21=amsd8_21 imamsd10a_21=amsd10a_21
imamsd12a_21=amsd12a_21 imamsd13a_21=amsd13a_21;
```

```
run;

data imp1;
merge imp.group4_kin_health_imputed;
by cunicah np; run;
data out_imp1;
merge out1 imp1;
by cunicah np;
run;

*** print putput;
Title "Group4 kin health - mean with zero";
proc means data=out_imp1 n nmiss mean std min max ;
variable amsd5_21 imamsd5_21 amsd8_21 imamsd8_21 amsd10a_21 imamsd10a_21
amsd12a_21 imamsd12a_21 amsd13a_21 imamsd13a_21;
; run;

Title "Group4 kin health - mean without zero";
data out_imp2; set out_imp1;
if imamsd5_21 =0 then imamsd5_21 =.;
if imamsd8_21 =0 then imamsd8_21 =.;
if imamsd10a_21 =0 then imamsd10a_21 =.;
if imamsd12a_21 =0 then imamsd12a_21 =.;
if imamsd13a_21 =0 then imamsd13a_21 =.;

if amsd5_21 =0 then amsd5_21 =.;
if amsd8_21 =0 then amsd8_21 =.;
if amsd10a_21 =0 then amsd10a_21 =.;
if amsd12a_21 =0 then amsd12a_21 =.;
if amsd13a_21 =0 then amsd13a_21 =.;
run;
proc means data=out_imp2 n mean std min max ;
variable amsd5_21 imamsd5_21 amsd8_21 imamsd8_21 amsd10a_21 imamsd10a_21
amsd12a_21 imamsd12a_21 amsd13a_21 imamsd13a_21;
; run;
;
merge imp.group4_kin_health_imputed;
by cunicah np; run;
data out_imp1;
merge out1 imp1;
by cunicah np;
run;

*** print putput;
Title "Group4 kin health - mean with zero";
proc means data=out_imp1 n nmiss mean std min max ;
variable amsd5_21 imamsd5_21 amsd8_21 imamsd8_21 amsd10a_21 imamsd10a_21
amsd12a_21 imamsd12a_21 amsd13a_21 imamsd13a_21;
; run;

Title "Group4 kin health - mean without zero";
data out_imp2; set out_imp1;
```

```
if imamsd5_21 =0 then imamsd5_21 =.;
if imamsd8_21 =0 then imamsd8_21 =.;
if imamsd10a_21 =0 then imamsd10a_21 =.;
if imamsd12a_21 =0 then imamsd12a_21 =.;
if imamsd13a_21 =0 then imamsd13a_21 =.;

if amsd5_21 =0 then amsd5_21 =.;
if amsd8_21 =0 then amsd8_21 =.;
if amsd10a_21 =0 then amsd10a_21 =.;
if amsd12a_21 =0 then amsd12a_21 =.;
if amsd13a_21 =0 then amsd13a_21 =.;
run;
proc means data=out_imp2 n mean std min max ;
variable amsd5_21 imamsd5_21 amsd8_21 imamsd8_21 amsd10a_21 imamsd10a_21
amsd12a_21 imamsd12a_21 amsd13a_21 imamsd13a_21;
; run;
```

GROUP 5. Household Monthly Rent

```
/*******************************************************/
/* PROGRAM NAME : Imput2021_group5_core_housing.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/8/2023 */
/* Impute missing value on core and proxy questionnaire */
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

data aa; set output.Sect_g_j_k_sa_2021; *** core and proxy questionnaire
N=10716;
proc sort out=temp nodupkey; by cunicah subhog_21; run; *** no duplicate;

***** Core questionnaire N=10716;
data aa1; set aa;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
j19_21 j20_21 j21a_21 j21b_21 J21c_21
;
if tipent_hh_21 in (1); run;
/*
proc freq data=aa2;
tables age_21 yrschool;
run;
*/
data aa2; set aa1;
if age_21 in (888,999) then age_21=.;
imamj20_21=j20_21;**** Imputation N=10;
if j19_21 ne 1 and missing(j20_21) then imamj20_21=0;
if j19_21=1 and j20_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamj20_21=.;
if missing(imamj20_21) and missing(j21a_21) then j21a_21=9;
dumj20_21=missing(imamj20_21);
run;
/*
data tmp;
set aa2;
if missing(imamj20_21);
run;
proc freq data=aa2;
tables dumj20_21;
run;
*/
***** define range of imputation;
%macro range(vname,va,vb,vc,rmax,r1,r1_2,r2_1,mix1,mix2);
data data&vname
(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21 imam&vname
```

```
dum&vname low&vname up&vname &mix1 &mix2);
set aa2;
low&vname=1; up&vname=&rmax ;
if &va=1 and &vc=1 then do; low&vname=&r1_2;
up&vname=&rmax; end;
if &va=1 and &vc=2 then do; low&vname=&r1; up&vname=&r1_2;
end;
if &va=1 and &vc=9 then do; low&vname=&r1; up&vname=&rmax;
end;
if &va=2 and &vb=1 then do; low&vname=&r2_1;
up&vname=&r1; end;
if &va=2 and &vb=2 then do; low&vname=1; up&vname=&r2_1;
end;
if &va=2 and &vb=9 then do; low&vname=1; up&vname=&r1;
end;
if &va=9 then do; low&vname=1; up&vname=&rmax; end;
if imam&vname >=0 then do; low&vname=imam&vname; end;
if imam&vname >=0 then do; up&vname=imam&vname; end;
if &mix1 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
if &mix2 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
%mend range;
%range(j20_21,j21a_21,j21b_21,J21c_21, 80000,6000,18000,2000); run;
/*
proc means data=aa2;
var age_21 yrschool;
run;
*/
data output.group5_core_housing; set dataj20_21 ; run;
data dd1; set output.group5_core_housing; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21;
count age_21;
mixed imamj20_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowj20_21 upj20_21 dumj20_21
;
bounds
imamj20_21 (>=lowj20_21 ,<=upj20_21)
yrschool(<=22, >=0)
age_21(<=107, >=17);
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
*multiples 5;
seed 2018;
```

```
run;

data data imp.group5_core_housing_imputed; set dd_1;
drop lowj20_21 upj20_21
; run;



proc means data=output.group5_core_housing n mean std min max nmiss  ;
variable imamj20_21;
run;

proc means data=imp.group5_core_housing_imputed n mean std min max nmiss  ;
variable imamj20_21;
run;

data group11;
set output.group5_core_housing;
if imamj20_21=0 then imamj20_21=.;
run;

proc means data=group11 n mean std min max  ;
variable imamj20_21;
run;

data group14;
set imp.group5_core_housing_imputed;
if imamj20_21=0 then imamj20_21=.;
run;

proc means data=group14 n mean std min max  ;
variable imamj20_21;
run;
;
```

```
/*******************************************************/
/* PROGRAM NAME : Imput2021_group5_proxy_housing.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/8/2023 */
/* Impute missing value on core and proxy questionnaire */
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

data aa; set output.Sect_g_j_k_sa_2021; *** core and proxy questionnaire
N=10716;
proc sort out=temp nodupkey; by cunicah subhog_21; run; *** no duplicate;

***** proxy questionnaire N=753;
data aa1; set aa;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
j19_21 j20_21 j21a_21 j21b_21 J21c_21
;
if tipent_hh_21 in (2); run;
/*
proc freq data=aa1;
tables age_21 yrschool;
run;
*/
data aa2; set aa1;
if age_21 in (888,999) then age_21=.;
imamj20_21=j20_21;**** Imputation N=2;
if j19_21 ne 1 and missing(j20_21) then imamj20_21=0;
if j19_21=1 and j20_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamj20_21=.;
if missing(imamj20_21) and missing(j21a_21) then j21a_21=9;
dumj20_21=missing(imamj20_21);
run;
/*
data tmp;
set aa2;
if missing(imamj20_21);
run;
proc freq data=aa2;
tables dumj20_21;
run;
*/
***** define range of imputation;
%macro range(vname,va,vb,vc,rmax,r1,r1_2,r2_1,mix1,mix2);
data data&vname
(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21 imam&vname
```

```
dum&vname low&vname up&vname &mix1 &mix2);
set aa2;
low&vname=1; up&vname=&rmax ;
if &va=1 and &vc=1 then do; low&vname=&r1_2;
up&vname=&rmax; end;
if &va=1 and &vc=2 then do; low&vname=&r1; up&vname=&r1_2;
end;
if &va=1 and &vc=9 then do; low&vname=&r1; up&vname=&rmax;
end;
if &va=2 and &vb=1 then do; low&vname=&r2_1;
up&vname=&r1; end;
if &va=2 and &vb=2 then do; low&vname=1; up&vname=&r2_1;
end;
if &va=2 and &vb=9 then do; low&vname=1; up&vname=&r1;
end;
if &va=9 then do; low&vname=1; up&vname=&rmax; end;
if imam&vname >=0 then do; low&vname=imam&vname; end;
if imam&vname >=0 then do; up&vname=imam&vname; end;
if &mix1 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
if &mix2 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
%mend range;
%range(j20_21,j21a_21,j21b_21,J21c_21, 80000,6000,18000,2000); run;
/*
proc means data=aa2;
var age_21 yrschool;
run;
*/
data output.group5_proxy_housing; set dataj20_21 ; run;
data dd1; set output.group5_proxy_housing; run; **** Core nonproxy N=683
var=10;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21;
count age_21;
mixed imamj20_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowj20_21 upj20_21 dumj20_21
;
bounds
imamj20_21 (>=lowj20_21 ,<=upj20_21)
yrschool(<=22, >=0)
age_21(<=107, >=17);
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
*multiples 5;
```

```
seed 2018;
run;

data data imp.group5_proxy_housing_imputed; set dd_1;
drop lowj20_21 upj20_21
; run;



proc means data=output.group5_proxy_housing n mean std min max nmiss  ;
variable imamj20_21;
run;

proc means data=imp.group5_proxy_housing_imputed n mean std min max nmiss  ;
variable imamj20_21;
run;

data group11;
set output.group5_proxy_housing;
if imamj20_21=0 then imamj20_21=.;
run;

proc means data=group11 n mean std min max  ;
variable imamj20_21;
run;

data group14;
set imp.group5_proxy_housing_imputed;
if imamj20_21=0 then imamj20_21=.;
run;

proc means data=group14 n mean std min max  ;
variable imamj20_21;
run;
;
```

```
/*******************************************************/
/* PROGRAM NAME : Imput2021_group5_report.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/22/2023 */
/* Descriptive Statistics of Derived (Un-imputed) and Imputed Variables
*/
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

************** core **************;
data out1;
merge output.Group5_core_housing;
by cunicah subhog_21;
rename imamj20_21=amj20_21;
run;

data imp1;
merge imp.Group5_core_housing_imputed;
by cunicah subhog_21; run;
data out_imp1;
merge out1 imp1;
by cunicah subhog_21;
run;

*** print putput;
Title "Group5 core Housing - mean with zero";
proc means data=out_imp1 n nmiss mean std min max ;
variable amj20_21 imamj20_21;
; run;

Title "Group5 core Housing - mean without zero";
data out_imp2; set out_imp1;
if imamj20_21 =0 then imamj20_21 =.;

if amj20_21 =0 then amj20_21 =.;
run;
proc means data=out_imp2 n mean std min max ;
variable amj20_21 imamj20_21;
; run;

************** proxy **************;
data out1;
merge output.Group5_proxy_housing;
by cunicah subhog_21;
rename imamj20_21=amj20_21;
run;
```

```
data imp1;
merge imp.Group5_proxy_housing_imputed;
by cunicah subhog_21; run;
data out_imp1;
merge out1 imp1;
by cunicah subhog_21;
run;

*** print putput;
Title "Group5 proxy Housing - mean with zero";
proc means data=out_imp1 n nmiss mean std min max ;
variable amj20_21 imamj20_21;
; run;

Title "Group5 proxy Housing - mean without zero";
data out_imp2; set out_imp1;
if imamj20_21 =0 then imamj20_21 =.;

if amj20_21 =0 then amj20_21 =.;
run;
proc means data=out_imp2 n mean std min max ;
variable amj20_21 imamj20_21;
; run;
;
```

GROUP 6. Pensions Income

```
/*******************************************************/
/* PROGRAM NAME : Imput2021_group6_core_pension.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/8/2023 */
/* Impute missing value on core and proxy questionnaire */
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';



data aa; set output.Sect_g_j_k_sa_2021; *** core and proxy questionnaire
N=10716;
proc sort out=temp nodupkey; by cunicah subhog_21; run; *** no duplicate;

***** Core questionnaire N=10716;
data aa1; set aa;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
k100_21 k101_21 k102a_21 k102b_21 k102c_21
k103_21 k104a_21 k104b_21 k104c_21
k98_21 k111_21 k112a_21 k112b_21 k112c_21;
if tipent_hh_21 in (1); run;


proc freq data=aa2;
tables dumk101_21 dumk103_21 dumk111_21;
run;

data aa2; set aa1;
if age_21 in (888,999) then age_21=.;
if missing(k98_21)=0;
imamk101_21=k101_21;**** Imputation N=3;
if k100_21 in (1,4,5) and missing(k101_21) then imamk101_21=0;
if k100_21 in (8,9) then k100_21m=9; ** mix imp var;
if k100_21 in (2,3) and k101_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk101_21=.;
if missing(imamk101_21) and missing(k102a_21) then k102a_21=9;
imamk103_21=k103_21;**** Imputation N=9;
if k100_21 in (4,5) and missing(k103_21) then imamk103_21=0;
if k100_21 in (8,9) then k100_21m=9; ** mix imp var;
if k100_21 in(1,2,3) and k103_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk103_21=.;
if k100_21 in(1,2,3) and k103_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then k103_21m=9; ** mix imp var; *????;
```

```
if missing(imamk103_21) and missing(k104a_21) then k104a_21=9;
imamk111_21=k111_21;**** Imputation N=143;
if missing(k111_21) then imamk111_21=0;
if k111_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk111_21=.;
if k111_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then k111_21m=9;
dumk101_21=missing(imamk101_21);
dumk103_21=missing(imamk103_21);
dumk111_21=missing(imamk111_21);
run;

**************;
/*
data tmp;
set aa2;
if missing(imamj20_21);
run;
proc freq data=aa2;
tables dumj20_21;
run;
*/
***** define range of imputation;
%macro range(vname,va,vb,vc,rmax,r1,r1_2,r2_1,mix1,mix2);
data data&vname
(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21 imam&vname
dum&vname low&vname up&vname &mix1 &mix2);
set aa2;
low&vname=1; up&vname=&rmax ;
if &va=1 and &vc=1 then do; low&vname=&r1_2;
up&vname=&rmax; end;
if &va=1 and &vc=2 then do; low&vname=&r1; up&vname=&r1_2;
end;
if &va=1 and &vc=9 then do; low&vname=&r1; up&vname=&rmax;
end;
if &va=2 and &vb=1 then do; low&vname=&r2_1;
up&vname=&r1; end;
if &va=2 and &vb=2 then do; low&vname=1; up&vname=&r2_1;
end;
if &va=2 and &vb=9 then do; low&vname=1; up&vname=&r1;
end;
if &va=9 then do; low&vname=1; up&vname=&rmax; end;
if imam&vname >=0 then do; low&vname=imam&vname; end;
if imam&vname >=0 then do; up&vname=imam&vname; end;
if &mix1 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
if &mix2 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
%mend range;
%range(k101_21,k102a_21,k102b_21,k102c_21, 30000,2000,7500,950,k100_21m);
run;
```

```
%range(k103_21,k104a_21,k104b_21,k104c_21,47000,2000,7500,95,k100_21m,k103_2
1m);run;
%range(k111_21,k112a_21,k112b_21,k112c_21,500000,7500,30000,4000,k111_21m);
run;
/*
proc means data=aa2;
var age_21 yrschool imamk101_21 imamk103_21 imamk111_21;
run;
*/

data output.group6_core_pension;
merge datak101_21 datak103_21 datak111_21 ;
by cunicah subhog_21;
drop k100_21m k103_21m k111_21m;
run;

data dd1; set output.group6_core_pension; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21;
count age_21;
mixed imamk101_21 imamk103_21 imamk111_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk101_21 upk101_21
lowk103_21 upk103_21
lowk111_21 upk111_21
dumk101_21
dumk103_21
dumk111_21
;
bounds
imamk101_21 (>=lowk101_21 ,<=upk101_21)
imamk103_21 (>=lowk103_21 ,<=upk103_21)
imamk111_21 (>=lowk111_21 ,<=upk111_21)
yrschool(<=22, >=0)
age_21(<=107, >=17);
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
*multiples 5;
seed 2018;
run;

data data imp.group6_core_pension_imputed; set dd_1;
drop
lowk101_21 upk101_21
```

```
lowk103_21 upk103_21
lowk111_21 upk111_21
; run;



proc means data=output.group6_core_pension n mean std min max nmiss  ;
variable imamk111_21;
run;

proc means data=imp.group6_core_pension_imputed n mean std min max nmiss  ;
variable imamk111_21;
run;

data group11;
set output.group6_core_pension;
if imamk111_21=0 then imamk111_21=.;
run;

proc means data=group11 n mean std min max  ;
variable imamk111_21;
run;

data group14;
set imp.group6_core_pension_imputed;
if imamk111_21=0 then imamk111_21=.;
run;

proc means data=group14 n mean std min max  ;
variable imamk111_21;
run;
;
```

```
/*******************************************************/
/* PROGRAM NAME : Imput2021_group6_proxy_pension.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED :5/8/2023 */
/* Impute missing value on core and proxy questionnaire */
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

data aa; set output.Sect_g_j_k_sa_2021; *** core and proxy questionnaire
N=11401;
proc sort out=temp nodupkey; by cunicah subhog_21; run; *** no duplicate;

***** proxy questionnaire N=683;
data aa1; set aa;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
k100_21 k101_21 k102a_21 k102b_21 k102c_21
k103_21 k104a_21 k104b_21 k104c_21
k98_21 k111_21 k112a_21 k112b_21 k112c_21;
if tipent_hh_21 in (2); run;

/*
proc freq data=aa;
tables tipent_hh_21;
run;
proc freq data=aa2;
tables dumk101_21 dumk103_21 dumk111_21;
run;
*/
data aa2; set aa1;
if age_21 in (888,999) then age_21=.;
if missing(k98_21)=0; ****55;
imamk101_21=k101_21;**** Imputation N=1;
if k100_21 in (1,4,5) and missing(k101_21) then imamk101_21=0;
if k100_21 in (8,9) then k100_21m=9; ** mix imp var;
if k100_21 in (2,3) and k101_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk101_21=.;
if missing(imamk101_21) and missing(k102a_21) then k102a_21=9;
imamk103_21=k103_21;**** Imputation N=4;
if k100_21 in (4,5) and missing(k103_21) then imamk103_21=0;
if k100_21 in (8,9) then k100_21m=9; ** mix imp var;
if k100_21 in(1,2,3) and k103_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk103_21=.;
```

```
if k100_21 in(1,2,3) and k103_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then k103_21m=9; ** mix imp var; *????;
if missing(imamk103_21) and missing(k104a_21) then k104a_21=9;
imamk111_21=k111_21;**** Imputation N=12;
if missing(k111_21) then imamk111_21=0;
if k111_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamk111_21=.;
if k111_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then k111_21m=9;
dumk101_21=missing(imamk101_21);
dumk103_21=missing(imamk103_21);
dumk111_21=missing(imamk111_21);
run;

**************;
/*
data tmp;
set aa2;
if missing(imamj20_21);
run;
proc freq data=aa2;
tables dumj20_21;
run;
*/
***** define range of imputation;
%macro range(vname,va,vb,vc,rmax,r1,r1_2,r2_1,mix1,mix2);
data data&vname
(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21 imam&vname
dum&vname low&vname up&vname &mix1 &mix2);
set aa2;
low&vname=1; up&vname=&rmax ;
if &va=1 and &vc=1 then do; low&vname=&r1_2;
up&vname=&rmax; end;
if &va=1 and &vc=2 then do; low&vname=&r1; up&vname=&r1_2;
end;
if &va=1 and &vc=9 then do; low&vname=&r1; up&vname=&rmax;
end;
if &va=2 and &vb=1 then do; low&vname=&r2_1;
up&vname=&r1; end;
if &va=2 and &vb=2 then do; low&vname=1; up&vname=&r2_1;
end;
if &va=2 and &vb=9 then do; low&vname=1; up&vname=&r1;
end;
if &va=9 then do; low&vname=1; up&vname=&rmax; end;
if imam&vname >=0 then do; low&vname=imam&vname; end;
if imam&vname >=0 then do; up&vname=imam&vname; end;
if &mix1 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
if &mix2 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
%mend range;
```

```
%range(k101_21,k102a_21,k102b_21,k102c_21, 30000,2000,7500,950,k100_21m);
run;
%range(k103_21,k104a_21,k104b_21,k104c_21,17000,2000,7500,95,k100_21m,k103_2
1m);run;
%range(k111_21,k112a_21,k112b_21,k112c_21,200000,7500,30000,4000,k111_21m);
run;
/*
proc means data=aa2;
var age_21 yrschool imamk101_21 imamk103_21 imamk111_21;
run;

data tmp;
set dd1;
if dumk103_21=1;
run;
*/

data output.group6_proxy_pension; *****55 var=18;
merge datak101_21 datak103_21 datak111_21 ;
by cunicah subhog_21;
drop k100_21m k103_21m k111_21m;
run;

data dd1; set output.group6_proxy_pension; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21;
count age_21;
mixed imamk101_21 imamk103_21 imamk111_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowk101_21 upk101_21
lowk103_21 upk103_21
lowk111_21 upk111_21
dumk101_21
dumk103_21
dumk111_21
;
bounds
imamk101_21 (>=lowk101_21 ,<=upk101_21)
imamk103_21 (>=lowk103_21 ,<=upk103_21)
imamk111_21 (>=lowk111_21 ,<=upk111_21)
yrschool(<=22, >=0)
age_21(<=107, >=17);
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
```

```
*multiples 5;
seed 2018;
run;

data data imp.group6_proxy_pension_imputed; set dd_1;
drop
lowk101_21 upk101_21
lowk103_21 upk103_21
lowk111_21 upk111_21
; run;




proc means data=output.group6_proxy_pension n mean std min max nmiss  ;
variable imamk111_21;
run;

proc means data=imp.group6_proxy_pension_imputed n mean std min max nmiss  ;
variable imamk111_21;
run;

data group11;
set output.group6_proxy_pension;
if imamk111_21=0 then imamk111_21=.;
run;

proc means data=group11 n mean std min max  ;
variable imamk111_21;
run;

data group14;
set imp.group6_proxy_pension_imputed;
if imamk111_21=0 then imamk111_21=.;
run;

proc means data=group14 n mean std min max  ;
variable imamk111_21;
run;
;
```

```
/*******************************************************/
/* PROGRAM NAME : Imput2021_group6_report.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/22/2023 */
/* Descriptive Statistics of Derived (Un-imputed) and Imputed Variables
 */
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';

************** core **************;
data out1;
merge output.group6_core_pension;
by cunicah subhog_21;
rename imamk101_21=amk101_21 imamk103_21=amk103_21 imamk111_21=amk111_21;
run;

data imp1;
merge imp.Group6_core_pension_imputed;
by cunicah subhog_21; run;
data out_imp1;
merge out1 imp1;
by cunicah subhog_21;
run;

*** print putput;
Title "Group6 core pension - mean with zero";
proc means data=out_imp1 n nmiss mean std min max ;
variable amk101_21 imamk101_21 amk103_21 imamk103_21 amk111_21 imamk111_21;
; run;

Title "Group6 core pension - mean without zero";
data out_imp2; set out_imp1;
if imamk101_21 =0 then imamk101_21 =.;
if imamk103_21 =0 then imamk103_21 =.;
if imamk111_21 =0 then imamk111_21 =.;

if amk101_21 =0 then amk101_21 =.;
if amk103_21 =0 then amk103_21 =.;
if amk111_21 =0 then amk111_21 =.;
run;
proc means data=out_imp2 n mean std min max ;
variable amk101_21 imamk101_21 amk103_21 imamk103_21 amk111_21 imamk111_21;
; run;

************** proxy **************;
data out1;
```

```
merge output.group6_proxy_pension;
by cunicah subhog_21;
rename imamk101_21=amk101_21 imamk103_21=amk103_21 imamk111_21=amk111_21;
run;

data imp1;
merge imp.Group6_proxy_pension_imputed;
by cunicah subhog_21; run;
data out_imp1;
merge out1 imp1;
by cunicah subhog_21;
run;

*** print putput;
Title "Group6 proxy pension - mean with zero";
proc means data=out_imp1 n nmiss mean std min max ;
variable amk101_21 imamk101_21 amk103_21 imamk103_21 amk111_21 imamk111_21;
; run;

Title "Group6 proxy pension - mean without zero";
data out_imp2; set out_imp1;
if imamk101_21 =0 then imamk101_21 =.;
if imamk103_21 =0 then imamk103_21 =.;
if imamk111_21 =0 then imamk111_21 =.;

if amk101_21 =0 then amk101_21 =.;
if amk103_21 =0 then amk103_21 =.;
if amk111_21 =0 then amk111_21 =.;
run;
proc means data=out_imp2 n mean std min max ;
variable amk101_21 imamk101_21 amk103_21 imamk103_21 amk111_21 imamk111_21;
; run;
;
```

```
/*******************************************************/
/* PROGRAM NAME : Imput2021_group7_core_help.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/8/2023 */
/* Impute missing value on core and proxy questionnaire */
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';


data aa; set output.sect_g_j_k_sa_2021; *** core and proxy questionnaire
N=10716;
proc sort out=temp nodupkey; by cunicah subhog_21; run; *** no duplicate;
***** Core questionnaire N=10716;
data aa1; set aa;
keep cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21
g7_21
g8c1_21 g8c2_21 g8c_monthly g8d1_21 g8d2_21
;
if tipent_hh_21 in (1); run;


data aa2; set aa1;
if age_21 in (888, 999) then age_21=.;
imamg8c_21=g8c_monthly; **** Imputation N=114;
if (g7_21 = 2 or missing(g7_21)) and missing(g8c_monthly) then imamg8c_21=0;
if g7_21=1 and G8c2_21 in
(9,99,999,9999,99999,999999,8,88,888,8888,88888,888888,777777,8888888,999999
9) then imamg8c_21=.;
if missing(imamg8c_21) and missing(g8d1_21) then g8d1_21=9;
dumg8c_21=missing(imamg8c_21);
run;

***** define range of imputation;
%macro range(vname,va,vc,rmax,r1,r1_2,mix1);
data data&vname
(keep=cunicah subhog_21 tipent_hh_21 yrschool sex_21 age_21 imam&vname
dum&vname low&vname up&vname &mix1);
set aa2;
low&vname=1; up&vname=&rmax ;
if &va=1 and &vc=1 then do; low&vname=&r1_2;
up&vname=&rmax; end;
if &va=1 and &vc=2 then do; low&vname=&r1; up&vname=&r1_2;
end;
if &va=1 and &vc=9 then do; low&vname=&r1; up&vname=&rmax;
end;
if &va=2 then do; low&vname=1; up&vname=&r1; end;
```

```
if &va=9 then do; low&vname=1; up&vname=&rmax; end;
if imam&vname >=0 then do; low&vname=imam&vname; end;
if imam&vname >=0 then do; up&vname=imam&vname; end;
if &mix1 in (8,9) then do; low&vname=0; up&vname=&rmax; end;
%mend range;
%range(g8c_21,g8d1_21, g8d2_21,320000,250,500,g7_21); run;

proc means data=aa2;
var imamg8c_21 age_21;
run;

data output.group7_core_help; merge datag8c_21;
by cunicah subhog_21; run;

data dd1; set output.group7_core_help;
drop g7_21; run;

options set = SRCLIB 'C:\Program Files\Srclib\sas' sasautos = ('!SRCLIB'
sasautos) mautosource;
/* run iveware */
/* multiple imputation */
%impute(name=impute,dir=.,setup=new)
title Multiple imputation;
datain dd1;
dataout dd_1;
categorical sex_21;
count age_21;
mixed imamg8c_21 yrschool;
transfer cunicah subhog_21 tipent_hh_21
lowg8c_21 upg8c_21 dumg8c_21;
bounds imamg8c_21(<=upg8c_21,>=lowg8c_21)
yrschool(<=22, >=0)
age_21(<=107, >=17);
INTERACT age_21*sex_21 age_21*age_21 sex_21*yrschool yrschool*yrschool ;
iterations 10;
/*multiples 5;*/
seed 2018;
run;

data imp.group7_core_help_imputed; set dd_1; ***** 10718 var=8;
drop lowg8c_21 upg8c_21
; run;



proc means data=output.group7_core_help n mean std min max nmiss  ;
variable imamg8c_21;
run;

proc means data=imp.group7_core_help_imputed n mean std min max nmiss  ;
variable imamg8c_21;
```

```
run;

data group11;
set output.group7_core_help;
if imamg8c_21=0 then imamg8c_21=.;
run;

proc means data=group11 n mean std min max  ;
variable imamg8c_21;
run;

data group14;
set imp.group7_core_help_imputed;
if imamg8c_21=0 then imamg8c_21=.;
run;

proc means data=group14 n mean std min max  ;
variable imamg8c_21;
run;

*** print putput: prior imputation;
Title "Group7 core help - before imputation (mean with zero)";
proc means data=output.group7_core_help mean std min max n nmiss;
variable imamg8c_21; run;
;
```

```
/*******************************************************/
/* PROGRAM NAME : Imput2021_group7_report.SAS */
/* PROGRAMMED BY : Brandon OGrady */
/* LAST UPDATEED : 5/22/2023 */
/* Descriptive Statistics of Derived (Un-imputed) and Imputed Variables
*/
/*******************************************************/

libname input 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Raw';
libname output 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Output\2021';
libname imp 'C:\Users\bbogrady\OneDrive - University of Texas Medical
Branch\Desktop\MHAS 2021\Data\Imputed\2021';


************** core *************;
data out1;
merge output.Group7_core_help;
by cunicah subhog_21;
rename imamg8c_21=amg8c_21;
run;

data imp1;
merge imp.Group7_core_help_imputed;
by cunicah subhog_21; run;
data out_imp1;
merge out1 imp1;
by cunicah subhog_21;
run;

*** print putput;
Title "Group7 core help given - mean with zero";
proc means data=out_imp1 n nmiss mean std min max ;
variable amg8c_21 imamg8c_21;
; run;

Title "Group7 core help given - mean without zero";
data out_imp2; set out_imp1;
if imamg8c_21 =0 then imamg8c_21 =.;

if amg8c_21 =0 then amg8c_21 =.;
run;
proc means data=out_imp2 n mean std min max ;
variable amg8c_21 imamg8c_21;
; run;

;
```