Dataset Integrity Check for the Casual Blood Pressure and Neurocognitive Function in Children with Chronic Kidney Disease: A Report of the Children with Chronic Kidney Disease Cohort Study (CKiD)

Version 1 Prepared by
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Revision History

Version	Author/Title	Date	Comments
1.0	M Spriggs	January 28, 2014	Original

Contents

1 Standard Disclaimer

The intent of this DSIC is to provide confidence that the data distributed by the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) Repository is a true copy of the study data. Our intent is not to assess the integrity of the statistical analyses reported by study investigators. As with all statistical analyses of complex datasets, complete replication of a set of statistical results should not be expected on a first (or second) exercise in secondary analysis. This occurs for a number of reasons, including differences in the handling of missing data, restrictions on cases included in samples for a particular analysis, software coding used to define complex variables, and other factors. Experience suggests that most discrepancies can ordinarily be resolved by consulting with the study data coordinating center (DCC); however, this process is labor-intensive for both DCC and Repository staff. It is thus not our policy to resolve every discrepancy observed in an integrity check. Specifically, we do not attempt to resolve minor or inconsequential discrepancies with published results or discrepancies that involve complex analyses, *unless NIDDK Repository staff suspect that the observed discrepancy suggests that the dataset may have been corrupted in storage, transmission, or processing by Repository staff*.
We do, however, document in footnotes to the integrity check those instances in which our secondary analyses produced results that were not fully consistent with those reported in the target publication.

2 Study Background

The CKiD Study is a multi-center, prospective cohort study of children aged 1 to 16 years with mild to moderate impaired kidney function. Two clinical coordinating centers at Children's Mercy Hospital in Kansas and at Children's Hospital of Philadelphia in Philadelphia, PA (previously at the Johns Hopkins Medical Institutions in Baltimore, MD), a central laboratory at the University of Rochester, and a data coordinating center at Johns Hopkins School of Public Health have formed a cooperative agreement to conduct a prospective study of chronic kidney disease in children. The scientific aims of CKiD have been to determine the risk factors for decline in kidney function and to define how progressive decline in kidney function impacts biomarkers of risk factors for cardiovascular disease; growth failure and its associated morbidity; and neurocognitive function and behavior.

Children with chronic kidney disease (CKD) are at risk for cognitive dysfunction, and over half have hypertension. Data on the potential contribution of hypertension to CKD-associated neurocognitive deficits in children are limited. Our objective was to determine whether children with CKD and elevated BP (EBP) had decreased performance on neurocognitive testing compared with children with CKD and normal BP.

2.1 Study Methods

Briefly, children enrolled in CKiD were 1 to 16 yr of age and had a Schwartz-estimated GFR (12,13) between 30 and 90ml/min per 1.73m2. Exclusion criteria included: renal, other solid-organ, bone marrow, or stem cell transplantation; dialysis treatment within the past 3 mo; cancer/leukemia diagnosis or HIV diagnosis/treatment within the past 12 mo; current pregnancy or pregnancy within the past 12 mo; history of structural heart disease; genetic syndromes involving the central nervous system; and history of severe to profound mental retardation.

This study is a cross-sectional analysis of baseline information for CKiD subjects between the ages of 6 and 17 years for whom both neurocognitive data and BP measurements were available as of September 2009. Subjects younger than 6 years were administered a different neurocognitive test battery and were therefore excluded. The study protocol was approved by the Institutional Review Boards at each participating center.

3 Archived Datasets

The DCC submitted 1 dataset that was used for the analysis for this paper that we used for this DSIC: LANDE_CJASN_2011. Contents of the archived dataset match descriptions provided in the document, Codebook for SAS dataset lande_cjasn_2011.pdf

4 Statistical Methods

We compared our DSIC results to the published results in:

- Table 1. Baseline demographics of subjects with normotension compared with those with EBP

Our DSIC analyses were conducted in SAS v9 (Appendix 1). The SAS code and output used to support the findings of the DSIC appear as Appendix 1.

Patient characteristics between blood pressure groups are provided in Table 1, which presents study Ns and percentages as well as means ± standard deviations where appropriate.

5 Results

Variables used to replicate Table 1. **Baseline demographics of subjects with normotension compared with those with EBP** are shown in Table A.

Table A: Variables Used to Replicate Table 1.

Measure	Variable
EBP	elevbp
Age (years)	age
Male gender	male
African American race	aarace
Hispanic	hisp
BMI percentile	bmipctag
Maternal education (college or more)	mateducollormore
iGFR	iGFR
Low birth weight	lbw
% of life with CKD	pctoflifewithckd
CKD duration (years)	durationofckd
Treated hypertension	antihtnmeds
Glomerular CKD diagnosis	glomerular
Nephrotic proteinuria	nephprot
Hemoglobin (g/dl)	hemoglobin
SBP index	sbpindxagh
DBP index	dbpindxagh

DSIC Results: Table 1. The published manuscript results and the DSIC results for Table 1 are shown below (Table B). The base Ns and medians and interquartile rangers for the patient characteristics and histology results calculated by the DSIC correspond to published values, with only inconsequential discrepancies.

Table B: Table 1. Baseline Characteristics of Study Participants.

	Lande et al (2011)		**DSIC**	
	Normal BP (*n*= 251)	EBP (*n* = 132)	Normal BP (*n*= 251)	EBP (*n* = 132)
Age (years)	13 (10 to 15)	13 (10 to 15)	13 (10 to 15)	13 (10 to 15)
Male gender	152 (61%)	78 (59%)	152 (61%)	78 (59%)
African American race	46 (18%)	30 (23%)	46 (18%)	30 (23%)
Hispanic	35 (14%)	20 (16%)	35 (14%)	20 (16%)
BMI percentile	61 (31 to 85)	70 (41 to 91)	61 (31 to 85)	70 (41 to 91)
Maternal education (college or more)	76 (31%)	39 (30%)	77 (31%)	39 (30%)
iGFR	44 (34 to 56)	41 (30 to 54)	44 (34 to 56)	41 (30 to 54)
Low birth weight	45 (19%)	22 (17%)	45 (19%)	22 (17%)
% of life with CKD	92 (43 to 100)	70 (21 to 99)	92 (43 to 100)	70 (21 to 99)
CKD duration (years)	9 (5 to 12)	7 (3 to 11)	9 (5 to 12)	7 (3 to 11)
Treated hypertension	68%	71%	168 (67%)	92 (70%)
Glomerular CKD diagnosis	57 (23%)	40 (31%)	57 (23%)	40 (31%)
Nephrotic proteinuria	34 (14%)	23 (18%)	34 (14%)	23 (18%)
Hemoglobin (g/dl)	12 (12 to 14)	12 (11 to 14)	12 (12 to 14)	12 (11 to 14)
SBP index	0.84 (0.80 to 0.89)	0.97 (0.92 to 1.00)	0.84 (0.80 to 0.89)	0.97 (0.92 to 1.00)
DBP index	0.80 (0.73 to 0.87)	0.96 (0.90 to 1.01)	0.80 (0.73 to 0.87)	0.96 (0.90 to 1.01)

6 Conclusions

The results of these DSIC analyses provide confidence that the CKiD data distributed by the NIDDK repository are a true copy of the study data.

7 References

M. B. Lande, A. C. Gerson, S. R. Hooper et al., “Casual blood pressure and neurocognitive function in children with chronic kidney disease: a report of the children with chronic kidney disease cohort study,” Clinical Journal of the American Society of Nephrology, vol. 6, no. 8, pp. 1831–1837, 2011.

Appendix 1. SAS Output used to Replicate Manuscript Results.

```
title1 "%sysfunc(getoption(sysin))";
title2 " ";

%macro meandata2(invar=, roundvar=, digit=);
proc means data=lande2011 nmiss median q1 q3 noprint;
      var &invar;
      class elevbp;
      output out=data1 nmiss=nmiss median=median q1=q1 q3=q3;
      run;

data data1(drop=_TYPE_ median q1 q3 rename=(_FREQ_=COUNT));
  set data1;
  length name CHARALL $100;
  name=upcase("&invar");
  median=round(median,&roundvar);
  q1=round(q1,&roundvar);
  q3=round(q3,&roundvar);
  CHARALL=compress(put(median,8.&digit))||" ("||compress(put(q1,8.&digit))||" to "||compress(put(q3,8.&digit))||")";


data accummeans2;
  set accummeans2 data1;

%mend meandata2;

%macro freqdata(invar=);
proc freq data=lande2011 compress noprint;
      tables &invar/out=data1;
      run;

data data1(keep=elevbp LEVEL name CHARALL);
  set data1(rename=(&invar=LEVEL));
  length name $100 CHARALL $100;
  name=upcase("&invar");
  PCT_DISP=round(PERCENT);
  elevbp=.;
  CHARALL=compress(put(COUNT,8.))||' ('||compress(put(PCT_DISP,8.))||'%)';

data accumfreq1;
  set accumfreq1 data1;
%mend freqdata;

%macro freqdata2(invar=);
proc freq data=lande2011 compress noprint;
      tables elevbp*&invar/out=data1 outpct;
      run;

data data1(keep=elevbp LEVEL name CHARALL);
  set data1(rename=(&invar=LEVEL));
  length name $100;
  name=upcase("&invar");
  PCT_DISP=round(PCT_ROW);
  CHARALL=compress(put(COUNT,8.))||' ('||compress(put(PCT_DISP,8.))||'%)';

data accumfreq2;
```

```
  set accumfreq2 data1;
%mend freqdata2;


libname sasdata "/prj/niddk/ims_analysis/CKiD/private_orig_data/CKiD Upload 01-16-14/analytical files 01/lande.cjasn_2011/";

data lande2011;
  set sasdata.lande_cjasn_2011;


data accumfreq1;
  set _null_;

data accumfreq2;
  set _null_;

data accummeans2;
  set _null_;


%freqdata(invar=male);
%freqdata(invar=aarace);
%freqdata(invar=hisp);
%freqdata(invar=mateducollormore);
%freqdata(invar=lbw);
%freqdata(invar=antihtnmeds);
%freqdata(invar=glomerular);
%freqdata(invar=nephprot);

%freqdata2(invar=male);
%freqdata2(invar=aarace);
%freqdata2(invar=hisp);
%freqdata2(invar=mateducollormore);
%freqdata2(invar=lbw);
%freqdata2(invar=antihtnmeds);
%freqdata2(invar=glomerular);
%freqdata2(invar=nephprot);

%meandata2(invar=age, roundvar=1, digit=0);
%meandata2(invar=bmipctag, roundvar=1, digit=0);
%meandata2(invar=iGFR, roundvar=1, digit=0);
%meandata2(invar=pctoflifewithckd, roundvar=1, digit=0);
%meandata2(invar=hemoglobin, roundvar=1, digit=0);
%meandata2(invar=durationofckd, roundvar=1, digit=0);
%meandata2(invar=sbpindxagh, roundvar=.01, digit=2);
%meandata2(invar=dbpindxagh, roundvar=.01, digit=2);

data accumfreq;
  set accumfreq1 accumfreq2;

data accummeans;
  set accummeans2(drop=COUNT nmiss);

data accumfreqmeans;
  set accumfreq accummeans;

data accumall;
  set accumfreqmeans;
  if elevbp=. then delete;
  if NAME="MALE" and level ne 1 then delete;
  if NAME="AARACE" and level ne 1 then delete;
```

```
  if NAME="HISP" and level ne 1 then delete;
  if NAME="MATEDUCOLLORMORE" and level ne 1 then delete;
  if NAME="LBW" and level ne 1 then delete;
  if NAME="ANTIHTNMEDS" and level ne 1 then delete;
  if NAME="GLOMERULAR" and level ne 1 then delete;
  if NAME="NEPHPROT" and level ne 1 then delete;

data accumall;
  set accumall;
  if NAME="MALE"             then orderer=2;
  if NAME="AARACE"           then orderer=3;
  if NAME="HISP"             then orderer=4;
  if NAME="MATEDUCOLLORMORE" then orderer=6;
  if NAME="LBW"              then orderer=8;
  if NAME="ANTIHTNMEDS"      then orderer=11;
  if NAME="GLOMERULAR"       then orderer=12;
  if NAME="NEPHPROT"         then orderer=13;
  if NAME="AGE"              then orderer=1;
  if NAME="BMIPCTAG"         then orderer=5;
  if NAME="IGFR"             then orderer=7;
  if NAME="PCTOFLIFEWITHCKD" then orderer=9;
  if NAME="HEMOGLOBIN"       then orderer=14;
  if NAME="DURATIONOFCKD"    then orderer=10;
  if NAME="SBPINDXAGH"       then orderer=15;
  if NAME="DBPINDXAGH"       then orderer=16;


proc sort data=accumall;
  by elevbp orderer;

proc print data=accumall noobs;
  var LEVEL name CHARALL;
  by ELEVBP;
  title 'accumall';
```

elevbp=0

LEVEL	name	CHARALL
.	AGE	13 (10 to 15)
1	MALE	152 (61%)
1	AARACE	46 (18%)
1	HISP	35 (14%)
.	BMIPCTAG	61 (31 to 85)
1	MATEDUCOLLORMORE	77 (31%)
.	IGFR	44 (34 to 56)
1	LBW	45 (19%)
.	PCTOFLIFEWITHCKD	92 (43 to 100)
.	DURATIONOFCKD	9 (5 to 12)
1	ANTIHTNMEDS	168 (67%)
1	GLOMERULAR	57 (23%)
1	NEPHPROT	34 (14%)
.	HEMOGLOBIN	12 (12 to 14)
.	SBPINDXAGH	0.84 (0.80 to 0.89)
.	DBPINDXAGH	0.80 (0.73 to 0.87)

elevbp=1

LEVEL	name	CHARALL
.	AGE	13 (10 to 15)
1	MALE	78 (59%)
1	AARACE	30 (23%)
1	HISP	20 (16%)
.	BMIPCTAG	70 (41 to 91)
1	MATEDUCOLLORMORE	39 (30%)
.	IGFR	41 (30 to 54)
1	LBW	22 (17%)
.	PCTOFLIFEWITHCKD	70 (21 to 99)
.	DURATIONOFCKD	7 (3 to 11)
1	ANTIHTNMEDS	92 (70%)
1	GLOMERULAR	40 (31%)
1	NEPHPROT	23 (18%)
.	HEMOGLOBIN	12 (11 to 14)
.	SBPINDXAGH	0.97 (0.92 to 1.00)
.	DBPINDXAGH	0.96 (0.90 to 1.01)