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SAS Code to identify AL decedents and generate study outcomes

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Stata Analytical Syntax

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/* This is the SAS code for identifying 2017 AL decedents */
/* Developed by Joyce Wang, PhD */

/* al.alfs_personswdenom_17_benezip is the data for everyone with at least
one day stay in an AL zip code in 2017, remove those not in the US or in
other countries, keep individuals 65+ ;
data alfs_personswdenom_17;
  set al.alfs_personswdenom_17_benezip;

  if hkstate=40 then delete; /*PR*/
  if hkstate=48 then delete; /*GU*/
  if hkstate=. then delete;
  if hkstate>53 then delete; /*other countries*/
  if hkage>= 65 then output;
run;

proc sort data=aldenom nodupkey out=res.alfs_personswdenom_17;
  by bene_id_18900;
run;
* 564504 unique benes;

/* get 2018 demographics for these AL residents for later use*/
proc sql;
  create table res.ALcohort_2018_2 as select *
  from aldenom
  as a inner join claims.hk100ann_bid_2018 as b
  on a.bene_id_18900 eq b.bene_id_18900;
quit;

* link to Residential History File;
proc sql;
  create table res.RHF_2 as
  select * from rhf.v4_all_epb where bene_id_18900 in
  (select distinct bene_id_18900 from res.ALcohort_2018_2);
quit;

*** Match AL residents to ALs***;
data see;
  set res.ALcohort_2018_2 (keep=bene_id_18900 hkyear hkz_zip9 hkz_from_dt
hkz_thru_dt);
  be7=int(hkz_zip9/100);
run;
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data zip2017;
set wlz.zip2017 ;
run;

proc sql;
  create table alcohorth_alzip18_2 as
  select * from see as a inner join zip2017 as b
  on a.be7=b.be7;
quit;

proc sort data=alcohorth_alzip18_2 nodupkey out=out;
  by bene_id_18900 hkz_zip9;
run;
* 501470 unique benes;

proc sort data=alcohorth_alzip18_2;
  by bene_id_18900 hkz_from_dt hkz_zip9 FacilityID;
run;

* create a tag for those with multiple matches;
data alcohorth_alzip18_2;
  set alcohorth_alzip18_2;
  if bene_id_18900 = lag(bene_id_18900) and hkz_from_dt=lag(hkz_from_dt) and
hkz_zip9=lag(hkz_zip9) then tag=1;
  if bene_id_18900 = lag2(bene_id_18900) and hkz_from_dt=lag2(hkz_from_dt)
and hkz_zip9=lag2(hkz_zip9) then tag=1;
  if bene_id_18900 = lag3(bene_id_18900) and hkz_from_dt=lag3(hkz_from_dt)
and hkz_zip9=lag3(hkz_zip9) then tag=1;
run;

proc sort data=alcohorth_alzip18_2;
  by bene_id_18900 descending hkz_from_dt descending hkz_zip9 descending
FacilityID;
run;

data alcohorth_alzip18_2;
  set alcohorth_alzip18_2;
  if bene_id_18900 = lag(bene_id_18900) and hkz_from_dt=lag(hkz_from_dt) and
hkz_zip9=lag(hkz_zip9) then tag=1;
  if bene_id_18900 = lag2(bene_id_18900) and hkz_from_dt=lag2(hkz_from_dt)
and hkz_zip9=lag2(hkz_zip9) then tag=1;
  if bene_id_18900 = lag3(bene_id_18900) and hkz_from_dt=lag3(hkz_from_dt)
and hkz_zip9=lag3(hkz_zip9) then tag=1;
run;

***** benes whose 7-digits zip code matching to multiple ALs *****;
data non_duplicate_2;
  set alcohorth_alzip18_2;
  extract=catt(' ', bene_id_18900, hkz_from_dt, hkz_zip9);
  if tag=1 then delete;
  if hkz_from_dt>hkz_thru_dt then delete;
run;
* 430661;

data see;

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set duplicate_2;
keep bene_id_18900 facilityid hkz_from_dt hkz_zip9 zip9;
run;

data duplicate_2;
set alcohol_alzip18_2;
extract=catx(',', bene_id_18900, hkz_from_dt, hkz_zip9);

if hkz_from_dt>hkz_thru_dt then delete;
if tag=1 then output;
run;
* 145649;

data samez9_2;
set duplicate_2;
if be9=int(hkz_zip9) then keep=1;
if keep=1 then output;
run;
* 31083;

proc sort data=samez9_2 nodupkey out=samez9_unique;
by bene_id_18900 hkz_from_dt hkz_zip9;
run;
*22788

* 8 digit;
proc sql;
create table duplicate_2 as
select * from duplicate_2 where extract not in
(select distinct extract from samez9_2);
quit;
* 96622;

data samez8_2 (drop=tag);
set duplicate_3;
if be8=int(hkz_zip9/10) then output;
run;
*19259;

/* assign the dup to a higher capacity AL by deleting dups in the lower
capacity AL if the license type and dementia license is the same*/
proc sort data=samez8_2;
by bene_id_18900 descending hkz_from_dt descending capacity;
run;

data samez8;
set samez8_2;
if bene_id_18900 = lag(bene_id_18900) and hkz_from_dt=lag(hkz_from_dt) then
tag=1;
if bene_id_18900 = lag2(bene_id_18900) and hkz_from_dt=lag2(hkz_from_dt)
then tag=1;
if bene_id_18900 = lag3(bene_id_18900) and hkz_from_dt=lag3(hkz_from_dt)
then tag=1;
if bene_id_18900 = lag(bene_id_18900) and hkz_from_dt=lag(hkz_from_dt) and
capacity NE lag(capacity) then difcap=1;

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    if bene_id_18900 = lag2(bene_id_18900) and hkz_from_dt=lag2(hkz_from_dt)
and capacity NE lag2(capacity) then difcap=1;
    if bene_id_18900 = lag3(bene_id_18900) and hkz_from_dt=lag3(hkz_from_dt)
and capacity NE lag3(capacity) then difcap=1;
run;

data same8cap;
set samez8;
if dif_licensecode=1 OR dif_dementia=1 then delete;
if tag=1 AND difcap=1 then delete;
run;
/* 19259 observations read from the data set WORK.SAMEZ8_3.
   WORK.SAME8CAP has 12735 observations*/

proc sort nodupkey out=samez8_unique;
by bene_id_18900 hkz_from_dt hkz_zip9;
run;
* 12636;

* 7 digit;
proc sql;
create table duplicate_2 as
select * from duplicate_2 where extract not in
(select distinct extract from samez8_2);
quit;

* same approach as above;
proc sort data=duplicate_4;
by bene_id_18900 descending hkz_from_dt descending capacity;
run;

data samez7;
set duplicate_4;
if bene_id_18900 = lag(bene_id_18900) and hkz_from_dt=lag(hkz_from_dt) then
tag=1;
if bene_id_18900 = lag2(bene_id_18900) and hkz_from_dt=lag2(hkz_from_dt)
then tag=1;
if bene_id_18900 = lag3(bene_id_18900) and hkz_from_dt=lag3(hkz_from_dt)
then tag=1;
if bene_id_18900 = lag(bene_id_18900) and hkz_from_dt=lag(hkz_from_dt) and
capacity NE lag(capacity) then difcap=1;
if bene_id_18900 = lag2(bene_id_18900) and hkz_from_dt=lag2(hkz_from_dt)
and capacity NE lag2(capacity) then difcap=1;
if bene_id_18900 = lag3(bene_id_18900) and hkz_from_dt=lag3(hkz_from_dt)
and capacity NE lag3(capacity) then difcap=1;
run;

data same7;
set samez7;
if dif_licensecode=1 OR dif_dementia=1 then delete;
if tag=1 AND difcap=1 then delete;
run;

proc sort nodupkey out=samez7_unique;

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    by bene_id_18900 hkz_from_dt hkz_zip9;
run;
* 43044;

data alcohol18_nodup (drop=tag difcap extract keep drop_obs);
    set non_duplicate_2 samez9_unique samez8_unique samez7_unique;
run;
* 509129 unique benes;

proc sort data=alcohol18_nodup;
    by bene_id_18900 hkz_from_dt hkz_zip9;
run;
* This is the 2017 AL cohort with residents matched to one AL, 509129 unique
benes;

* bene-level data (includes information for combined ALFs);
data res.alcohol18_bene_2 (keep=bene_id_18900 hkz_from_dt hkz_zip9
hkz_thru_dt combine_capacity combine_dementia combineALF be9 facilityid
groupid licensetype1 licensetype2 licensetype3 licensetype4 licensetype5
sublicense1 sublicense2 alllicensecodes alllicensetypes fips state county
city ALyear address);
    set alcohol18_nodup;
    label be9="AL 9-digit zipcode";
run;

proc sql;
    create table alcohol18_alfbene_2 as select *
    from res.alcohol18_bene_2 as a inner join w1z.zip2017 as b
    on a.be9 eq b.be9;
quit;

proc sort data=alcohol18_alfbene_2;
    by facilityid;
run;

* creating a count of benes by facility id;
proc sort data=alcohol18_alfbene_2;
    by facilityid bene_id_18900;
run;

data alcohol18_alfbene2;
    set alcohol18_alfbene_2;
    benecount + 1;
    by facilityid bene_id_18900;
    if first.bene_id_18900 then benecount = 1;
run;

data alcohol18_alfbene3 (keep=bene_id_18900 facilityid benecount);
    set alcohol18_alfbene2;
    benecount=benecount;
    if benecount NE 1 then benecount=0;
run;

data alcohol18_alfbene4;

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    set alcohol18_alfbene3;
    by facilityid;
    if First.facilityid then totalbene=0;
    totalbene + bencount;
run;

proc sql;
    create table output1 as
    select facilityid, max(totalbene) as totalbenecount
    from alcohol18_alfbene4 group by facilityid;
quit;

proc sql;
    create table alcohol18_alfbene_final as select *
    from alcohol18_alfbene4 as a inner join output1 as b
    on a.facilityid eq b.facilityid ;
quit;

proc sort data=alcohol18_alfbene_final nodupkey out=out;
    by bene_id_18900;
run;
proc sort data=alcohol18_alfbene_final nodupkey out=out;
    by facilityid ;
run;
/* 482957 benes in 12630 ALs*/

data alcohol18_alfbene_final2;
    set alcohol18_alfbene_final;
    where totalbene>10;
run;
* 408129 observations;

proc sort data=alcohol18_alfbene_final2 nodupkey out=out;
    by bene_id_18900;
run;
proc sort data=alcohol18_alfbene_final2 nodupkey out=out;
    by facilityid ;
run;
/* after limiting to ALs with more than 10 benes, we have a sample of 377,947
benes in 9,217 ALs*/

data res.alcohol18_alfbene;
    set alcohol18_alfbene_final;
run;

data res.alcohol18_alfbene_final;
    set alcohol18_alfbene_final2;
run;
/* this is the file including ALs with >10 benes*/

* generate a count of decedents for each AL;
* merge to RHF;
proc sql;

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create table alcohort18_alfdece as select *
from alcohort18_alfbene_final2 (keep=bene_id_18900 facilityid)
as a inner join res.rhf_2 (keep=bene_id_18900 hes_dod) as b
on a.bene_id_18900 eq b.bene_id_18900;
quit;
* 11,465,194 observation;

proc sort data=alcohort18_alfdece nodupkey out=alcohort18_alfdece_nodup;
by bene_id_18900 facilityid;
run;
*9217 ALs, the 11 ALs lost are the ones not merged with RHF;

data alcohort18_alfdeced;
set alcohort18_alfdece_nodup;
if hes_dod="" then dece = 0;
if hes_dod NE"" then dece = 1;
run;

proc sort data= alcohort18_alfdeced;
by facilityid;
run;

data alcohort18_alfdecdecnt (keep=bene_id_18900 facilityid hes_dod totaldec);
set alcohort18_alfdeced;
by facilityid;
if First.facilityid then totaldec=0;
totaldec + dece;
run;

proc sql;
create table totdec as
select facilityid, max(totaldec) as totaldecdecnt
from alcohort18_alfdecdecnt group by facilityid;
quit;

proc sql;
create table alwdecdecnt (drop=dif_dementia dif_licensecode flag bencount
benecount totalbene be8 be7 zipper)as
select * from alcohort18_alfbene_final2 as a inner join totdec as b
on a.facilityid=b.facilityid;
quit;

proc sort data=alwdecdecnt nodupkey out=out;
by facilityid;
run;

proc sort data=alwdecdecnt nodupkey out=out;
by bene_id_18900 ;
run;
* 377,947 benes in 9217 ALs;

* merge to claims;

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proc sort data= res.ALcohort_2018_2 ;
  by bene_id_18900 hkz_from_dt hkz_zip9;
run;

proc sort data= alwdecedent ;
  by bene_id_18900 hkz_from_dt hkz_zip9;
run;

data mergeclaims no why;
  merge alwdecedent (in=a) res.ALcohort_2018_2(in=b);
  by bene_id_18900 hkz_from_dt hkz_zip9;
  if a and b then output mergeclaims;
  if a and not b then output why;
  if b and not a then output no;
run;

proc sort data= mergeclaims nodupkey out=alwdecedents;
  by bene_id_18900 hkz_from_dt hkz_zip9;
run;

* link bene data to demographic data;
/* exclude those who moved out of continental US in 2018 using hkstate
variable*/
data alwodecedent ;
  set alwdecedents;
  if hkstate=40 then delete;
  if hkstate=48 then delete;
  if hkstate=. then delete;
  if hkstate>53 then delete;
run;

proc sort data= alwodecedent nodupkey out=out;
  by bene_id_18900 ;
run;

proc sort data= alwodecedent nodupkey out=out;
  by facilityid;
run;
* 383172 benes in 9151 als;

data res.alwodecedent2;
  set alwodecedent;
  /* demographics */
  if age=. ; if (hkage>=65) and (hkage<=74) then age=1;
  if (hkage>=75) and (hkage<=84) then age=2; if (hkage>=85) then age=3;
  if hkc_alzdem_fst^=. and hkc_alzdem_fst<date then adrd_fst18=1; else
  adrd_fst18=0;
  rename hkc_alzdem_fst=hkc_alzdem_fst18;
  if hkc_ami_fst^=. and hkc_ami_fst<date then ami_fst18=1; else ami_fst18=0;
  rename hkc_ami_fst=hkc_ami_fst18;
  if hkc_anem_fst^=. and hkc_anem_fst<date then anem_fst18=1; else
  anem_fst18=0;
  rename hkc_anem_fst=hkc_anem_fst18;
  if hkc_arthr_fst^=. and hkc_arthr_fst<date then arthr_fst18=1; else
  arthr_fst18=0;
  rename hkc_arthr_fst=hkc_arthr_fst18;

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if hkc_asth_fst^=. and hkc_asth_fst<date then asth_fst18=1; else
asth_fst18=0;
rename hkc_asth_fst=hkc_asth_fst18;
if hkc_atrfib_fst^=. and hkc_atrfib_fst<date then atrfib_fst18=1; else
atrfib_fst18=0;
rename hkc_atrfib_fst=hkc_atrfib_fst18;
if hkc_bph_fst^=. and hkc_bph_fst<date then bph_fst18=1; else bph_fst18=0;
rename hkc_bph_fst=hkc_bph_fst18;
if hkc_cabrst_fst^=. and hkc_cabrst_fst<date then cabrst_fst18=1; else
cabrst_fst18=0;
rename hkc_cabrst_fst=hkc_cabrst_fst18;
if hkc_cacolo_fst^=. and hkc_cacolo_fst<date then cacolo_fst18=1; else
cacolo_fst18=0;
rename hkc_cacolo_fst=hkc_cacolo_fst18;
if hkc_caendo_fst^=. and hkc_caendo_fst<date then caendo_fst18=1; else
caendo_fst18=0;
rename hkc_caendo_fst=hkc_caendo_fst18;
if hkc_calung_fst^=. and hkc_calung_fst<date then calung_fst18=1; else
calung_fst18=0;
rename hkc_calung_fst=hkc_calung_fst18;
if hkc_capros_fst^=. and hkc_capros_fst<date then capros_fst18=1; else
capros_fst18=0;
rename hkc_capros_fst=hkc_capros_fst18;
if cabrst_fst18=1 or cacolo_fst18=1 or caendo_fst18=1 or calung_fst18=1 or
capros_fst18=1 then cancer_fst18=1; else cancer_fst18=0;
if hkc_catar_fst^=. and hkc_catar_fst<date then catar_fst18=1; else
catar_fst18=0;
rename hkc_catar_fst=hkc_catar_fst18;
if hkc_chf_fst^=. and hkc_chf_fst<date then chf_fst18=1; else chf_fst18=0;
rename hkc_chf_fst=hkc_chf_fst18;
if hkc_chrkid_fst^=. and hkc_chrkid_fst<date then chrkid_fst18=1; else
chrkid_fst18=0;
rename hkc_chrkid_fst=hkc_chrkid_fst18;
if hkc_copd_fst^=. and hkc_copd_fst<date then copd_fst18=1; else
copd_fst18=0;
rename hkc_copd_fst=hkc_copd_fst18;
if hkc_depr_fst^=. and hkc_depr_fst<date then depr_fst18=1; else
depr_fst18=0;
rename hkc_depr_fst=hkc_depr_fst18;
if hkc_diab_fst^=. and hkc_diab_fst<date then diab_fst18=1; else
diab_fst18=0;
rename hkc_diab_fst=hkc_diab_fst18;
if hkc_glauc_fst^=. and hkc_glauc_fst<date then glauc_fst18=1; else
glauc_fst18=0;
rename hkc_glauc_fst=hkc_glauc_fst18;
if hkc_hipfx_fst^=. and hkc_hipfx_fst<date then hipfx_fst18=1; else
hipfx_fst18=0;
rename hkc_hipfx_fst=hkc_hipfx_fst18;
if hkc_hyperten_fst^=. and hkc_hyperten_fst<date then hyperten_fst18=1; else
hyperten_fst18=0;
rename hkc_hyperten_fst=hkc_hyperten_fst18;
if hkc_hypothy_fst^=. and hkc_hypothy_fst<date then hypothy_fst18=1; else
hypothy_fst18=0;
rename hkc_hypothy_fst=hkc_hypothy_fst18;
if hkc_hyprlip_fst^=. and hkc_hyprlip_fst<date then hyprlip_fst18=1; else
hyprlip_fst18=0;
rename hkc_hyprlip_fst=hkc_hyprlip_fst18;

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if hkc_ischhd_fst^=. and hkc_ischhd_fst<date then ischhd_fst18=1; else
ischhd_fst18=0;
rename hkc_ischhd_fst=hkc_ischhd_fst18;
if hkc_osteo_fst^=. and hkc_osteo_fst<date then osteo_fst18=1; else
osteo_fst18=0;
rename hkc_osteo_fst=hkc_osteo_fst18;
if hkc_stroke_fst^=. and hkc_stroke_fst<date then stroke_fst18=1; else
stroke_fst18=0;
rename hkc_stroke_fst=hkc_stroke_fst18;
condition_fst18 = sum(anem_fst18, atrfib_fst18, cancer_fst18, chrkid_fst18,
copd_fst18, depr_fst18, diab_fst18,
chf_fst18, hyprrlip_fst18, hyperten_fst18, ischhd_fst18, stroke_fst18);

* chronic conditions by end of year;
ADRD=.; if hkc_alzdem_yr in ("1", "3") then ADRD_yr18 = 1; else ADRD_yr18 =0;
rename hkc_alzdem_yr=hkc_alzdem_yr18;
ami = .; if hkc_ami_yr="1" | hkc_ami_yr="3" then ami_yr18=1; else ami_yr18=0;
rename hkc_ami_yr=hkc_ami_yr18;
anem = .; if hkc_anem_yr="1" | hkc_anem_yr="3" then anem_yr18=1; else
anem_yr18=0;
rename hkc_anem_yr=hkc_anem_yr18;
arthr = .; if hkc_arthr_yr="1" | hkc_arthr_yr="3" then arthr_yr18=1; else
arthr_yr18=0;
rename hkc_arthr_yr=hkc_arthr_yr18;
asth = .; if hkc_asth_yr="1" | hkc_asth_yr="3" then asth_yr18=1; else
asth_yr18=0;
rename hkc_asth_yr=hkc_asth_yr18;
atrfib = .; if hkc_atrfib_yr="1" | hkc_atrfib_yr="3" then atrfib_yr18=1; else
atrfib_yr18=0;
rename hkc_atrfib_yr=hkc_atrfib_yr18;
bph = .; if hkc_bph_yr="1" | hkc_bph_yr="3" then bph_yr18=1; else bph_yr18=0;
rename hkc_bph_yr=hkc_bph_yr18;
cancer_yr18 = .; if hkc_cabrst_yr="1" | hkc_cabrst_yr="3" | hkc_cacolo_yr="1"
| hkc_cacolo_yr="3"
| hkc_caendo_yr="1" | hkc_caendo_yr="3" | hkc_calung_yr="1" |
hkc_calung_yr="3"
| hkc_capros_yr="1" | hkc_capros_yr="3" then cancer_yr18=1; else
cancer_yr18=0;
rename hkc_cabrst_yr=hkc_cabrst_yr18;
rename hkc_cacolo_yr=hkc_cacolo_yr18;
rename hkc_caendo_yr=hkc_caendo_yr18;
rename hkc_calung_yr=hkc_calung_yr18;
rename hkc_capros_yr=hkc_capros_yr18;
catar = .; if hkc_catar_yr="1" | hkc_catar_yr="3" then catar_yr18=1; else
catar_yr18=0;
rename hkc_catar_yr=hkc_catar_yr18;
chf = .; if hkc_chf_yr="1" | hkc_chf_yr="3" then chf_yr18=1; else chf_yr18=0;
rename hkc_chf_yr=hkc_chf_yr18;
chrkid = .; if hkc_chrkid_yr="1" | hkc_chrkid_yr="3" then chrkid_yr18=1; else
chrkid_yr18=0;
rename hkc_chrkid_yr=hkc_chrkid_yr18;
copd = .; if hkc_copd_yr="1" | hkc_copd_yr="3" then copd_yr18=1; else
copd_yr18=0;
rename hkc_copd_yr=hkc_copd_yr18;
depr = .; if hkc_depr_yr="1" | hkc_depr_yr="3" then depr_yr18=1; else
depr_yr18=0;

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rename hkc_depr_yr=hkc_depr_yr18;
diab = .; if hkc_diab_yr="1" | hkc_diab_yr="3" then diab_yr18=1; else
diab_yr18=0;
rename hkc_diab_yr=hkc_diab_yr18;
glauc = .; if hkc_glauc_yr="1" | hkc_glauc_yr="3" then glauc_yr18=1; else
glauc_yr18=0;
rename hkc_glauc_yr=hkc_glauc_yr18;
hipfx = .; if hkc_hipfx_yr="1" | hkc_hipfx_yr="3" then hipfx_yr18=1; else
hipfx_yr18=0;
rename hkc_hipfx_yr=hkc_hipfx_yr18;
hyperten = .; if hkc_hyperten_yr="1" | hkc_hyperten_yr="3" then
hyperten_yr18=1; else hyperten_yr18=0;
rename hkc_hyperten_yr=hkc_hyperten_yr18;
hypothy = .; if hkc_hypothy_yr="1" | hkc_hypothy_yr="3" then hypothy_yr18=1;
else hypothy_yr18=0;
rename hkc_hypothy_yr=hkc_hypothy_yr18;
hyprlip = .; if hkc_hyprlip_yr="1" | hkc_hyprlip_yr="3" then hyprlip_yr18=1;
else hyprlip_yr18=0;
rename hkc_hyprlip_yr=hkc_hyprlip_yr18;
ischhd = .; if hkc_ischhd_yr="1" | hkc_ischhd_yr="3" then ischhd_yr18=1; else
ischhd_yr18=0;
rename hkc_ischhd_yr=hkc_ischhd_yr18;
osteo = .; if hkc_osteo_yr="1" | hkc_osteo_yr="3" then osteo_yr18=1; else
osteo_yr18=0;
rename hkc_osteo_yr=hkc_osteo_yr18;
stroke = .; if hkc_stroke_yr="1" | hkc_stroke_yr="3" then stroke_yr18=1; else
stroke_yr18=0;
rename hkc_stroke_yr=hkc_stroke_yr18;

```

```

condition_yr18 = sum(ADRD_yr18, cancer_yr18, chrkid_yr18, copd_yr18,
diab_yr18, chf_yr18, stroke_yr18);

```

```

label hkz_zip9="resident's 9-digit zipcode";
label state="AL state";
label name="AL name";
label address="AL address";
label capacity="AL capacity";
label zip9="AL 9-digit zipcode";
label zip5="AL 5-digit zipcode";
label city="AL city";
label county="AL county";
label dementia="AL dementia";
label telephonenumber="AL telephonenumber";
label alllicensetypes="AL license type";
label alllicensecodes="AL license code";
label groupid="AL groupid";
label facilityid="AL facilityid";
label be9="AL 9-digit zipcode";
label totalbenecount="Total count of residents by facilityid";
label totaldecedent="Total count of decedents by facilityid";

```

```
run;
```

```

proc sort data= res.alwodecedent2 nodupkey out=out;
by bene_id_18900 hkz_from_dt ;

```

```

run;

** this file eventually ended up with 383,172 benes in 9151 als;
* note there are no multiple records for one bene;
* if there is, the only scenario is one bene moving between ALs
* note, I didn't merge this file with RHF, because merging to RHF
substantially increased the size of observations;
* decided to delete the individuals with multiple obs here
* these are the individuals who either moved between ALs or have days
overlapping in different ALs
*it's hard to tell which AL policy they are more exposed to;

proc sort data=res.alwodecedent2; by bene_id_18900 hkz_from_dt;run;
data wwodecedup;
  set res.alwodecedent2;
  if bene_id_18900 = lag(bene_id_18900) then tag=1;
  if bene_id_18900 = lag2(bene_id_18900) then tag=1;
  if bene_id_18900 = lag3(bene_id_18900) then tag=1;
  if bene_id_18900 = lag4(bene_id_18900) then tag=1;
run;

proc sort data=wwodecedup; by bene_id_18900 descending hkz_from_dt;run;
data wwodecedup2;
  set wwodecedup;
  if bene_id_18900 = lag(bene_id_18900) then tag=1;
  if bene_id_18900 = lag2(bene_id_18900) then tag=1;
  if bene_id_18900 = lag3(bene_id_18900) then tag=1;
  if bene_id_18900 = lag4(bene_id_18900) then tag=1;
  if tag=1 then delete;
run;

proc sort data=wwodecedup2 nodupkey out=out; by bene_id_18900;run;
proc sort data=wwodecedup2 nodupkey out=out; by facilityid;run;
* 372,789 benes in 9137 ALs;

data res.alwodecedent18;
  set wwodecedup2;
run;

*****starting here is the decedent
file*****;
* restricting the sample first to those who died in 2018;

data dec;
  set res.dec18_long;
  dif=hkdod-hes_dod;
run;

proc means data=dec; var dif;run;

```

```

data rhf18 (keep=bene_id_18900);
  set res.RHF_2;
  if year(hes_dod)=2018 then output;
run;

proc sql;
  create table dec1 as
  select * from res.alwodecedent2 where bene_id_18900 in
  (select distinct bene_id_18900 from rhf18);
quit;

proc sort data=dec1 nodupkey out=out; by bene_id_18900;run;
proc sort data=dec1 nodupkey out=out; by facilityid;run;
* 56858 unique benes in 7904 ALs;

* merging the file with Residential History File to get other vars;
proc sql;
  create table dec2 as select *
  from dec1 as a inner join res.rhf_2 as b
  on a.bene_id_18900 eq b.bene_id_18900;
quit;

* Exclude decedents who left AL more than one year before death;
data res.dec18_long;
  set dec2;
  if hkz_thru_dt<=hes_dod-365 then delete;
run;

proc sort data=res.dec18_long nodupkey out=out; by bene_id_18900;run;
proc sort data=res.dec18_long nodupkey out=out; by facilityid;run;
* 54480 benes in 7833 ALs;

* last 90 days;
data dec90days;
  set res.dec18_long;
  time_interval = hes_dod - hee_thru + 1;
  if time_interval <= 90 & time_interval >= 0 then output;
run;

* coding place of care and hospice from residential history file for daily
indicators;
data c;
  set dec90days;
/* type */
compress=compress(hee_type);
  if substr(compress, 1, 6)= "01.Inp" then type = 1; /* hosp */
  if substr(compress, 1, 6)= "01.SNF" then type = 2; /* NH */
  if substr(compress, 1, 6)= "02.MDS" then type = 2;
  if substr(compress, 1, 6)= "03.OBS" or hee_er_count>0 then type =
3; /*grouping observation and hee_er_count together*/

```

```

/* GIP/IPR*/
compressh=compress(hee_hospice);
if substr(compressh, 1, 9)="10.HpcGIP" | substr(compressh, 1,
9)="10.HpcIPR" then GIPIPR=1;

/* hospice POS*/
compressshpos=compress(hee_hospice);
if substr(compressshpos, 10, 25)="Asstliv" then hospicepos=1;
if substr(compressshpos, 10, 25)="Home" then hospicepos=2;
if substr(compressshpos, 10, 25)="Placenos" then hospicepos=3;
if substr(compressshpos, 10, 25)="Hospiceresid" then hospicepos=4; /*Hospice
home care provided in a hospice facility*/
if substr(compressshpos, 10, 25)="Hospicefacility" then hospicepos=5; /*
inpatient hospice*/
if substr(compressshpos, 10, 25)="Inpatienthospital" then hospicepos=6;
if substr(compressshpos, 10, 25)="LT/non-skilledNF" then hospicepos=7;
if substr(compressshpos, 10, 25)="LTCH" then hospicepos=8;
if substr(compressshpos, 10, 25)="SNF" then hospicepos=9;
if compressh="10.HpcGIPPlacenos" | compressh="10.HpcGIP???" |
compressh="10.Hpc???????" then posflag=1;
run;

data d;
set c;

if type NOT in ('1', '2', '3') AND GIPIPR NE 1 then type=4; /* AL*/
if hee_hospice^= '' then hospice =1;
else if hee_hospice= '' then hospice = 0;
/* place of care category */
category=.;
if (hospice=1 AND type=1) | (type=1 AND GIPIPR=1) | (GIPIPR=1 AND hospicepos in
('4', '5', '6')) then category=1;
/*GIP/hospice in inpatient, the first 2 conditions may overwrite some GIP
designations, but prioritizing type;
there are a few other situations where type=gap but hospice POS indicates
inpatient setting, use hospice POS assuming it's correct */
if hospice=0 AND GIPIPR NE 1 AND type=1 then category=2; /*No GIP/hospice in
inpatient */

if (type=3 AND hospice=1 ) | (type=3 AND GIPIPR=1) then category=3; /* hospice
in obs/ER*/
if (type=3 AND hospice=0 ) AND GIPIPR NE 1 then category=4; /* no hospice in
obs/ER*/

if (type=2 AND hospice=1 AND hee_er_count=0) | (type=. AND GIPIPR=1 AND
hee_er_count=0 AND hospicepos in ('7', '9'))
then category=5; /* NH with hospice, there are 28 obs with missing types
but hospice POS indicates GIP/IPR in NHs */
if type=2 and hospice=0 AND hee_er_count=0 then category=6; /* NH without
hospice */

if type=4 AND hospice=1 AND hee_er_count=0 then category=7; /* AL with
hospice */
if type=4 AND hospice=0 AND hee_er_count=0 then category=8; /* AL without
hospice */

```

```

if (type=4 |type=.) AND GIPIPR=1 AND hee_er_count=0 AND hospicepos='8' then
category=9; /* GIP in LTCH*/

run;

proc freq data=d;
  table category;
  table posflag;
run;

* there're 2 obs type=gap, GIP=1, but POS=not specified
for daily indicators, code it as inpatient with hospice, but indicate in
posflag for censoring later;

data e;
set d;
if compressh="10.HpcGIPPlacenos" |compressh="10.HpcGIP???" then category=1;
run;

proc freq data=e;
  table category;
run;

data out90;
  set e (keep=bene_id_18900 hes_dod hee_from hee_thru category);
  array date (90) d1 - d90;
  do i= 1 to 90;
    if hee_from<=hes_dod-i+1<=hee_thru then date(i)=category;
  end;
run;

proc sql;
create table output1 as
select bene_id_18900,
max(d1) as d0, max(d2) as d1, max(d3) as d2, max(d4) as d3, max(d5) as d4,
max(d6) as d5, max(d7) as d6, max(d8) as d7, max(d9) as d8, max(d10) as d9,
max(d11) as d10, max(d12) as d11, max(d13) as d12, max(d14) as d13, max(d15)
as d14, max(d16) as d15, max(d17) as d16, max(d18) as d17, max(d19) as d18,
max(d20) as d19, max(d21) as d20, max(d22) as d21, max(d23) as d22, max(d24)
as d23, max(d25) as d24, max(d26) as d25, max(d27) as d26, max(d28) as d27,
max(d29) as d28, max(d30) as d29, max(d31) as d30, max(d32) as d31, max(d33)
as d32, max(d34) as d33, max(d35) as d34, max(d36) as d35, max(d37) as d36,
max(d38) as d37, max(d39) as d38, max(d40) as d39, max(d41) as d40,
max(d42) as d41, max(d43) as d42, max(d44) as d43, max(d45) as d44, max(d46)
as d45, max(d47) as d46, max(d48) as d47, max(d49) as d48, max(d50) as d49,
max(d51) as d50, max(d52) as d51, max(d53) as d52, max(d54) as d53, max(d55)
as d54, max(d56) as d55, max(d57) as d56, max(d58) as d57, max(d59) as d58,
max(d60) as d59, max(d61) as d60, max(d62) as d61, max(d63) as d62, max(d64)
as d63, max(d65) as d64, max(d66) as d65, max(d67) as d66, max(d68) as d67,
max(d69) as d68, max(d70) as d69, max(d71) as d70, max(d72) as d71, max(d73)
as d72, max(d74) as d73, max(d75) as d74, max(d76) as d75, max(d77) as d76,
max(d78) as d77, max(d79) as d78, max(d80) as d79, max(d81) as d80, max(d82)
as d81, max(d83) as d82, max(d84) as d83, max(d85) as d84, max(d86) as d85,
max(d87) as d86, max(d88) as d87, max(d89) as d88, max(d90) as d89
from out90 group by bene_id_18900;
quit;

```

```

* change from wide to long;
proc sort data=output1; by bene_id_18900; run;
proc transpose data=output1 out=long;
  by bene_id_18900;
var d0 d1-d89;
run;

***** count the number of days spent in different settings in the last 90
days of life *****;

data long_1; set long;
if coll=1 then output; run;
data long_2; set long;
if coll=2 then output; run;
data long_3; set long;
if coll=3 then output; run;
data long_4; set long;
if coll=4 then output; run;
data long_5; set long;
if coll=5 then output; run;
data long_6; set long;
if coll=6 then output; run;
data long_7; set long;
if coll=7 then output; run;
data long_8; set long;
if coll=8 then output; run;
data long_9; set long;
if coll=9 then output; run;

proc sql;
create table long1 as
select bene_id_18900, count(coll) as dHospital_hospice
from long_1 group by bene_id_18900;
quit;

proc sql;
create table long2 as
select bene_id_18900, count(coll) as dHospital_nohospice
from long_2 group by bene_id_18900;
quit;

proc sql;
create table long3 as
select bene_id_18900, count(coll) as dOBSer_hospice
from long_3 group by bene_id_18900;
quit;

proc sql;
create table long4 as
select bene_id_18900, count(coll) as dOBSer_nohospice
from long_4 group by bene_id_18900; quit;

```

```

proc sql;
create table long5 as
select bene_id_18900, count(coll1) as dNH_hospice
from long_5 group by bene_id_18900; quit;

proc sql;
create table long6 as
select bene_id_18900, count(coll1) as dNH_nohospice
from long_6 group by bene_id_18900; quit;

proc sql;
create table long7 as
select bene_id_18900, count(coll1) as dAL_hospice
from long_7 group by bene_id_18900; quit;

proc sql;
create table long8 as
select bene_id_18900, count(coll1) as dAL_nohospice
from long_8 group by bene_id_18900; quit;

proc sql;
create table long9 as
select bene_id_18900, count(coll1) as dLTCH_hospice
from long_9 group by bene_id_18900; quit;


proc sql;
create table out1 as select *
from output1 as a left join long1 as b
on a.bene_id_18900 eq b.bene_id_18900; quit;

proc sql;
create table out1 as select *
from output1 as a left join long2 as b
on a.bene_id_18900 eq b.bene_id_18900; quit;
proc sql;
create table out1 as select *
from out1 as a left join long3 as b
on a.bene_id_18900 eq b.bene_id_18900; quit;
proc sql;
create table out1 as select *
from out1 as a left join long4 as b
on a.bene_id_18900 eq b.bene_id_18900; quit;
proc sql;
create table out1 as select *
from out1 as a left join long5 as b
on a.bene_id_18900 eq b.bene_id_18900; quit;

proc sql;
create table out1 as select *
from out1 as a left join long6 as b
on a.bene_id_18900 eq b.bene_id_18900; quit;

proc sql;

```

```

create table out1 as select *
from out1 as a left join long7 as b
on a.bene_id_18900 eq b.bene_id_18900; quit;

proc sql;
create table out1 as select *
from out1 as a left join long8 as b
on a.bene_id_18900 eq b.bene_id_18900; quit;

proc sql;
create table out1 as select *
from out1 as a left join long9 as b
on a.bene_id_18900 eq b.bene_id_18900; quit;

data rhf90day ;
  set out1;
  if dHospital_nohospice=. then dHospital_nohospice=0;
  if dHospital_hospice=. then dHospital_hospice=0;
  if dNH_hospice=. then dNH_hospice=0;
  if dNH_nohospice=. then dNH_nohospice=0;
  if dAL_hospice=. then dAL_hospice=0;
  if dAL_nohospice=. then dAL_nohospice=0;
  if dOBSer_hospice=. then dOBSer_hospice=0;
  if dOBSer_nohospice=. then dOBSer_nohospice=0;
  if dltch_hospice=. then dltch_hospice=0;

  prop90_AL=(dAL_nohospice+dAL_hospice)/90;
  label prop90_AL="proportion of days spent in AL for the last 90 days
alive";
  format prop90_AL 12.3;
run;

data res.rhf90day ;
  set out1;
  if dHospital_nohospice=. then dHospital_nohospice=0;
  if dHospital_hospice=. then dHospital_hospice=0;
  if dNH_hospice=. then dNH_hospice=0;
  if dNH_nohospice=. then dNH_nohospice=0;
  if dAL_hospice=. then dAL_hospice=0;
  if dAL_nohospice=. then dAL_nohospice=0;
  if dOBSer_hospice=. then dOBSer_hospice=0;
  if dOBSer_nohospice=. then dOBSer_nohospice=0;
  if dltch_hospice=. then dltch_hospice=0;

  prop90_AL=(dAL_nohospice+dAL_hospice)/90;
  label prop90_AL="proportion of days spent in AL for the last 90 days
alive";
  format prop90_AL 12.3;
run;

```

```

proc means data=res.rhf90day n nmiss min p25 p30 p50 p60 p75 max;
var prop90_AL;
where prop90_AL>0;
run;

data prop90AL;
set res.rhf90day (keep=bene_id_18900 prop90_AL);
run;

/* now get 30 days indicators, same code*/
proc sql;
create table dec90days as select *
from res.dec18_long as a left join prop90AL as b
on a.bene_id_18900 eq b.bene_id_18900;
quit;

data dec30;
set dec90days;
time_interval = hes_dod - hee_thru + 1;
if time_interval <= 30 AND time_interval >= 0 then output;
run;

proc sort data=dec30 nodupkey out=out; by bene_id_18900; run;

data dec30_2;
set dec30;
/* type */
compress=compress(hee_type);
if substr(compress, 1, 6)= "01.Inp" then type = 1;
if substr(compress, 1, 6)= "01.SNF" then type = 2;
if substr(compress, 1, 6)= "02.MDS" then type = 2;
if substr(compress, 1, 6)= "03.OBS" or hee_er_count>0 then type = 3;
compressh=compress(hee_hospice);
if substr(compressh, 1, 9)="10.HpcGIP" | substr(compressh, 1,
9)="10.HpcIPR" then GIPIPR=1;

compressh=compress(hee_hospice);
if substr(compressh, 1, 9)="10.HpcCHC" then hospicetype=1;
if substr(compressh, 1, 9)="10.HpcRHC" then hospicetype=2;
if substr(compressh, 1, 9)="10.HpcIPR" then hospicetype=3;
if substr(compressh, 1, 9)="10.HpcGIP" then hospicetype=4;

/* hospice POS*/
compresshpos=compress(hee_hospice);
if substr(compresshpos, 10, 25)="Asstliv" then hospicepos=1;
if substr(compresshpos, 10, 25)="Home" then hospicepos=2;
if substr(compresshpos, 10, 25)="Placenos" then hospicepos=3;

```

```

    if substr(compresshpos, 10, 25)="Hospiceresid" then hospicepos=4; if
substr(compresshpos, 10, 25)="Hospicefacility" then hospicepos=5;
    if substr(compresshpos, 10, 25)="Inpatienthospital" then hospicepos=6;
    if substr(compresshpos, 10, 25)="LT/non-skilledNF" then hospicepos=7;
    if substr(compresshpos, 10, 25)="LTCH" then hospicepos=8;
    if substr(compresshpos, 10, 25)="SNF" then hospicepos=9;
    if compressh="10.Hpc?????" | compressh="10.HpcGIPPlacenos" |
compressh="10.HpcGIP???" | compressh="10.HpcGIPAsstliv" |
compressh="10.HpcGIPHome" |
                                compressh="10.HpcGIPPlacenos" |
compressh="10.HpcIPR???" |
compressh="10.HpcIPRAsstliv" | compressh="10.HpcIPRHome"
    then posflag=1;

    if compressh="10.HpcGIPPlacenos" | compressh="10.HpcGIP???" |
compressh="10.Hpc?????" | compressh="10.HpcRHC???" |
    compressh="10.HpcCHC???" | compressh="10.HpcCHCPlacenos" |
compressh="10.HpcRHCPlacenos" then posflag2=1;
run;

data dec30_3;
    set dec30_2;
    if type NOT in ('1', '2', '3') AND GIPIPR NE 1 then type=4; /* AL*/
    if hee_hospice^= '' then hospice =1;
    else if hee_hospice= '' then hospice = 0;
/* place of care category */
category=.;
if (hospice=1 AND type=1) | (type=1 AND GIPIPR=1) | (GIPIPR=1 AND hospicepos in
('4', '5', '6')) then category=1;

if hospice=0 AND GIPIPR NE 1 AND type=1 then category=2;
if (type=3 AND hospice=1 ) | (type=3 AND GIPIPR=1) then category=3;
if (type=3 AND hospice=0 ) AND GIPIPR NE 1 then category=4;
if (type=2 AND hospice=1 AND hee_er_count=0) | (type=. AND GIPIPR=1 AND
hee_er_count=0 AND hospicepos in ('7', '9'))
    then category=5;
if type=2 and hospice=0 AND hee_er_count=0 then category=6;
if type=4 AND hospice=1 AND hee_er_count=0 then category=7;
if type=4 AND hospice=0 AND hee_er_count=0 then category=8;
if (type=4 | type=.) AND GIPIPR=1 AND hee_er_count=0 AND hospicepos='8' then
category=9;
if compressh="10.HpcGIPPlacenos" | compressh="10.HpcGIP???" then category=1;
run;

proc freq data=b;
    table category;
    table posflag;
run;

data out30;
    set dec30_3 (keep=bene_id_18900 hes_dod hee_thru hee_from category
hospicepos hospicetype hee_hospice_provn);
array date (30) d1 - d30;
array hospos (30) hospl-hosp30;
array hospt (30) hospt1-hospt30;

```

```

array hospnum (30) hospn1-hospn30;
do i= 1 to 30;
  if hee_from<=hes_dod-i+1<=hee_thru
    then date(i)=category;

  if hee_from<=hes_dod-i+1<=hee_thru
    then hospos(i)=hospicepos;

  if hee_from<=hes_dod-i+1<=hee_thru
    then hospt(i)=hospicetype;

  if hee_from<=hes_dod-i+1<=hee_thru
    then hospnum(i)=hee_hospice_provn;
end;
run;

```

```

proc sql;
  create table output1 as
  select bene_id_18900, max(d1) as placeofdeath,
    max(d1) as d0, max(d2) as d1, max(d3) as d2,
    max(d4) as d3, max(d5) as d4, max(d6) as d5, max(d7) as d6, max(d8) as d7,
    max(d9) as d8, max(d10) as d9, max(d11) as d10, max(d12) as d11, max(d13) as
    d12, max(d14) as d13, max(d15) as d14, max(d16) as d15, max(d17) as d16,
    max(d18) as d17, max(d19) as d18, max(d20) as d19, max(d21) as d20, max(d22)
    as d21, max(d23) as d22, max(d24) as d23, max(d25) as d24, max(d26) as d25,
    max(d27) as d26, max(d28) as d27, max(d29) as d28, max(d30) as d29
  from out30 group by bene_id_18900;
quit;

```

```

proc sql;
  create table output2 as
  select bene_id_18900,
    max(hosp1) as hosp0, max(hosp2) as hosp1, max(hosp3) as hosp2,
    max(hosp4) as hosp3, max(hosp5) as hosp4, max(hosp6) as hosp5, max(hosp7)
    as hosp6, max(hosp8) as hosp7, max(hosp9) as hosp8, max(hosp10) as hosp9,
    max(hosp11) as hosp10, max(hosp12) as hosp11, max(hosp13) as hosp12,
    max(hosp14) as hosp13, max(hosp15) as hosp14, max(hosp16) as hosp15,
    max(hosp17) as hosp16, max(hosp18) as hosp17, max(hosp19) as hosp18,
    max(hosp20) as hosp19, max(hosp21) as hosp20, max(hosp22) as hosp21,
    max(hosp23) as hosp22, max(hosp24) as hosp23, max(hosp25) as hosp24,
    max(hosp26) as hosp25, max(hosp27) as hosp26, max(hosp28) as hosp27,
    max(hosp29) as hosp28, max(hosp30) as hosp29
  from out30 group by bene_id_18900;
quit;

```

```

proc sql;
  create table output3 as
  select bene_id_18900,
    max(hospt1) as hospt0, max(hospt2) as hospt1, max(hospt3) as hospt2,
    max(hospt4) as hospt3, max(hospt5) as hospt4, max(hospt6) as hospt5,
    max(hospt7) as hospt6, max(hospt8) as hospt7, max(hospt9) as hospt8,

```

```

    max(hospt10) as hospt9, max(hospt11) as hospt10, max(hospt12) as hospt11,
    max(hospt13) as hospt12, max(hospt14) as hospt13,
    max(hospt15) as hospt14, max(hospt16) as hospt15, max(hospt17) as hospt16,
    max(hospt18) as hospt17, max(hospt19) as hospt18,
    max(hospt20) as hospt19, max(hospt21) as hospt20, max(hospt22) as hospt21,
    max(hospt23) as hospt22, max(hospt24) as hospt23,
    max(hospt25) as hospt24, max(hospt26) as hospt25, max(hospt27) as hospt26,
    max(hospt28) as hospt27, max(hospt29) as hospt28, max(hospt30) as hospt29
    from out30 group by bene_id_18900;
quit;

```

```

proc sql;
    create table output4 as
    select bene_id_18900,
    max(hospn1) as hospn0, max(hospn2) as hospn1, max(hospn3) as hospn2,
    max(hospn4) as hospn3, max(hospn5) as hospn4, max(hospn6) as hospn5,
    max(hospn7) as hospn6, max(hospn8) as hospn7, max(hospn9) as hospn8,
    max(hospn10) as hospn9, max(hospn11) as hospn10, max(hospn12) as hospn11,
    max(hospn13) as hospn12, max(hospn14) as hospn13,
    max(hospn15) as hospn14, max(hospn16) as hospn15, max(hospn17) as hospn16,
    max(hospn18) as hospn17, max(hospn19) as hospn18,
    max(hospn20) as hospn19, max(hospn21) as hospn20, max(hospn22) as hospn21,
    max(hospn23) as hospn22, max(hospn24) as hospn23,
    max(hospn25) as hospn24, max(hospn26) as hospn25, max(hospn27) as hospn26,
    max(hospn28) as hospn27, max(hospn29) as hospn28, max(hospn30) as hospn29
    from out30 group by bene_id_18900;
quit;

```

```

data out2;
    set out30 (keep=bene_id_18900 hes_dod hee_from hee_thru);
run;
* date variable;

```

```

proc sql;
    create table daily as select *
    from out2 as a left join output1 as b
    on a.bene_id_18900 eq b.bene_id_18900;
quit;

```

```

proc sql;
    create table daily2 as select *
    from daily as a left join output2 as b
    on a.bene_id_18900 eq b.bene_id_18900;
quit;

```

```

proc sql;
    create table daily3 as select *
    from daily2 as a left join output3 as b
    on a.bene_id_18900 eq b.bene_id_18900;
quit;

```

```

proc sql;
    create table daily4 as select *
    from daily3 as a left join output4 as b
    on a.bene_id_18900 eq b.bene_id_18900;

```

```

quit;

data dailyoutput ;
  set daily4;

  label d0="loc on the date of death";
  label d1="loc 1 day before death";
  label d2="loc 2 days before death";
  label d3="loc 3 days before death";
  label d4="loc 4 days before death";
  label d5="loc 5 days before death";
  label d6="loc 6 days before death";
  label d7="loc 7 days before death";
  label d8="loc 8 days before death";
  label d9="loc 9 days before death";
  label d10="loc 10 day before death";
  label d11="loc 11 day before death";
  label d12="loc 12 days before death";
  label d13="loc 13 days before death";
  label d14="loc 14 days before death";
  label d15="loc 15 days before death";
  label d16="loc 16 days before death";
  label d17="loc 17 days before death";
  label d18="loc 18 days before death";
  label d19="loc 19 days before death";
  label d20="loc 20 day before death";
  label d21="loc 21 day before death";
  label d22="loc 22 days before death";
  label d23="loc 23 days before death";
  label d24="loc 24 days before death";
  label d25="loc 25 days before death";
  label d26="loc 26 days before death";
  label d27="loc 27 days before death";
  label d28="loc 28 days before death";
  label d29="loc 29 days before death";
  label d29="loc 29 days before death";
  label placeofdeath="loc in the date of death, same as d0 variable";

  label hosp0="hospice POS on the date of death";
  label hosp1="hospice POS 1 day before death";
  label hosp2="hospice POS 2 days before death";
  label hosp3="hospice POS 3 days before death";
  label hosp4="hospice POS 4 days before death";
  label hosp5="hospice POS 5 days before death";
  label hosp6="hospice POS 6 days before death";
  label hosp7="hospice POS 7 days before death";
  label hosp8="hospice POS 8 days before death";
  label hosp9="hospice POS 9 days before death";
  label hosp10="hospice POS 10 day before death";
  label hosp11="hospice POS 11 day before death";
  label hosp12="hospice POS 12 days before death";
  label hosp13="hospice POS 13 days before death";
  label hosp14="hospice POS 14 days before death";
  label hosp15="hospice POS 15 days before death";
  label hosp16="hospice POS 16 days before death";
  label hosp17="hospice POS 17 days before death";

```

```

label hosp18="hospice POS 18 days before death";
label hosp19="hospice POS 19 days before death";
label hosp20="hospice POS 20 day before death";
label hosp21="hospice POS 21 day before death";
label hosp22="hospice POS 22 days before death";
label hosp23="hospice POS 23 days before death";
label hosp24="hospice POS 24 days before death";
label hosp25="hospice POS 25 days before death";
label hosp26="hospice POS 26 days before death";
label hosp27="hospice POS 27 days before death";
label hosp28="hospice POS 28 days before death";
label hosp29="hospice POS 29 days before death";

label hospt0="hospice type on the day of death";
label hospt1="hospice type 1 day before death";
label hospt2="hospice type 2 day before death";
label hospt3="hospice type 3 day before death";
label hospt4="hospice type 4 day before death";
label hospt5="hospice type 5 day before death";
label hospt6="hospice type 6 day before death";
label hospt7="hospice type 7 day before death";
label hospt8="hospice type 8 day before death";
label hospt9="hospice type 9 day before death";
label hospt10="hospice type 10 day before death";
label hospt11="hospice type 11 day before death";
label hospt12="hospice type 12 day before death";
label hospt13="hospice type 13 day before death";
label hospt14="hospice type 14 day before death";
label hospt15="hospice type 15 day before death";
label hospt16="hospice type 16 day before death";
label hospt17="hospice type 17 day before death";
label hospt18="hospice type 18 day before death";
label hospt19="hospice type 19 day before death";
label hospt20="hospice type 20 day before death";
label hospt21="hospice type 21 day before death";
label hospt22="hospice type 22 day before death";
label hospt23="hospice type 23 day before death";
label hospt24="hospice type 24 day before death";
label hospt25="hospice type 25 day before death";
label hospt26="hospice type 26 day before death";
label hospt27="hospice type 27 day before death";
label hospt28="hospice type 28 day before death";
label hospt29="hospice type 29 day before death";

label hospn0="provider number on the day of death";
label hospn1="provider number 1 day before death";
label hospn2="provider number 2 day before death";
label hospn3="provider number 3 day before death";
label hospn4="provider number 4 day before death";
label hospn5="provider number 5 day before death";
label hospn6="provider number 6 day before death";
label hospn7="provider number 7 day before death";
label hospn8="provider number 8 day before death";
label hospn9="provider number 9 day before death";
label hospn10="provider number 10 day before death";

```

```

label hospn11="provider number 11 day before death";
label hospn12="provider number 12 day before death";
label hospn13="provider number 13 day before death";
label hospn14="provider number 14 day before death";
label hospn15="provider number 15 day before death";
label hospn16="provider number 16 day before death";
label hospn17="provider number 17 day before death";
label hospn18="provider number 18 day before death";
label hospn19="provider number 19 day before death";
label hospn20="provider number 20 day before death";
label hospn21="provider number 21 day before death";
label hospn22="provider number 22 day before death";
label hospn23="provider number 23 day before death";
label hospn24="provider number 24 day before death";
label hospn25="provider number 25 day before death";
label hospn26="provider number 26 day before death";
label hospn27="provider number 27 day before death";
label hospn28="provider number 28 day before death";
label hospn29="provider number 29 day before death";

run;

proc sort data=dailyoutput; by bene_id_18900 hee_from hee_thru;run;
proc sort data= dec30_3; by bene_id_18900 hee_from hee_thru;run;

data mergedailyw30days dailynomerge rhf30nomerge;
  merge dailyoutput (in=a) dec30_3 (in=b);
  by bene_id_18900 hee_from hee_thru;
  if a and b then output mergedailyw30days;
  if a and not b then output dailynomerge;
  if b and not a then output rhf30nomerge;
run;

data res.RHF2018_30DAYS;
  set mergedailyw30days;
run;

proc freq data=res.RHF2018_30DAYS;
table d0-d29 ;
run;

***** create separate files *****;

/* AL with hospice */
data ALhospice;
  set res.RHF2018_30DAYS;
  if d0=7 and hee_thru=hes_dod then output;
run;

/* AL without hospice */
data ALwohospice;
  set res.RHF2018_30DAYS;
  if d0=8 and hee_thru=hes_dod then output;

```

```

run;

/* NH with hospice */
data NHhospice;
set res.RHF2018_30DAYS;
if d0=5 and hee_thru=hes_dod then output;
run;

/* NH without hospice */
data NHwohospice;
set res.RHF2018_30DAYS;
if d0=6 and hee_thru=hes_dod then output;
run;

/* hospital with hospice*/
data inpwhospice;
set res.RHF2018_30DAYS;
if d0=1 and hee_thru=hes_dod then output;
run;

/* hospital without hospice*/
data inpwohospice;
set res.RHF2018_30DAYS;
if d0=2 and hee_thru=hes_dod then output;
run;

/* observation/ER with hospice*/
data obER;
set res.RHF2018_30DAYS;
if d0=3 and hee_thru=hes_dod then output;
run;

/* observation/ER without hospice*/
data obERwohospice;
set res.RHF2018_30DAYS;
if d0=4 and hee_thru=hes_dod then output;
run;

/* GIP in LTCH*/
data ltch;
set res.RHF2018_30DAYS;
if d0=9 and hee_thru=hes_dod then output;
run;

* combine files;
data ALcohort_v1;
set ALhospice ALwohospice NHhospice NHwohospice inpwhospice
inpwohospice obER obERwohospice ltch;
run;

proc sort data=ALcohort_v1 nodupkey out=out; by bene_id_18900 ; run;

```

```

proc format;
value loc
1 = "1: in hospital with hospice"
2 = "2: in hospital without hospice"
3 = "3: in obs/ER with hospice"
4 = "4: in obs/ER without hospice"
5 = "5: NH with hospice"
6 = "6: NH without hospice"
7 = "7: AL with hospice"
8 = "8: AL without hospice"
9 = "9: GIP in LTCH";

value hospt
1 = "1: CHC"
2 = "2: RHC"
3 = "3: IPR"
4 = "4: GIP";

value hosp
1 = "1: AL"
2 = "2: Home"
3 = "3: Placenos"
4 = "4: home care in hospice facility"
5 = "5: inpatient hospice"
6 = "6: inpatient hospital"
7 = "7: LT/non-skilledNF"
8 = "8: LTCH"
9 = "9: SNF";

value age
1 = "1: age 65-74"
2 = "2: age 75-84"
3 = "3: age 85+";

value race
1 = "1: White"
2 = "2: Black"
3 = "3: Hispanic"
4 = "4: Other";
run;

data res.ALcohort_v1;
set ALcohort_v1;

    format placeofdeath loc.;
    format d0 loc.;
    format d1-d29 loc.;
    format hosp0-hosp29 hosp.;
    format hospt0-hospt29 hospt.;
    format age age.;
    format race race.;
run;

proc sort data=res.ALcohort_v1; by bene_id_18900; run;

```

```

proc transpose data=res.ALcohort_v1 out=long;
  by bene_id_18900;
  var d0 d1-d29 ;
run;

data long_1; set long;
if coll=1 then output; run;
data long_2; set long;
if coll=2 then output; run;
data long_3; set long;
if coll=3 then output; run;
data long_4; set long;
if coll=4 then output; run;
data long_5; set long;
if coll=5 then output; run;
data long_6; set long;
if coll=6 then output; run;
data long_7; set long;
if coll=7 then output; run;
data long_8; set long;
if coll=8 then output; run;
data long_9; set long;
if coll=9 then output; run;

proc sql;
create table long1 as
select bene_id_18900, count(coll) as dHospital_hospice
from long_1 group by bene_id_18900;
quit;

proc sql;
create table long2 as
select bene_id_18900, count(coll) as dHospital_nohospice
from long_2 group by bene_id_18900;
quit;

proc sql;
create table long3 as
select bene_id_18900, count(coll) as dOBSer_hospice
from long_3 group by bene_id_18900;
quit;

proc sql;
create table long4 as
select bene_id_18900, count(coll) as dOBSer_nohospice
from long_4 group by bene_id_18900; quit;

proc sql;
create table long5 as
select bene_id_18900, count(coll) as dNH_hospice
from long_5 group by bene_id_18900; quit;

proc sql;
create table long6 as

```

```
select bene_id_18900, count(coll) as dNH_nohospice
from long_6 group by bene_id_18900; quit;
```

```
proc sql;
create table long7 as
select bene_id_18900, count(coll) as dAL_hospice
from long_7 group by bene_id_18900; quit;
```

```
proc sql;
create table long8 as
select bene_id_18900, count(coll) as dAL_nohospice
from long_8 group by bene_id_18900; quit;
```

```
proc sql;
create table long9 as
select bene_id_18900, count(coll) as dLTCH_GIP
from long_9 group by bene_id_18900; quit;
```

```
proc sql;
create table ALcohort_v2 as select *
from res.ALcohort_v1 as a left join long1 as b
on a.bene_id_18900 eq b.bene_id_18900;
quit;
```

```
proc sql;
create table ALcohort_v2 as select *
from ALcohort_v2 as a left join long2 as b
on a.bene_id_18900 eq b.bene_id_18900;
quit;
```

```
proc sql;
create table ALcohort_v2 as select *
from ALcohort_v2 as a left join long3 as b
on a.bene_id_18900 eq b.bene_id_18900; quit;
```

```
proc sql;
create table ALcohort_v2 as select *
from ALcohort_v2 as a left join long4 as b
on a.bene_id_18900 eq b.bene_id_18900;
quit;
```

```
proc sql;
create table ALcohort_v2 as select *
from ALcohort_v2 as a left join long5 as b
on a.bene_id_18900 eq b.bene_id_18900;
quit;
```

```
proc sql;
create table ALcohort_v2 as select *
from ALcohort_v2 as a left join long6 as b
on a.bene_id_18900 eq b.bene_id_18900;
quit;
```

```
proc sql;
create table ALcohort_v2 as select *
```

```

    from ALcohort_v2 as a left join long7 as b
    on a.bene_id_18900 eq b.bene_id_18900;
quit;

proc sql;
    create table ALcohort_v2 as select *
    from ALcohort_v2 as a left join long8 as b
    on a.bene_id_18900 eq b.bene_id_18900;
quit;

proc sql;
    create table ALcohort_v2 as select *
    from ALcohort_v2 as a left join long9 as b
    on a.bene_id_18900 eq b.bene_id_18900;
quit;

data res.ALdecedent18;
    set ALcohort_v2;

    array Months_noHMO (12) hkhmo1 - hkhmo12;
    deadmo=month(hes_dod) ;
    do i= deadmo;
        if Months_noHMO(i) in ('0', '4') then FFS = 1;
        else if Months_noHMO(i) NOT in ('0', '4') then FFS = 0; end;
        label FFS="FFS at the month of death";

    array Months_dual (12) hkdua11 - hkdua12;
    deadmo=month(hes_dod) ;
    do i= deadmo;
        if Months_dual(i) in ('**', '00', 'NA', '09', '99') then dual = 0;
        else if Months_dual(i) NOT in ('**', '00', 'NA', '09', '99') then dual = 1;
    end;
    label dual="Dual at the month of death";

    if dHospital_hospice=. then dhospital_hospice=0;
    if dHospital_nohospice=. then dhospital_nohospice=0;
    if dNH_hospice=. then dNH_hospice=0;
    if dNH_nohospice=. then dNH_nohospice=0;
    if dAL_hospice=. then dAL_hospice=0;
    if dAL_nohospice=. then dAL_nohospice=0;
    if dOBser_hospice=. then dOBser_hospice=0;
    if dOBser_nohospice=. then dOBser_nohospice=0;
    if dLTCH_GIP=. then dLTCH_GIP=0;
    prop30_AL=(dAL_nohospice+dAL_hospice)/30;

    label dhospital_hospice="# days in hospital with hospice in the last 30 days
of life";
    label dhospital_nohospice="# days in hospital without hospice in the last 30
days of life";
    label dNH_hospice="# days in NH with hospice in the last 30 days of life";
    label dNH_nohospice="# days in NH without hospice in the last 30 days of
life";
    label dAL_hospice="# days in AL with hospice in the last 30 days of life";

```

```
label dAL_nohospice="# days in AL without hospice in the last 30 days of
life";
label dOBSer_hospice="# days in ER/OBS with hospice in the last 30 days of
life";
label dOBSer_nohospice="# days in ER/OBS without hospice in the last 30 days
of life";
label dLTCH_GIP="# days in LTCH with GIP in the last 30 days of life";
label hkz_zip9="beneficiary's 9-digit zipcode";
label state="AL state";
label name="AL name";
label address="AL address";
label capacity="AL capacity";
label zip9="AL Zip9";
label city="AL city";
label county="AL county";
label dementia="whether AL has licensed dementia care";
label alllicensetypes="AL license types (could contain multiple licenses)";
label alllicensecodes="AL license codes";
label hes_dod="date of death";

run;
```

*** Analytical Syntax for "State Regulations and Hospice Utilization in Assisted Living during the Last Month of Life"**

*** November 2021, Nicole Rosendaal**

*** data ***

use "\$finaldata\HospiceUtilizationAnalytic", clear

*** select ***

count // 53,796

* keep if continuous ffs

keep if FFSnrMO == 12 // 17,971 dropped

* keep only if anyAL in last 30 days

keep if anyAL == 1 // 12,540 dropped

count // 23,285

* tables

* table 1: descriptive characteristics

tab ADRD_yr1718, m

tab age, m

bysort ADRD_yr1718: tab age, m

tab hksex, m

bysort ADRD_yr1718: tab hksex, m

tab race, m

bysort ADRD_yr1718: tab race, m

tab dual_any1718, m

bysort ADRD_yr1718: tab dual_any1718, m

summ total_CC_yr1718

bysort ADRD_yr1718: summ total_CC_yr1718

summ yearinAL

bysort ADRD_yr1718: summ yearinAL

* table 2: multivariable models

* 30 days

* hospice

// unadjusted

logistic dAL_hospice_any i.ANY_REC_hospice, or

// adjusted

logistic dAL_hospice_any i.ANY_REC_hospice i.ADRD_yr1718 i.age i.race i.hksex

i.dual_any1718 total_CC_yr1718 yearinAL, or

```

// adjusted with FE
xtset HRR
xtlogit dAL_hospice_any i.ANY_REC_hospice i.ADRD_yr1718 i.age i.race i.hksex
i.dual_any1718 total_CC_yr1718 yearinAL, or fe

```

* RN

```

// unadjusted
logistic dAL_hospice_any i.ANY_REC_RN_staffing, or

// adjusted
logistic dAL_hospice_any i.ANY_REC_RN_staffing i.ADRD_yr1718 i.age i.race
i.hksex i.dual_any1718 total_CC_yr1718 yearinAL, or

```

```

// adjusted with FE
xtlogit dAL_hospice_any i.ANY_REC_RN_staffing i.ADRD_yr1718 i.age i.race
i.hksex i.dual_any1718 total_CC_yr1718 yearinAL, or fe

```

* table S1: multivariable models

* 7 days

* hospice

```

// unadjusted
logistic dAL_hospice_any7 i.ANY_REC_hospice, or

// adjusted
logistic dAL_hospice_any7 i.ANY_REC_hospice i.ADRD_yr1718 i.age i.race
i.hksex i.dual_any1718 total_CC_yr1718 yearinAL, or

```

```

// adjusted with FE
xtlogit dAL_hospice_any7 i.ANY_REC_hospice i.ADRD_yr1718 i.age i.race i.hksex
i.dual_any1718 total_CC_yr1718 yearinAL, or fe

```

* RN

```

// unadjusted
logistic dAL_hospice_any7 i.ANY_REC_RN_staffing, or

// adjusted
logistic dAL_hospice_any7 i.ANY_REC_RN_staffing i.ADRD_yr1718 i.age i.race
i.hksex i.dual_any1718 total_CC_yr1718 yearinAL, or

```

```

// adjusted with FE
xtlogit dAL_hospice_any7 i.ANY_REC_RN_staffing i.ADRD_yr1718 i.age i.race
i.hksex i.dual_any1718 total_CC_yr1718 yearinAL, or fe

```

* table S2: multivariable models - ADRD only

* hospice

```

// unadjusted
logistic dAL_hospice_any i.ANY_REC_hospice if ADRD_yr1718 == 1, or

// adjusted
logistic dAL_hospice_any i.ANY_REC_hospice i.age i.race i.hksex i.dual_any1718
total_CC_yr1718 yearinAL if ADRD_yr1718 == 1, or

// adjusted with FE
xtlogit dAL_hospice_any i.ANY_REC_hospice i.age i.race i.hksex i.dual_any1718
total_CC_yr1718 yearinAL if ADRD_yr1718 == 1, or fe

```

* RN

```

// unadjusted
logistic dAL_hospice_any i.ANY_REC_RN_staffing if ADRD_yr1718 == 1, or

// adjusted
logistic dAL_hospice_any i.ANY_REC_RN_staffing i.age i.race i.hksex
i.dual_any1718 total_CC_yr1718 yearinAL if ADRD_yr1718 == 1, or

// adjusted with FE
xtlogit dAL_hospice_any i.ANY_REC_RN_staffing i.age i.race i.hksex
i.dual_any1718 total_CC_yr1718 yearinAL if ADRD_yr1718 == 1, or fe

```

* figures

* figure 1 - input for bar chart

```

tab ANY_REC_hospice anyHospinAL, row chi2
tab ANY_REC_hospice anyCHCinAL, row chi2
tab ANY_REC_RN_staffing anyHospinAL, row chi2
tab ANY_REC_RN_staffing anyCHCinAL, row chi2

```

* figure 2 - input for sankey diagram

* numbers input for sankey diagram:

```

tab NO_RHC_CHC_AL placeofdeath_3cat

```

*** other info throughout manuscript text:

* how many facilities are these part of?

```

capture drop rowno_facility

```

```

bysort State FacilityID: gen rowno_facility = _n

```

```

count if rowno_facility == 1 // 6,274

```

* how many licenses with indep var?

```

tab allLicenseCodes ANY_REC_hospice
tab ANY_REC_hospice if rowno == 1
tab State ANY_REC_hospice if rowno == 1
tab ANY_REC_RN_staffing if rowno == 1
tab State ANY_REC_RN_staffing if rowno == 1

```

```

* how many classification combinations?
capture drop rowno_clas
bysort State sum_classifications: gen rowno_clas = _n
tab sum_classifications if rowno_clas == 1 // 146

```

```

tab ANY_REC_RN_staffing if rowno_clas == 1
tab ANY_REC_hospice if rowno_clas == 1
tab ANY_REC_hospice if rowno_facility == 1

```

```

* how many states where hospice care not explicitly allowed
tab State ANY_REC_hospice if rowno == 1

```

```

* how many facilities had different policies
tab ANY_REC_hospice if rowno_facility == 1
tab ANY_REC_RN_staffing if rowno_facility == 1

```

```

* % received hospice in AL, % received CHC
tab anyHospinAL
tab NO_RHC_CHC_AL

```

```

* % decedents with independent variables
tab ANY_REC_hospice
tab ANY_REC_RN_staffing

```

```

* report amount of variance
xtset HRR
xtsum dAL_hospice_any

```

* Questions from reviewers:

* look at those who receive no hospice in AL and die elsewhere w/ hospice

* are they more often in the states where hospice is not explicitly allowed? ?

```
gen nohospAL_hospElse = 0
```

```
replace nohospAL_hospElse = 1 if placeofdeath_3cat == 1 & NO_RHC_CHC_AL == 0
```

```
gen states_nohosp = 0
```

```
replace states_nohosp = 1 if State == "AK" | State == "AR" | State == "HI" | State ==
"ME" | State == "MN" | State == "MS" | State == "MT" | State == "NC" | State == "TX"
```

```
tab nohospAL_hospElse states_nohosp, row
```
