Langa-Weir Classification of Cognitive Function (1995 Onward)

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This document describes a researcher contributed dataset that provides a total summary score for cognition using measures from the core HRS interview as well as three derived categories: Normal, Cognitively Impaired but not Demented (CIND), and Demented. We refer to these as the Langa-Weir Classifications (Crimmins et al., 2011). HRS also makes use of proxy respondents to reduce sample attrition. Therefore, this dataset also includes scoring of cognition based on data from proxy respondent interviews.

**Self Respondents**

HRS employs a range of measures to assess cognitive status that can be used to create a summary score. Depending on the study sample, researchers can use either a 35-point (range 0-35) or 27-point (range 0-27) scale to determine total cognitive functioning. The 35-point scale includes a subset of questions that were only asked of respondents age 65 and older whereas the 27-point scale includes question that were asked of all HRS respondents.

The 27-point scale includes: 1) immediate and delayed 10-noun free recall test to measure memory (0 to 20 points); 2) a serial sevens subtraction test to measure working memory (0 to 5 points); and 3) a counting backwards test to measure speed of mental processing (0 to 2 points). The additional questions included in the 35-point scale are the three mental status questions that include: 1) date naming (0 to 4 points); 2) object naming (0 to 2 points); and 3) naming the president and the vice president of the United States (0 to 2 points).

The Weir-Langa Classifications map onto the 27-point scale (variable name cogtot27_imp) thus: Normal (12 – 27); Cognitively Impaired but not Demented (CIND) (7 – 11); and Demented (0 – 6) (variable name cogfunction). Crimmins et al. (2011) documents the methods used to make these classifications based on diagnostic information from the ADAMS. Another important

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1 Much more detail on all of these measures is available in the user guide, *Documentation of Cognitive Functioning Measures in the Health and Retirement Study*, also available on the HRS website: https://hrs.isr.umich.edu/sites/default/files/biblio/dr-006.pdf


4 The 35-point scale is available in the RAND HRS dataset as RwCOGTOT.
feature of the present contributed dataset is that it makes use of imputed information for the HRS cognitive measures. Procedures for the imputation methodology are available on the HRS website.\textsuperscript{5} It is important to note that if you choose to use raw (not imputed) data, you will be missing a large fraction of respondents with dementia.

**Proxy Respondents**

If you wish to include proxy respondents in your study sample, it is important to understand that there is no direct assessment of cognition. Rather, we suggest the use of a combination of instrumental activities of daily living (IADLs), proxy assessment of respondent’s memory, and interviewer’s assessment of respondent’s cognition to create a total cognition score based on proxy information. Note that in this contributed dataset, we also imputed missing values on these three variables.

The total cognition score based on proxy information is an 11-point scale using proxy assessment of memory (excellent, very good, good, fair, poor), IADL limitations (ranging from no limitations to 5 limitations), and the interviewer assessment of cognitive impairment (CI: no CI, may have CI, has CI). For proxy assessment of memory, “excellent” was assigned a value of 0, “very good” a value of 1, “good” a value of 2, “fair” a value of 3, and “poor” a value of 4. For the interviewer assessment of CI, “no CI” was assigned a value of 0, “may have CI” a value of 1, and “has CI” a value of 2. In the 2000 interview, there is a fourth classification of interviewer assessment (please refer to variable G517), and it is classified as “has CI.” Combining these three variables results in a scale ranging from 0 to 11, with higher scores indicating worse cognitive function.

The interviewer assessment of cognitive impairment question was not asked for any wave prior to 2000; therefore, for waves 1995-1998, we created a 9-point scale by adding the proxy assessment of memory and IADL limitations. The 11-point scale and the 9-point scale were combined into a single variable that range from 0-11 or 0-9 depending on the year cognition was assessed (variable name prxyscore_imp). Therefore, beginning in the 2000 HRS interview, we used the 11-point scale and 9-point scale prior the 2000 HRS interview to classify proxy-respondents into Normal, CIND or Demented. This categorization is combined with the non-proxy categorization so that both proxy and non-proxy interview information is used to create the

summary categorization (variable name: cogfunction).

Lastly, note that the dataset also contains all of the variables used to create the summary scores with imputed values.

The classifications and their relevant cut points are summarized in Table 1. The variable names and labels included in this dataset are in Table 2. The data are released in wide format, but the code to reshape to long format is included at the end of this document.

**Papers that use the Langa-Weir Classifications**


Table 1. Cut-points on the self-respondent 27-point scale and proxy-respondent cognitive scales

<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>12 – 27</td>
<td>0 – 2</td>
<td>0 – 2</td>
</tr>
<tr>
<td>CIND</td>
<td>7 – 11</td>
<td>3 – 4</td>
<td>3 – 5</td>
</tr>
<tr>
<td>Demented</td>
<td>0 – 6</td>
<td>5 – 9</td>
<td>6 – 11</td>
</tr>
</tbody>
</table>

Table 2. Variable names and labels for Langa-Weir classification dataset

<table>
<thead>
<tr>
<th>Variable</th>
<th>Label</th>
</tr>
</thead>
<tbody>
<tr>
<td>numiadl_impX</td>
<td>NUMIADLs</td>
</tr>
<tr>
<td>imparate_impX</td>
<td>Interviewer assessment of proxy</td>
</tr>
<tr>
<td>memoryp_impX</td>
<td>Proxy Assessment of Memory</td>
</tr>
<tr>
<td>fimrc_impX</td>
<td>IMPFLAG: IMMEDIATE WORD RECALL</td>
</tr>
<tr>
<td>fdlrc_impX</td>
<td>IMPFLAG: DELAYED WORD RECALL</td>
</tr>
<tr>
<td>fser7_impX</td>
<td>IMPFLAG: SERIAL 7S</td>
</tr>
<tr>
<td>fbwc20_impX</td>
<td>IMPFLAG: BACKWARDS COUNT FROM 20</td>
</tr>
<tr>
<td>imrc_impX</td>
<td>IMMEDIATE WORD RECALL</td>
</tr>
<tr>
<td>dlrc_impX</td>
<td>DELAYED WORD RECALL</td>
</tr>
<tr>
<td>ser7_impX</td>
<td>SERIAL 7S</td>
</tr>
<tr>
<td>bwc20_impX</td>
<td>BACKWARDS COUNT FROM 20</td>
</tr>
<tr>
<td>cogtot27_impX</td>
<td>TICS-m 27-point scale</td>
</tr>
<tr>
<td>proxyX</td>
<td>PROXY TYPE STATUS</td>
</tr>
<tr>
<td>cogfunctionX</td>
<td>Cognition Category: 1=Normal, 2=CIND, 3=Demented</td>
</tr>
<tr>
<td>fnumiadl_impX</td>
<td>IMPFLAG: NUMIADLs</td>
</tr>
<tr>
<td>fmemoryp_impX</td>
<td>IMPFLAG: Proxy Assessment of Memory</td>
</tr>
<tr>
<td>fimparate_impX</td>
<td>IMPFLAG: Interviewer assessment of proxy</td>
</tr>
<tr>
<td>prxyscore_impX</td>
<td>Total: Proxy Score (&lt;2000 0-9; &gt;=2000 0-11)</td>
</tr>
<tr>
<td>intrviewX</td>
<td>Interviewed this Wave</td>
</tr>
</tbody>
</table>

SAS code to reshape data from wide to long format

/**Macro to reshape data from wide to long format*/

libname cog "...\Cognitive function\data\";

data work.cognidata;
  set cog.cognfinalimp_9514wide;
  run;
%
%macro cognl(year);
  data work.cogd&year (keep= hhid pn studyyr numiadl_imp imparate_imp memoryp_imp fimrc_imp fdlrc_imp
    fser7_imp fbwc20_imp imrc_imp dlrc_imp
    ser7_imp bwc20_imp cogtot27_imp proxy cogfunction fnumiadl_imp fmemoryp_imp fimparate_imp
    prxyscore_imp intrview);
  set work.cognidata;
  if intrview=&year=1;
  studyyr=&year;
  rename numiadl_imp&year=numiadl_imp imparate_imp&year=imparate_imp
    memoryp_imp&year=memoryp_imp fimrc_imp&year=fimrc_imp
    fdlrc_imp&year=fdlrc_imp fser7_imp&year=fser7_imp fbwc20_imp&year=fbwc20_imp imrc_imp&year=imrc_imp
    dlrc_imp&year=dlrc_imp
    ser7_imp&year=ser7_imp bwc20_imp&year=bwc20_imp cogtot27_imp&year=cogtot27_imp proxy&year=proxy
    cogfunction&year=cogfunction fnumiadl_imp&year=fnumiadl_imp
    fmemoryp_imp&year=fmemoryp_imp fimparate_imp&year=fimparate_imp prxyscore_imp&year=prxyscore_imp
    intrview&year=intrview;
  run;
%
%mend;
%
cognl(1995); %cognl(1996); %cognl(1998); %cognl(2000); %cognl(2002); %cognl(2004); %cognl(2006);
%cognl(2008); %cognl(2010); %cognl(2012); %cognl(2014); %cognl(2016);

data work.cognfinalimp_9516long;
    work.cogd2008 work.cogd2010 work.cogd2012 work.cogd2014 work.cogd2016;

label numiadl_imp ="\num": NUMIADLs
  imparate_imp ="Interviewer assessment of proxy"
  memoryp_imp ="Proxy Assessment of Memory"
  fimrc_imp ="IMPFLAG: IMMEDIATE WORD RECALL"
  fdlrc_imp ="IMPFLAG: DELAYED WORD RECALL"
  fser7_imp ="IMPFLAG: SERIAL 7S"
  fbwc20_imp ="IMPFLAG: BACKWARDS COUNT FROM 20"
  imrc_imp ="IMMEDIATE WORD RECALL"
  dlrc_imp ="DELAYED WORD RECALL"
  ser7_imp ="SERIAL 7S"
bwc20_imp = "BACKWARDS COUNT FROM 20"
cogtoT27_imp = "TICS-m 27-point scale" proxy
        = "PROXY TYPE STATUS"
cogfunction = "Cognition Category: 1=Normal, 2=CIND, 3=Demented"
fnumiad1_imp = "IMPFLAG: NUMIADLs"
fmemoryp_imp = "IMPFLAG: Proxy Assessment of Memory"
fimparate_imp = "IMPFLAG: Interviewer assessment of proxy"
prxyscore_imp = "Total: Proxy Score (<2000 0-9; >=2000 0-11)"
intrview = "Interviewed this Wave"
studyyr = "Study year";
run;
Stata code to reshape data from wide to long format

/**Macro to reshape data from wide to long format*/

#delimit ;
use "...\cogfinalimp_9516wide.dta";
tempfile widefile;
save widefile, replace;

/*Separate for the 1995 and 1998 because interviewer’s assessment respondent was not asked**/
foreach num of numlist 1995 1998 {
    use widefile.dta;
tempfile longfile`num';
keep hhid pn *num';
keep if intrview`num'==1;
foreach x in "bwc20_imp" "cogfunction" "cogtot27_imp" "dlrc_imp" "fbwc20_imp" "fdlrc_imp" "fimrc_imp" "fmemoryp_imp" "fnumiadl_imp"
    "fser7_imp" "imrc_imp" "intrview" "memoryp_imp" "numiadl_imp" "proxy" "prxyscore_imp" "ser7_imp" {
        rename `x'`num' `x';
    };
    gen studyyr=`num';
save longfile`num', replace;
}

/**HRS interview 2000 - 2016*/
    use widefile.dta;
tempfile longfile`num';
keep hhid pn *num';
keep if intrview`num'==1;
foreach x in "bwc20_imp" "cogfunction" "cogtot27_imp" "dlrc_imp" "fbwc20_imp" "fdlrc_imp" "fimparate_imp" "fimrc_imp" "fmemoryp_imp"
    "fnumiadl_imp"
    "fser7_imp" "imparate_imp" "imrc_imp" "intrview" "memoryp_imp" "numiadl_imp" "proxy" "prxyscore_imp" "ser7_imp" {
        rename `x'`num' `x';
    };
    gen studyyr=`num';
save longfile`num', replace;
};
clear;
/**Appending all files**/
longfile2012 longfile2014 longfile2016 {
append using "`file";;
}

label var bwc20_imp "BACKWARDS COUNT FROM 20";
label var cogfunction "Cognition Category: 1=Normal, 2=CIND, 3=Demented";
label var cogtot27_imp "TICS-m 27-point scale";
label var dlrc_imp "DELAYED WORD RECALL";
label var fbwc20_imp "IMPFLAG: BACKWARDS COUNT FROM 20";
label var fdlrc_imp "IMPFLAG: DELAYED WORD RECALL";
label var fimparate_imp "IMPFLAG: Interviewer assessment of proxy";
label var fimrc_imp "IMPFLAG: IMMEDIATE WORD RECALL";
label var fnumiadl_imp "IMPFLAG: NUMIADLs";
label var fmemoryp_imp "IMPFLAG: Proxy Assessment of Memory";
label var fnanced_imp "IMPFLAG: NURSING HOME";
label var hhid "HOUSEHOLD IDENTIFICATION NUMBER";
label var imparate_imp "Interviewer assessment of proxy";
label var imrc_imp "IMMEDIATE WORD RECALL";
label var intrview "Interviewed this Wave";
label var memoryp_imp "Proxy Assessment of Memory";
label var numiadl_imp "NUMIADLs";
label var pn "RESPONDENT PERSON IDENTIFICATION NUMBER";
label var proxy "PROXY TYPE STATUS";
label var prxyscore_imp "Total: Proxy Score (<2000 0-9; >=2000 0-11)";
label var ser7_imp "SERIAL 7S";
label var studyyr "Study year";

*save "cognfinalimp_9516long.dta;
#delimit cr