Supplementary material

S1 File. Stata do file. The Stata do-file can be used in the readers own dataset.

```
use "E:\Users\Kani\AOM_20181003\200311\analysis\cohort3580COPD_kani", clear

keep lpnr lessthan5years muerto2011 muerto_raros seninvar_2010 stayer nostayer
lan sex COPD2 CBCOPD ASTMA IMM_2011 SABASAMA_2011 SABASAMA_prev IMM_prev
LABA_2011 ///
LAMA_2011 LABALAMA_2011 LABAICS_2011 LABALAMAICS_2011 age income
income_tertiles18_10 cons

codebook age
*Number of individuals aged 35-80 residing in Sweden by 31 december 2010
*4,994,922

*Keep individuals with an ICDJ43-J44=COPD2

*4,918,895 individuals erased.

tab COPD2
tab CBCOPD
keep if COPD2==1
*CBCOPD 76,027
*COPD2  69,391
*ASTMA 112,263

*keep individuals with previuos inhaled maintenance medication
tab IMM_prev
codebook IMM_prev
keep if IMM_prev==0

**COPD2  52,991 remaining
*
* CBCOPD 55,940

*Erase individuals dead during 2011
tab muerto2011
drop if muerto2011==1

* 3,633  erased
*49,358 remaining

* CBCOPD 52,261  .

*erase late registrations of death
tab muerto_raros
drop if muerto_raros==1

* 7  individuals erased
* 49,351 remaining

* CBCOPD 52,253
```

```
*Erase residing in Sweden less than 5 years
tab lessthan5years
drop if lessthan5years==1
* 330 individuals erased
* 49,021 remaining
* CBCOPD 51,901  remaining

*MISSING VALUES
*age
tab age
codebook age
* 0 missing individuals
*  49,021   individuals remaining

*sex
tab sex
codebook sex
*0 missing individuals
*  49,021  individuals remaining

* income
tab income
codebook income
* missing 381 --> replace missing with 2010 tertiles income value
replace income_ter=3-income_ter
replace income=income_tertiles18_10 if missing(income)
codebook income

* 0 missing
*  49,021  individuals remaining


*county
tab lan
codebook lan
*0 missing individuals


***49,021 individuals left***
save
"E:\Users\Kani\AOM_20181003\200311\analysis\cohort3580COPD_analysis_200319",
replace

****deleting patients with 0 or negative values
use "E:\Users\Kani\AOM_20181003\200311\analysis\cohort3580COPD_analysis_200319"
, clear
keep lpnr
cd "E:\Users\Kani\AOM_20181003\200311\analysis"
save idn, replace


forval i=2005 (1) 2010{
```

```
                   use "F:\LOMAS2010 (Läkemedel)\Work\Lakemedel\R_`i'.dta", clear

                   keep if year(edatum)==`i'
                   keep if atc== "R03AC13" | atc== "R03AC18" | atc== "R03AC19" |
atc=="R03AK06" | ///
                   atc=="R03AK07" | atc=="R03AK08" | atc=="R03AK10" |
atc=="R03AL03" | atc=="R03AL04" ///
                   | atc=="R03AL05" | atc=="R03AL06" | atc=="R03AL07" |
atc=="R03AL08" | ///
                   atc=="R03AL09" | atc=="R03BB04" | atc=="R03BB05" |
atc=="R03BB06" | atc=="R03BB07"

                   gcollapse (sum) sumantal=antal, by (lpnr)
                   keep if sumantal<=0
                   cd "E:\Users\Kani\AOM_20181003\200311\analysis"
                   save negative_values_`i', replace
                   use "E:\Users\Kani\AOM_20181003\200311\analysis\idn", clear
                   merge 1:1 lpnr using negative_values_`i'
                   drop if _m==2
                   drop _m
                   save "E:\Users\Kani\AOM_20181003\200311\analysis\idn", replace
                   }
drop if sumantal<=0
drop sumantal
save, replace
**2 observations deleted (no prev use of IMM)

**merge IDN with cohort
use "E:\Users\Kani\AOM_20181003\200311\analysis\cohort3580COPD_analysis_200319",
clear
merge 1:1 lpnr using idn
drop if _m==2
drop if _m==1
drop _m
save
"E:\Users\Kani\AOM_20181003\200311\analysis\cohort3580COPD_analysis_200319",
replace

***checking negative values during 2011
cd "E:\Users\Kani\AOM_20181003\200311\analysis"
use "F:\LOMAS2010 (Läkemedel)\Work\Lakemedel\R_2011.dta", clear
keep if year(edatum)==2011
keep if atc=="R03AC12" | atc=="R03AC13" | atc== "R03AC18" | atc== "R03AC19" |
atc=="R03AK06" | ///
atc=="R03AK07" | atc=="R03AK08" | atc=="R03AK10" | atc=="R03AL03" |
atc=="R03AL04" ///
 | atc=="R03AL05" | atc=="R03AL06" | atc=="R03AL07" | atc=="R03AL08" | ///
 atc=="R03AL09" | atc=="R03BB04" | atc=="R03BB05" | atc=="R03BB06" |
atc=="R03BB07"

gcollapse (sum) sumantal=antal, by (lpnr)
keep if sumantal<=0
```

```
cd "E:\Users\Kani\AOM_20181003\200311\analysis"
save "OR_negative_values", replace
use "E:\Users\Kani\AOM_20181003\200311\analysis\cohort3580COPD_analysis_200319",
clear
merge 1:1 lpnr using "OR_negative_values"
drop if _m==2

replace IMM_2011=1 if _m==3
drop _m sumantal
save
"E:\Users\Kani\AOM_20181003\200311\analysis\cohort3580COPD_analysis_200319",
replace
***49,019 remaining

*** Create intercategorical groups
replace age =2-age
label def agelbl 0 "65-80" 1 "50-64" 2 "35-49"
label val age agelbl
egen ASI= group(age sex income), label




proportion IMM_2011 , over (sex age income ASI)
proportion IMM_2011, over (lan)
/* proportion disscontinuation (over ASI) with CI 95%




    _subpop_1: ASI = 65-80 male high
    _subpop_2: ASI = 65-80 male Middle
    _subpop_3: ASI = 65-80 male low
    _subpop_4: ASI = 65-80 female high
    _subpop_5: ASI = 65-80 female Middle
    _subpop_6: ASI = 65-80 female low
    _subpop_7: ASI = 50-64 male high
    _subpop_8: ASI = 50-64 male Middle
    _subpop_9: ASI = 50-64 male low
   _subpop_10: ASI = 50-64 female high
   _subpop_11: ASI = 50-64 female Middle
   _subpop_12: ASI = 50-64 female low
   _subpop_13: ASI = 35-49 male high
   _subpop_14: ASI = 35-49 male Middle
   _subpop_15: ASI = 35-49 male low
   _subpop_16: ASI = 35-49 female high
   _subpop_17: ASI = 35-49 female Middle
   _subpop_18: ASI = 35-49 female low


 _prop_2      |
  _subpop_1 |    .1764873    .0064166    .1642606    .1894178
   _subpop_2 |    .1774057    .0049679    .1678772    .1873533
   _subpop_3 |    .1879253    .0051603    .1780196    .1982493
   _subpop_4 |     .147398    .0059456    .1361213    .1594366
   _subpop_5 |     .153041    .0042818    .1448358    .1616232
```

```
    _subpop_6  |    .1533342    .0040763     .1455139    .1614953
    _subpop_7  |    .2153141    .0105153     .1954195    .2366384
    _subpop_8  |    .2430366    .0100237     .2239324    .2632178
    _subpop_9  |    .2679196    .0092588     .2501661    .2864516
   _subpop_10  |    .1520237    .0079768     .1370398    .1683263
   _subpop_11  |    .1783747     .007104     .1648734    .1927264
   _subpop_12  |    .2151407    .0073911     .2010082    .2299809
   _subpop_13  |    .2956522    .0425535     .2194953    .3851922
   _subpop_14  |    .3478261    .0375362     .2782948    .4245111
   _subpop_15  |    .3659942    .0258594     .3169402    .4179945
   _subpop_16  |    .2352941    .0514397     .1494406    .3501648
   _subpop_17  |    .3224299    .0319513     .2632236    .3879414
   _subpop_18  |    .3177458    .0161224     .2870165    .3501494


*proporion over län
__subpop_1: lan = Stockholms län
   _subpop_2: lan = Uppsala län
   _subpop_3: lan = Södermanlands län
   _subpop_4: lan = Östergötlands län
   _subpop_5: lan = Jönköpings län
   _subpop_6: lan = Kronobergs län
   _subpop_7: lan = Kalmar län
   _subpop_8: lan = Gotlands län
   _subpop_9: lan = Blekinge län
  _subpop_10: lan = Skåne län
  _subpop_11: lan = Hallands län
  _subpop_12: lan = Västra Götalands län
  _subpop_13: lan = Värmlands län
  _subpop_14: lan = Örebro län
  _subpop_15: lan = Västmanlands län
  _subpop_16: lan = Dalarnas län
  _subpop_17: lan = Gävleborgs län
  _subpop_18: lan = Västernorrlands län
  _subpop_19: lan = Jämtlands län
  _subpop_20: lan = Västerbottens län
  _subpop_21: lan = Norrbottens län

_prop_2       |
    _subpop_1 |    .2101117    .0040682      .202249    .2181964
    _subpop_2 |    .1648028    .0090008     .1479101    .1832101
    _subpop_3 |    .1677057    .0093285     .1502085    .1867932
    _subpop_4 |    .1528269    .0075622     .1385864    .1682448
    _subpop_5 |    .1586128    .0087103     .1422762    .1764394
    _subpop_6 |    .1617162    .0122121     .1391846    .1871024
    _subpop_7 |    .1774436    .0104758     .1578331    .1989152
    _subpop_8 |    .2024169     .022085     .1625496    .2491532
    _subpop_9 |    .1811765     .013211     .1567065    .2085226
   _subpop_10 |    .1769978    .0042581     .1688056    .1854987
   _subpop_11 |    .1641497    .0094915     .1463826    .1836095
   _subpop_12 |    .1965112     .004568     .1877117    .2056187
   _subpop_13 |    .1386736     .010143     .1199617    .1597742
```

```
    _subpop_14 |    .1740764    .0094883      .1562554    .1934639
    _subpop_15 |    .1888218    .0107557      .1686367    .2108102
    _subpop_16 |    .1728838    .0101281       .153924    .1936445
    _subpop_17 |    .1782032    .0103846      .1587506    .1994743
    _subpop_18 |    .1698984    .0114116      .1486865    .1934489
    _subpop_19 |    .1843854    .0158055      .1553938    .2173937
    _subpop_20 |         .18    .0113291      .1588528     .203282
    _subpop_21 |    .1928375    .0103536      .1733521    .2139462
    -------------------------------------------------------------

*/
save , replace
gen denom=1
collapse (mean) propIMM_2011=IMM_2011 (sum) numerator=IMM_2011 denom, ///
  by(lan ASI cons sex age income) ///
  fast
 save "E:\Users\Kani\AOM_20181003\200311\analysis\analysis_aggregated", replace


use "E:\Users\Kani\AOM_20181003\200311\analysis\cohort3580COPD_kani", clear
keep lpnr alderslu
sort lpnr
save "alderslut", replace
use "E:\Users\Kani\AOM_20181003\200311\analysis\cohort3580COPD_analysis_200319",
clear
merge 1:1 lpnr using "alderslut"
keep if _m==3
drop _m

save, replace




********************************************************************************
*------------------------------------------------------------------------------*
*MODEL 1* cross classified county & strata
*------------------------------------------------------------------------------*
********************************************************************************
cd "E:\Users\Kani\AOM_20181003\200311\analysis"
use "E:\Users\Kani\AOM_20181003\200311\analysis\analysis_aggregated", clear
global MLwiN_path "C:\program files\MLwiN v3.02\mlwin.exe"
order lan ASI numerator denom propIMM_2011
sort lan ASI

**starting values by RIGLS PQL2
runmlwin propIMM_2011 cons, ///
  level3(lan: cons) ///
  level2(ASI: cons) ///
  level1(ASI: ) ///
  discrete(d(binomial) l(logit) denom(denom) pql2) ///
  rigls nopause

* fit by MCMC
```

```
runmlwin propIMM_2011 cons, ///
  level3(lan: cons, residuals(m1ul, savechains("m1lan.dta", replace))) ///
  level2(ASI: cons, residuals(m1ua, savechains("m1ASI.dta", replace))) ///
  level1(ASI: ) ///
  discrete(d(binomial) l(logit) denom(denom)) ///
  mcmc(cc b(5000) c(10000) savechains("m1b.dta", replace)) initsprevious  ///
  nopause
 estimates store M1

save "E:\Users\Kani\AOM_20181003\200311\analysis\workingModel_1", replace


*-------------------------------------------------------------------------------*
* PREPARE FIXED-PART PARAMETER CHAINS -- Model 1
*-------------------------------------------------------------------------------*
cd "E:\Users\Kani\AOM_20181003\200311\analysis"
use "m1b.dta", clear
drop deviance  OD_bcons_1
rename FP1_* b1_*
rename RP3_* var1_lan
rename RP2_* var1_strata
format %9.2f b1_* var1_*
compress
save "m1b_prepared.dta", replace
isid iteration
codebook iteration, compact


*-------------------------------------------------------------------------------*
* PREPARE county RANDOM EFFECTS CHAINS -- Model 1
*-------------------------------------------------------------------------------*
cd "E:\Users\Kani\AOM_20181003\200311\analysis"
use "m1lan.dta", clear
drop residual idnum
rename value v1
format %9.2f v1
sort lan iteration
order lan iteration
compress
save "m1lan_prepared.dta", replace
isid lan iteration
codebook iteration, compact


-------------------------------------------------------------------------------*
* PREPARE Strata RANDOM EFFECTS CHAINS -- Model 1
*-------------------------------------------------------------------------------*
cd "E:\Users\Kani\AOM_20181003\200311\analysis"
use "m1ASI.dta", clear
drop residual idnum
rename value u1
format %9.2f u1
sort ASI iteration
order ASI iteration
compress
```

```
save "m1ASI_prepared.dta", replace
isid ASI iteration
codebook iteration, compact
*------------------------------------------------------------------------------*
* MERGE DATA, FIXED-PART PARAMETER AND RANDOM EFFECTS CHAINS TOGETHER -- Model 1
*------------------------------------------------------------------------------*
cd "E:\Users\Kani\AOM_20181003\200311\analysis"
use "workingModel_1.dta", clear
isid lan ASI
cross using "m1b_prepared.dta"
sort lan ASI iteration
merge m:1 lan iteration using "m1lan_prepared.dta"
drop if _m==2
drop _m
isid lan ASI iteration
save "m1data_prepped.dta", replace

merge m:1 ASI iteration using "m1ASI_prepared.dta"
drop if _m==2
drop _m
isid lan ASI iteration
compress
save "m1data_prepped.dta", replace

*------------------------------------------------------------------------------*
*ABsolute risks* Model 1
*------------------------------------------------------------------------------*
**generate absolute risk prediction for county-level adjusted for socioeconomic
strata
use "m1data_prepped.dta", clear
gen pk=invlogit(b1_cons*cons + v1)
gcollapse (p2.5) pk_lo = pk (mean) pk_mn = pk (p97.5) pk_hi = pk, by(lan)
order pk_mn
sort pk_mn
list lan pk*

/*
```

```
     +----------------------------------------------------------+
     |              lan      pk_mn      pk_lo      pk_hi |
     |----------------------------------------------------------|
  1. |      Värmlands län    .1915128    .1589099    .2270184 |
  2. |   Östergötlands län    .1972514    .1683686    .2310522 |
  3. |     Jönköpings län     .203107    .1717029    .2365644 |
  4. |        Uppsala län    .2077087     .176239    .2429643 |
  5. |   Kronobergs län      .2093434    .1758691     .246853 |
     |----------------------------------------------------------|
  6. |       Hallands län    .2117124    .1784835    .2476448 |
  7. |   Södermanlands län    .2120799    .1809129     .247548 |
  8. | Västernorrlands län     .213455    .1800554    .2503714 |
  9. |        Örebro län    .2136259    .1816806    .2492121 |
```

```
 10. |        Dalarnas län    .2159964    .1832799    .2514309 |
     |----------------------------------------------------------|
 11. |          Skåne län    .2184061    .1904288    .2504331 |
 12. |         Kalmar län    .2194175    .1859462    .2572208 |
 13. |       Blekinge län    .2208856     .185438    .2597463 |
 14. |      Gävleborgs län    .2212304    .1879507    .2588649 |
 15. |  Västerbottens län    .2239033     .189382     .261542 |
     |----------------------------------------------------------|
 16. |       Jämtlands län    .2253893    .1889845    .2659114 |
 17. |    Västmanlands län    .2266632    .1918566    .2648307 |
 18. |       Gotlands län    .2273669    .1856868    .2738401 |
 19. |     Norrbottens län    .2354109    .2006443    .2738071 |
 20. | Västra Götalands län    .2420706    .2117578    .2762719 |
     |----------------------------------------------------------|
 21. |       Stockholms län     .257977    .2260939    .2942652 |
     +----------------------------------------------------------+
```

*/**figure 3 absolute risk county model 1

```stata
gen pk_rank=_n
gen pk_mncent=100*pk_mn
gen pk_hicent=100*pk_hi
gen pk_locent=100*pk_lo
sort pk_rank pk_mncent
twoway ///
  (scatter pk_mncent pk_rank, mcolor(black) msymbol(circle) msize(small)) ///
  (rspike pk_hicent pk_locent pk_rank, lcolor(black)), ///
  ytitle("Predicted county absolut risks (%) (adjusted)") ///
  ylabel(0(5)55, angle(horizontal) format(%9.2f)) ///
  xtitle("county") ///
  xlabel(1 "Värmland" 2 "Östergötland" 3 "Jönköping" ///
  4 "Uppsala" 5 "Kronoberg" 6 "Halland" 7 "Södermanland" ///
  8 "Västernorrland" 9 "Örebro" 10 "Dalarna" 11 "Skåne" ///
  12 "Kalmar" 13 "Blekinge" 14 "Gävleborg" 15 "Västerbotten" ///
  16 "Jämtland" 17 "Västmanland" 18 "Gotland" 19 "Norrbotten" ///
  20 "Västra Götaland" 21 "Stockholm", angle(vertical) labsize(vsmall)) ///
  legend(off) scheme(s1mono)

graph export "AR1county.png", replace width(1000)

**generate absolute risk prediction for strata-level adjusted for counties
use "m1data_prepped.dta", clear
gen pj=invlogit(b1_cons*cons+u1)
gcollapse (p2.5) pj_lo = pj (mean) pj_mn = pj (p97.5) pj_hi = pj, by( sex age
income ASI)

list ASI pj*

/*
```

```
        +----------------------------------------------------+
        |                ASI      pj_lo      pj_mn      pj_hi |
        |----------------------------------------------------|
  1.    |      65-80 male high   .1538118    .1670674    .180766 |
  2.    |    65-80 male Middle   .1593487    .1707308   .1823993 |
  3.    |       65-80 male low   .1705583    .1822321   .1946208 |
  4.    |     50-64 male high    .1852138    .2058892   .2276898 |
  5.    |   50-64 male Middle    .2124419    .2338519   .2546153 |
        |----------------------------------------------------|
  6.    |      50-64 male low    .2363836    .2561281    .276502 |
  7.    |     35-49 male high    .1973634    .2653607   .3401613 |
  8.    |   35-49 male Middle       .25065    .3158447   .3875589 |
  9.    |      35-49 male low    .2923216    .3405144   .3910073 |
 10.    |   65-80 female high    .1261693    .1380714   .1508275 |
        |----------------------------------------------------|
 11.    | 65-80 female Middle    .1356818    .1456054   .1563751 |
 12.    |    65-80 female low    .1385361    .1484732   .1587844 |
 13.    |   50-64 female high    .1295231    .1454701   .1622274 |
 14.    | 50-64 female Middle    .1576995    .1723826   .1887844 |
 15.    |    50-64 female low    .1918961    .2071862   .2230229 |
        |----------------------------------------------------|
 16.    |   35-49 female high    .1440164    .2178686   .3050906 |
 17.    | 35-49 female Middle    .2401654    .2957675    .355378 |
 18.    |    35-49 female low    .2735842    .3046449   .3383381 |
        +----------------------------------------------------+
```

*/**figure 4 absolute risk strata model 1

```
gen pj_rank=_n
 gen pj_mncent=100*pj_mn
 gen pj_hicent=100*pj_hi
 gen pj_locent=100*pj_lo
sort sex age income
order sex age income
twoway ///
  (scatter pj_mncent pj_rank, mcolor(black) msymbol(smcircle)) ///
  (rspike pj_hicent pj_locent pj_rank, lcolor(black)), ///
  ytitle("Predicted strata absolut risks (%) (adjusted)") ///
  ylabel(0(5)55, angle(horizontal) format(%9.2f)) ///
  xtitle("sociodemographic Strata") ///
  xlabel(1 "65-80 male high" 2 "65-80 male Middle" 3 "65-80 male low" ///
  4 "50-64 male high" 5 "50-64 male Middle" 6 "50-64 male low" 7 "35-49 male
high" ///
  8 "35-49 male Middle" 9 "35-49 male low" 10 "65-80 female high" 11 "65-80
female Middle" ///
  12 "65-80 female low" 13 " 50-64 female high" 14 "50-64 female Middle" 15
"50-64 female low" ///
  16 "35-49 female high" 17 "35-49 female Middle" 18 "35-49 female low",  ///
  angle(vertical) labsize(vsmall)) ///
  legend(off) scheme(s1mono)

graph export "AR1strata.png", replace width(1000)
```

```
***Absolute risks strata&counties model 1
use "m1data_prepped.dta", clear
gen pkj=invlogit(b1_cons*cons+v1+u1)
gcollapse (p2.5) pkj_lo = pkj (mean) pkj_mn = pkj (p97.5) pkj_hi = pkj, by(lan
ASI)
order pkj_mn
sort pkj_mn
list lan ASI pk*

gen pkj_rank=_n
sort pkj_rank pkj_mn
twoway ///
  (rspike pkj_hi pkj_lo pkj_rank, lcolor(gs13)) ///
  (scatter pkj_mn pkj_rank, mcolor(black) msymbol(smcircle) msize(tiny)), ///
  ytitle("Predicted absolut risks(adjusted)") ///
  ylabel(0(0.05)0.55, angle(horizontal) format(%9.2f)) ///
  xtitle("sociodemographic StrataXlan") ///
  xlabel(0 (50) 372 372) ///
  legend(off) scheme(s1mono)

graph export "AR1model1Strata&county.png", replace width(1000)
*-------------------------------------------------------------------------*
*VPCs* Model 1
*-------------------------------------------------------------------------*
**VPC for county-level, adjusted
use "m1data_prepped.dta", clear
gen VPCc= 100*(var1_lan/(var1_lan+var1_strata+((_pi^2)/3)))
gcollapse (p2.5) VPCc_lo=VPCc (mean) VPCc_mn=VPCc (p97.5) VPCc_hi=VPCc
order VPCc_mn
list VPC*

/*  VPCc as %


  +-------------------------------+
     |  VPCc_mn    VPCc_lo    VPCc_hi |
     |-------------------------------|
  1. | .3519686   .1466865   .7476869 |
     +-------------------------------+



*/

**VPC for STRATA-level, adjusted
use "m1data_prepped.dta", clear
gen VPCsds= 100*(var1_strata/(var1_lan+var1_strata+((_pi^2)/3)))
gcollapse (p2.5) VPCsds_lo=VPCsds (mean) VPCsds_mn=VPCsds (p97.5)
VPCsds_hi=VPCsds
order VPCsds_mn
list VPC*

/*  VPCsds as %
```

```
        +-------------------------------+
        |  VPCsds~n   VPCsds~o   VPCsds~i  |
        |-------------------------------|
     1. |  4.978777   2.417344   9.633404  |
        +-------------------------------+


*/
**VPC for total model 1, adjusted
use "m1data_prepped.dta", clear
gen VPCmodel1= 100*((var1_lan+var1_strata)/(var1_lan+var1_strata+((_pi^2)/3)))
gcollapse (p2.5) VPCmodel1_lo=VPCmodel1 (mean) VPCmodel1_mn=VPCmodel1 (p97.5)
VPCmodel1_hi=VPCmodel1
order VPCmodel1_mn
list VPC*

/*  VPCmodel1 as %


        +-------------------------------+
        |  VPCmod~n   VPCmod~o   VPCmod~i  |
        |-------------------------------|
     1. |  5.330746   2.766361   9.940882  |
        +-------------------------------+



*/
*---------------------------------------------------------------------------------*
*ROC AUC* Model 1
*---------------------------------------------------------------------------------*
use "m1data_prepped.dta", clear
generate phat = invlogit(b1_cons*cons + v1 + u1)
gcollapse (mean) phat, by (lan ASI denom numer)
expand 2
bysort lan ASI : generate y = _n - 1
generate n = .
replace n = denom - numer if y==0
replace n = numer if y==1
roctab y phat [fweight=n], graph summary mcolor(black) scheme(s1mono)
aspectratio(1)
graph export "AUC_modelOne.png", replace width(1000)

/* AUC model 1



              ROC                    -Asymptotic Normal--
       Obs      Area     Std. Err.     [95% Conf. Interval]
     ------------------------------------------------------------
      49,019    0.5806     0.0034        0.57401     0.58720
```

```
*/

use "m1data_prepped.dta", clear
generate phat = invlogit(b1_cons*cons + v1 )
gcollapse (mean) phat, by (lan ASI denom numer)
expand 2
bysort lan ASI : generate y = _n - 1
generate n = .
replace n = denom - numer if y==0
replace n = numer if y==1
roctab y phat [fweight=n], graph summary mcolor(black) scheme(s1mono)
aspectratio(1)
graph export "AUC_modelOnelan.png", replace width(1000)
/*AUC model 1 just counties
```

```
                      ROC                    -Asymptotic Normal--
            Obs        Area     Std. Err.      [95% Conf. Interval]
          --------------------------------------------------------------
          49,019      0.5351      0.0033        0.52858     0.54159
```

```
*/
use "m1data_prepped.dta", clear
generate phat = invlogit(b1_cons*cons + u1 )
gcollapse (mean) phat, by (lan ASI denom numer)
expand 2
bysort lan ASI : generate y = _n - 1
generate n = .
replace n = denom - numer if y==0
replace n = numer if y==1
roctab y phat [fweight=n], graph summary mcolor(black) scheme(s1mono)
aspectratio(1)
graph export "AUC_modelOnestrata.png", replace width(1000)
/*AUC model 1 just strata
```

```
                      ROC                    -Asymptotic Normal--
            Obs        Area     Std. Err.      [95% Conf. Interval]
          --------------------------------------------------------------
          49,019      0.5670      0.0034        0.56030     0.57364
```

```
*/
/*
ROC strata and county on same graph
*/
use "m1data_prepped.dta", clear
generate sociodemographic = invlogit(b1_cons*cons + u1 )
generate county = invlogit(b1_cons*cons + v1 )
gcollapse (mean) sociodemographic count, by (lan ASI denom numer)
```

```
expand 2
bysort lan ASI : generate y = _n - 1
generate n = .
replace n = denom - numer if y==0
replace n = numer if y==1
roccomp y sociodemographic county [fweight=n], graph summary scheme(s1mono)
aspectratio(1) leg(size(small))
graph export "AUC_modelOnestrataLAN.png", replace width(1000)


*******************************************************************************




**Sensitivity  groupings

*sesitivity cross-class 9x25x2 [9 age, 25 income, 2 sex]

cd "E:\Users\Kani\AOM_20181003\200311\analysis"
use "E:\Users\Kani\AOM_20181003\200311\analysis\cohort3580COPD_kani", clear
keep lpnr alderslu incomesum
sort lpnr
save "alderslut", replace
use "E:\Users\Kani\AOM_20181003\200311\analysis\cohort3580COPD_analysis_200319",
clear
merge 1:1 lpnr using "alderslut"
keep if _m==3
drop _m
save "E:\Users\Kani\AOM_20181003\200311\analysis\sens-cc", replace

egen age9= cut (alder), at (35,40,45,50,55,60,65,70,75,81)label
xtile income25= incomesum, nq(25)
keep lpnr lessthan5years muerto2011 muerto_raros seninvar_2010 stayer nostayer
lan sex COPD2 IMM_2011 SABASAMA_2011 SABASAMA_prev IMM_prev LABA_2011 ///
LAMA_2011 LABALAMA_2011 LABAICS_2011 LABALAMAICS_2011 age income alderslut_2010
income25 age9 cons


save , replace
egen ASI9= group(age9 sex income25), label
tab COPD2
keep if COPD2==1

tab IMM_prev
codebook IMM_prev
keep if IMM_prev==0

tab muerto2011
drop if muerto2011==1
```

```
tab muerto_raros
drop if muerto_raros==1


tab lessthan5years
drop if lessthan5years==1

drop if income25==.
*381 deleted
save, replace



gen denom=1
collapse (mean) propIMM_2011=IMM_2011 (sum) numerator=IMM_2011 denom, ///
  by(lan ASI9 cons sex age9 income25) ///
  fast
global MLwiN_path "C:\program files\MLwiN v3.02\mlwin.exe"
order lan ASI9 numerator denom propIMM_2011
sort lan ASI9

**starting values by RIGLS PQL2
runmlwin propIMM_2011 cons, ///
  level3(lan: cons) ///
  level2(ASI9: cons) ///
  level1(ASI9: ) ///
  discrete(d(binomial) l(logit) denom(denom) pql2) ///
  rigls nopause

* fit by MCMC

runmlwin propIMM_2011 cons, ///
  level3(lan: cons, residuals(m19ul, savechains("m1lan9.dta", replace))) ///
  level2(ASI9: cons, residuals(m19ua, savechains("m1ASI9.dta", replace))) ///
  level1(ASI9: ) ///
  discrete(d(binomial) l(logit) denom(denom)) ///
  mcmc(cc b(5000) c(10000) savechains("m1b9.dta", replace)) initsprevious  ///
  nopause


save "E:\Users\Kani\AOM_20181003\200311\analysis\sens200417", replace



*-------------------------------------------------------------------------------*
* PREPARE FIXED-PART PARAMETER CHAINS -- Model 1
*-------------------------------------------------------------------------------*
cd "E:\Users\Kani\AOM_20181003\200311\analysis"
use "m1b9.dta", clear
drop deviance  OD_bcons_1
rename FP1_* b1_*
rename RP3_* var1_lan
rename RP2_* var1_strata
format %9.2f b1_* var1_*
```

```
compress
save "m1b9_prepared.dta", replace
isid iteration
codebook iteration, compact


*--------------------------------------------------------------------------*
* PREPARE county RANDOM EFFECTS CHAINS -- Model 1
*--------------------------------------------------------------------------*
cd "E:\Users\Kani\AOM_20181003\200311\analysis"
use "m1lan9.dta", clear
drop residual idnum
rename value v1
format %9.2f v1
sort lan iteration
order lan iteration
compress
save "m1lan9_prepared.dta", replace
isid lan iteration
codebook iteration, compact


--------------------------------------------------------------------------*
* PREPARE Strata RANDOM EFFECTS CHAINS -- Model 1
*--------------------------------------------------------------------------*
cd "E:\Users\Kani\AOM_20181003\200311\analysis"
use "m1ASI9.dta", clear
drop residual idnum
rename value u1
format %9.2f u1
sort ASI9 iteration
order ASI9 iteration
compress
save "m1ASI9_prepared.dta", replace
isid ASI9 iteration
codebook iteration, compact
*--------------------------------------------------------------------------*
* MERGE DATA, FIXED-PART PARAMETER AND RANDOM EFFECTS CHAINS TOGETHER -- Model 1
*--------------------------------------------------------------------------*
cd "E:\Users\Kani\AOM_20181003\200311\analysis"
use "sens200417", clear
isid lan ASI9
cross using "m1b9_prepared.dta"
sort lan ASI9 iteration
merge m:1 lan iteration using "m1lan9_prepared.dta"
drop if _m==2
drop _m
isid lan ASI9 iteration
save "m1data9_prepped.dta", replace

merge m:1 ASI9 iteration using "m1ASI9_prepared.dta"
drop if _m==2
drop _m
isid lan ASI9 iteration
compress
save "m1data9_prepped.dta", replace
```

```
*------------------------------------------------------------------------*
*VPCs* Model 1
*------------------------------------------------------------------------*
**VPC for county-level, adjusted
use "m1data9_prepped.dta", clear
gen VPCc= 100*(var1_lan/(var1_lan+var1_strata+((_pi^2)/3)))
gcollapse (p2.5) VPCc_lo=VPCc (mean) VPCc_mn=VPCc (p97.5) VPCc_hi=VPCc
order VPCc_mn
list VPC*

/*  VPCc as %
```

```
      +-------------------------------+
      |  VPCc_mn     VPCc_lo    VPCc_hi |
      |-------------------------------|
   1. |  .3803298    .1550018   .8109455 |
      +-------------------------------+
```

```
*/

**VPC for STRATA-level, adjusted
use "m1data9_prepped.dta", clear
gen VPCsds= 100*(var1_strata/(var1_lan+var1_strata+((_pi^2)/3)))
gcollapse (p2.5) VPCsds_lo=VPCsds (mean) VPCsds_mn=VPCsds (p97.5)
VPCsds_hi=VPCsds
order VPCsds_mn
list VPC*

/*  VPCsds as %
```

```
      +-------------------------------+
      |  VPCsds~n    VPCsds~o   VPCsds~i |
      |-------------------------------|
   1. |  2.704777    2.037974   3.535365 |
      +-------------------------------+
```

```
*/
**VPC for total model 1, adjusted
use "m1data9_prepped.dta", clear
gen VPCmodel1= 100*((var1_lan+var1_strata)/(var1_lan+var1_strata+((_pi^2)/3)))
gcollapse (p2.5) VPCmodel1_lo=VPCmodel1 (mean) VPCmodel1_mn=VPCmodel1 (p97.5)
VPCmodel1_hi=VPCmodel1
order VPCmodel1_mn
list VPC*
```

```
/*  VPCmodel1 as %

        +------------------------------+
        | VPCmod~n   VPCmod~o   VPCmod~i |
        |------------------------------|
     1. | 3.085107    2.34925   3.984625 |
        +------------------------------+


*/
*-----------------------------------------------------------------------------*
*ROC AUC* Model 1
*-----------------------------------------------------------------------------*
use "m1data9_prepped.dta", clear
generate phat = invlogit(b1_cons*cons + u1)
gcollapse (mean) phat, by (lan ASI9 denom numer)
expand 2
bysort lan ASI9 : generate y = _n - 1
generate n = .
replace n = denom - numer if y==0
replace n = numer if y==1
roctab y phat [fweight=n], graph summary mcolor(black) scheme(s1mono)
aspectratio(1)


/*
ACU sociodemographic context

                        ROC                 -Asymptotic Normal--
            Obs        Area     Std. Err.    [95% Conf. Interval]
         -----------------------------------------------------------
          48,638      0.5945      0.0034      0.58793      0.60115

*/
```