CENTRE DE RECHERCHE EN DÉMOGRAPHIE ET SOCIÉTÉS, UCL

ANALYSIS-ORIENTED LONGITUDINAL DATA MANAGEMENT:
CHANGING THE ANALYTICAL PERSPECTIVE IN DHS AND HDSS

20 March 2012

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Outline

Conviction: longitudinal data process model influences the quality of the analysis

- Breaking the myths on EHA
- Process for descriptive analysis
  - Conventional approach
  - EHA approach
- Process for regression analysis
  - Conventional approach
  - EHA approach

Some myths around Event History Analysis (EHA)

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- EHA is essentially about:
  - Lifetime data
  - Survey data
  - Right-censored data
  - Multivariate analysis
- EHA is inappropriate or a waste of time for:
  - Short-time data
  - Register or census data
  - Left-censored data
  - Basic, descriptive or aggregate data

(Terminology used in this presentation:
Event history analysis = biographical data analysis)

Event History Analysis (EHA)

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EHA should not be:	EHA should be:
… starting from after data cleaning	… starting from data collection and data management
… separated from cross-sectional analysis	… forming a continuum with cross-sectional analysis
… used only at senior (PhD) level	… part of basic training (Master's level)
… left to analysts only	… integrated into data processing

Conventional model of descriptive data process: "Module approach"

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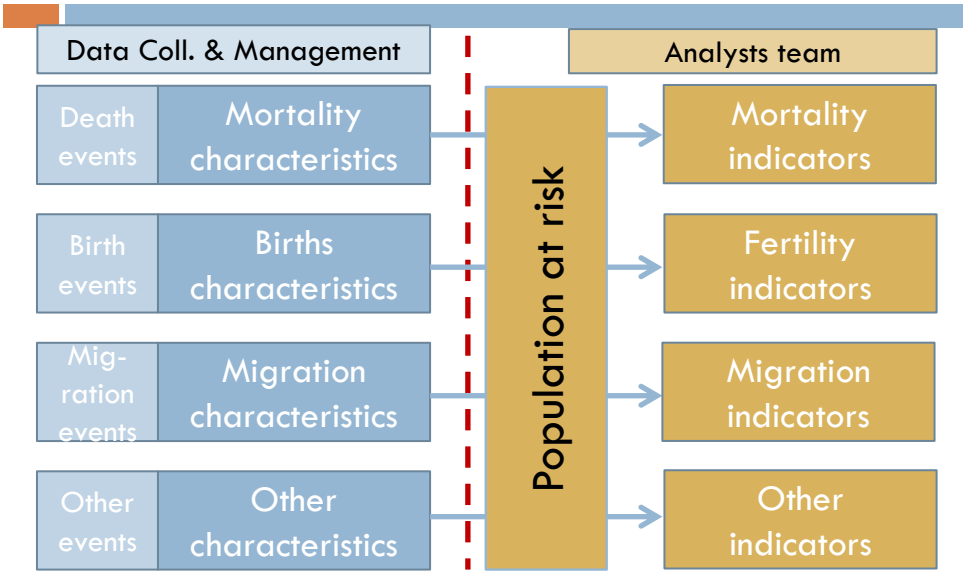

Conventional model of descriptive data process: "Module approach" in words

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- Numerator is aggregated on fixed time intervals
- Denominator is aggregated on fixed time intervals:
  - Either mid-year/period population
  - Or mean population (multiplied by number of years in the interval to approximate person-years at risk)
- Rates are obtained by dividing numerator by denominator
- Assumption of equal distribution over time interval for both numerator and denominator
  - Necessary when cohort data is used to compute calendar time (period) indicators, or *vice versa*

Conventional model of descriptive data process: "Module approach" pitfalls

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- Computing the number of events (numerator) usually not a problem
- Risk of computing denominator wrongly:
  - Assumption of equal distribution is wrong in many instances
  - Person-years at risk depends on inclusion and exclusion criteria defined using other files
- Probability-to-rate conversion (or vice versa) heavily depends on equal distribution assumption

EHA model of descriptive data process: "Core residency file approach"

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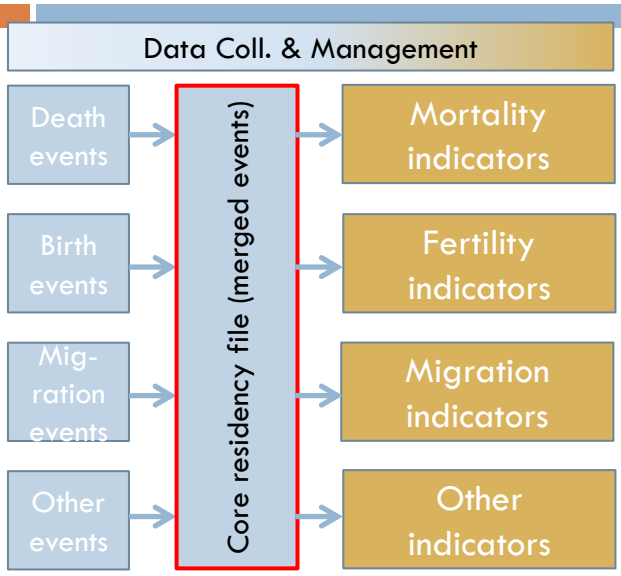

What is a core residency file? ("Core individual level residency file")

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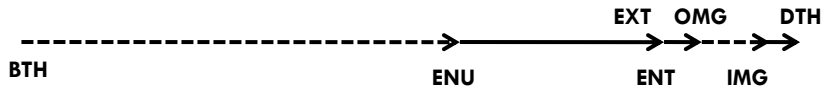
	Individual_ID	Household_ID	Event	DoB	DateEvent
A	G0010010010001	G00100100100	ENU	17 Nov 1947	21 Aug 2002
	G0010010010001	G00100100100	EOB	17 Nov 1947	31 Dec 2010
B	G0010010010002	G00100100100	ENU	1 Jul 1976	21 Aug 2002
	G0010010010002	G00100100100	OMG	1 Jul 1976	1 Jul 2007
C	G0010010010003	G00100100100	ENU	23 Aug 1985	21 Aug 2002
	G0010010010003	G00100100100	EXT	23 Aug 1985	1 Jul 2007
	G0010010010003	G00203000104	ENT	23 Aug 1985	2 Jul 2007
	G0010010010003	G00203000104	OMG	23 Aug 1985	10 Nov 2007
	G0010010010003	G00100100111	IMG	23 Aug 1985	30 Mar 2008
	G0010010010003	G00100100111	DTH	23 Aug 1985	15 Oct 2008
D	G0010010010004	G00100100100	ENU	1 Jul 1988	21 Aug 2002
	G0010010010004	G00100100100	EXT	1 Jul 1988	1 Jul 2007
	G0010010010004	G00203000104	ENT	1 Jul 1988	2 Jul 2007
	G0010010010004	G00203000104	OMG	1 Jul 1988	10 May 2008
E	G0010010010005	G00100100100	BTH	1 Jul 2005	1 Jul 2005
	G0010010010005	G00100100100	EOB	1 Jul 2005	31 Dec 2010
F	G0010010010006	G00100100100	IMG	1 Jul 1983	31 Aug 2007
	G0010010010006	G00100100100	OMG	1 Jul 1983	8 Apr 2008



EHA model of descriptive data process: Event and date consistency checks

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- Check non-logical sequence of events such as:
  - ⇒ BTH after DTH/ENU/IMG...
  - ⇒ Succession of same event
  - ⇒ First event not ENU, IMG or BTH
  - ⇒ Last event not OMG, DTH or end of observation (EOB)
  - ⇒ Internal moves: EXT not followed by ENT
- Check dates:
  - ⇒ Date of birth, date of last observation...
  - ⇒ Non-logical sequence often originate in errors of dates
  - ⇒ Need at least one day between BTH and DTH (born alive)

Kintampo HDSS: before corrections

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event	ENU	BTH	IMG	OMG	EXT	ENT	DTH	CUR	.	Total
ENU	320	0	346	48,569	22,941	34	4,503	49,530	14	126,257
BTH	0	6	28	3,530	3,036	0	1,091	16,335	0	24,026
IMG	5	1	367	26,058	11,452	74	1,025	45,959	11	84,952
OMG	0	0	10,856	306	210	435	6	329	74,853	86,995
EXT	0	0	875	65	538	44,837	2	280	72	46,669
ENT	0	0	362	8,455	8,455	475	563	27,404	161	45,875
DTH	0	0	0	0	0	0	19	1	7,192	7,212
CUR	3	0	0	0	0	1	0	346	139,978	140,328
.	0	1	2	12	16	10	3	42	149	235
Total	328	8	12,836	86,995	46,648	45,866	7,212	140,226	222,430	562,549
Percentage of records with inconsistencies: 2.26										

Kintampo HDSS: description of corrections

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Error type	Description	Number	Percentage	Solution
Wrong IDs	Arose due to correction of wrong IDs of individuals concerned but old IDs still in database	179	15.6%	Old IDs deleted from database
Inconsistent dates	Arose due to correction of wrong dates which led to inconsistencies with other dates previously entered concerning an individual's residency	317	40.3%	Corrections made on database
Duplicates	Arose mainly due to problems with merging data tables	188	27.7%	Removed by data correction program
Hanging cases	Migrations not reconciled	462	16.7%	Removed from current analysis by data correction program
Total		1146	100.0%	

EHA model of descriptive data process: "Core residency file approach" in words

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- Denominator is computed from exposure using all events defining inclusion (birth, enumeration, in-migration) and exclusion (death, last observation, out-migration) at the individual level
- Numerator is also computed at individual level
- Rates are obtained by dividing numerator by denominator
- Assumption of equal distribution is not needed
  - Rates can be computed for any time interval

EHA model of descriptive data process: "Core residency file approach" advantages

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- Basic demographic rates can be computed directly from the core residency file
  - Computer capacities allow large datasets handling
  - Regular and reliable production of indicators made easier
- No risk of computing denominator wrongly:
  - No assumption of equal distribution
  - Built-in person-years at risk computation based on inclusion and exclusion criteria
- Probability-to-rate conversion (or vice versa) is not necessary

Conventional model of EHA data process: Modules

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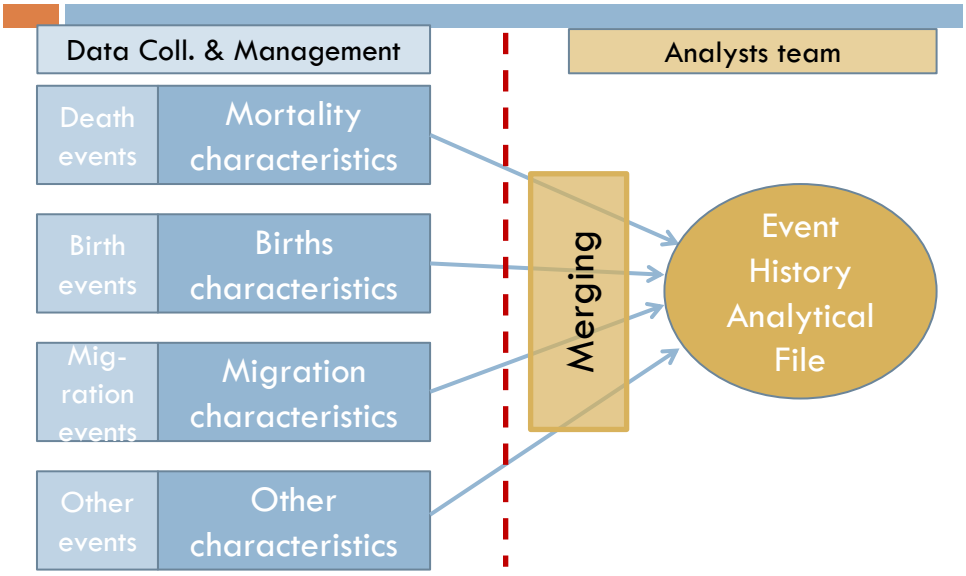

Recommended integrated process: Core residency file

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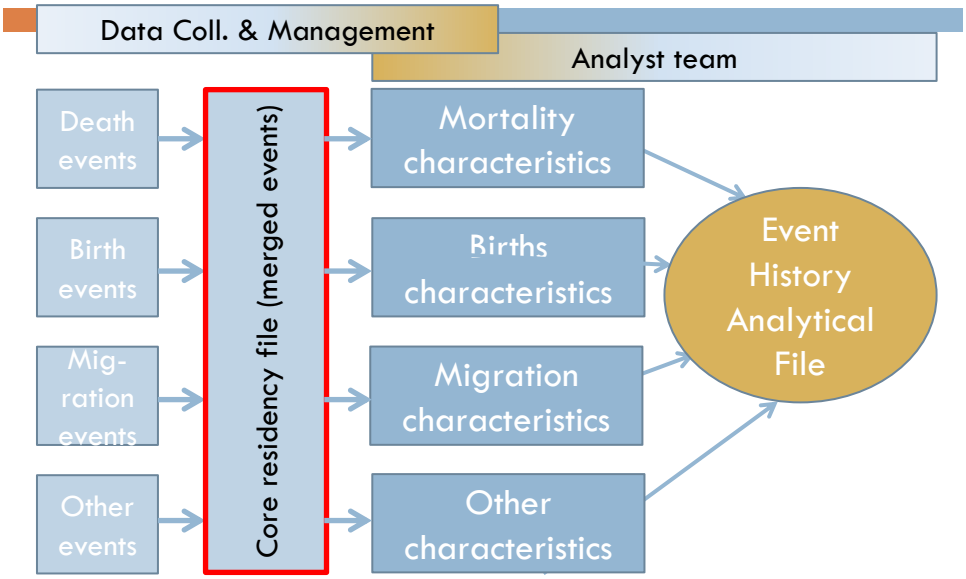

"Core residency file approach" : advantages for determinants (regression) analysis

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- Core residency file is:
  - Controlled at data management level
  - Basic demographic rates and regression analysis are consistent

  ⇒ No need for (differently endowed) analysts to merge files, with risk of producing different results
- Core residency file can easily be expanded on demand:
  - Adding event attributes (e.g. cause of death, child rank, migration destination and origin…)
  - Adding other status events that do not modify exposure in the reference population (e.g. changes in employment, education, marriage, etc.)

  ⇒ Flexibility
- EHA-oriented data management training needed at Masters level (data manager, research assistant…)

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Many thanks for your kind attention