Great Possibilities— Using Linked Data in New Ways

International Data Linkage Conference, Perth Australia, May 2, 2012

Leslie L Roos, PhD
Distinguished Professor
Dept of Community Health Sciences
University of Manitoba
Co-Founder, Manitoba Centre for Health Policy

UNIVERSITY OF MANITOBA | Faculty of Medicine
Community Health Sciences

Multiple Files, Multiple Contexts

- Boundary crossing
- Linkage often more than a technical exercise
- Linking to different intellectual traditions
- Examples from education data

Treading on Others' Turf

- Sociology
  - Like: Parental education, household income
  - Dislike: Even fine-grained ecological data substituting for family data

Treading on Others' Turf, cont'd

- Economics
  - Like: Experiments, strong quasi-experiments
  - Like: Sibling and twin studies (control for unmeasured family variables)

Strengths

1) Large N facilitates multi-level modeling—Design

    a)   Neighbourhood in 'proper place'

    b)   Family variables (can look at 2+ child families)

    c)   Individual variables

"child in family in neighbourhood"

2) Working explicitly at family level

3) Large N = many variables, many categories

Strengths, cont'd

4) Some variables can be age grouped—i.e. mental health (0-3), (4-8), etc.

5) Some variables can be combined for indices (SEFI, educational indices; population-based details published)

6) Multiple work on measures = great potential but complicated (particularly registry)

7) 'Portion of population' analyses facilitated

   a) Deal with criticisms

   b) Particularly interesting subgroups

Portion of Population

New Files/New Variables:

  - Pharmaceutical data provide <u>household income</u> information for portion of population

Passage of Time/Intergenerational Variables:

 - 1978 Birth cohort is 33 in 2011—1979 cohort is 32. <u>Parental education</u>—look at parents of children born 1995 and after
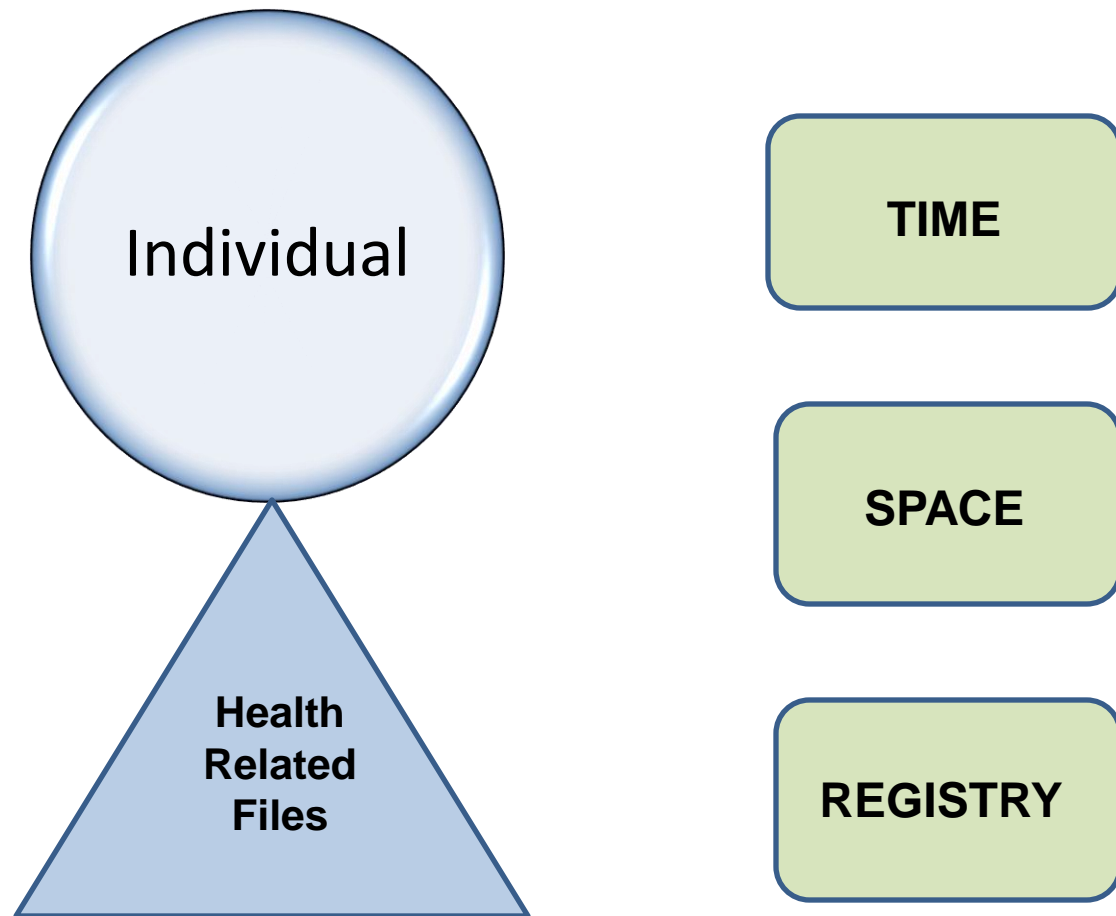
UNIVERSITY OF MANITOBA | Faculty of Medicine
Community Health Sciences

Compare to Well-Known Literature

a) 'Face Validity'—Educational indices similar to "number of 0 level passes" in 1958 British Birth Cohort Study
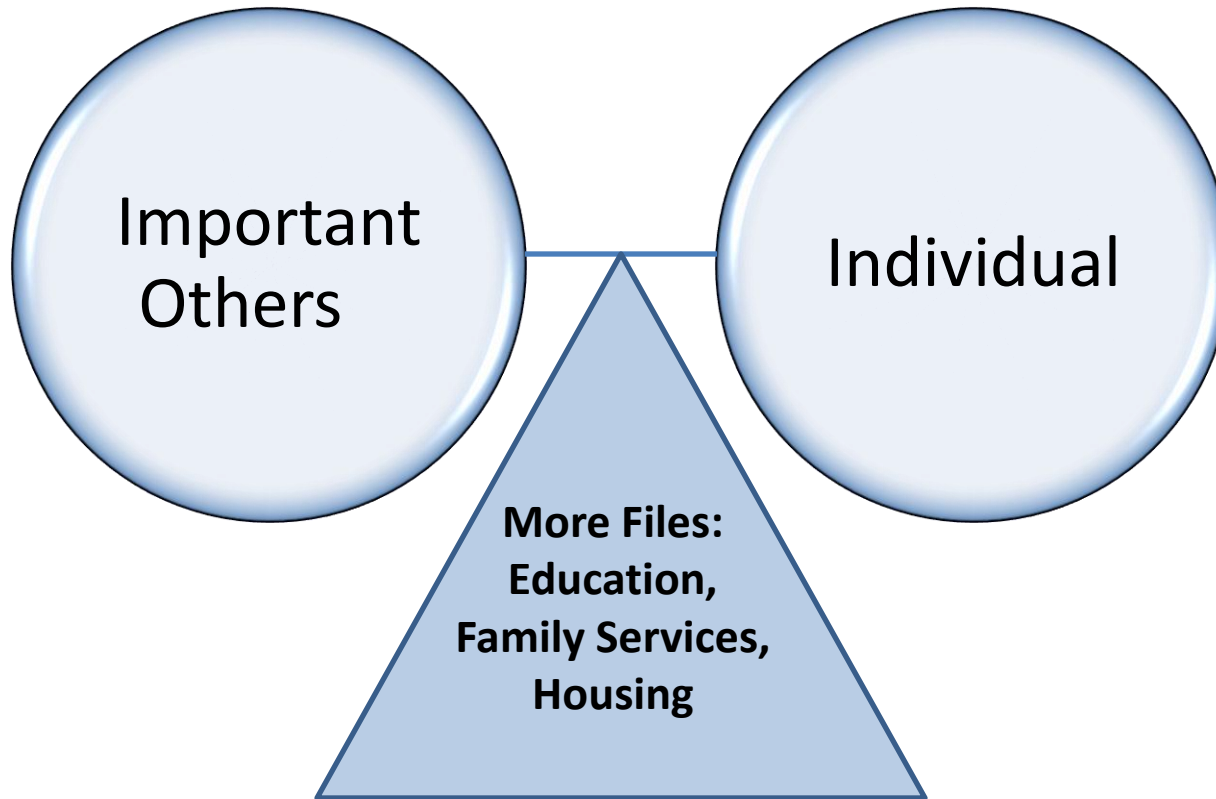
b) Duplicate published analyses

Compare to Well-Known Literature (cont'd)

c) Manitoba covariates predict educational achievement (without having parental education, race or religion) at least as well as Panel Study of Income Dynamics

UNIVERSITY OF MANITOBA | Faculty of Medicine
Community Health Sciences

Manitoba 2000

Manitoba 2012

Important Others

Individual

More Files:
Education,
Family Services,
Housing

TIME

SPACE

REGISTRY

Example: James Bolton's paper on Suicide

- Rare events/need large N to get sufficient sample

- Family response

- Population-based

- Before/after to control/examine outcomes

- Use of families experiencing traffic deaths as controls

UNIVERSITY OF MANITOBA | Faculty of Medicine

Community Health Sciences

Pre-death and post-death comparisons of suicide-bereaved parents and non-bereaved matched parent controls
*p<0.05; **p<0.01; ***p<0.001

Suicide-Bereaved (n=1415) vs.
Non-Bereaved (n=1415) (reference)

Outcomes	2 Years Pre-Death Adjusted Relative Rate[1] (95% Confidence Interval)	Pre-post Time Period X Parent Group Interaction (p-value)	2 Years Post-Death Adjusted Relative Rate[1] (95% Confidence Interval)
Mental disorders			
Depression	1.41 (1.16-1.71)***	<0.0001	3.09 (2.60-3.68)***
Anxiety disorder	1.27 (1.07-1.51)**	0.0045	1.69 (1.44-1.98)***
Any mental disorder	1.27 (1.12-1.43)***	<0.0001	1.96 (1.76-2.19)***
Demographic Factors			
Single marital status	0.99 (0.96-1.03)	0.0004	1.08 (1.01-1.12)***
Treatment Utilization			
Physician visit for mental illness	1.38 (0.96-1.98)	0.0001	2.64 (1.97-3.55)***

Manitoba Centre for Health Policy

UNIVERSITY OF MANITOBA | Faculty of Medicine
Community Health Sciences

Possibilities

- Population Perspective/Individual Perspective

- Across Different Kinds of Predictors

- Across Different Kinds of Outcomes

Important Variables
Grade 12 Achievement Index

VARIABLES	NUMBER OF CASES (with indicator=1)	POPULATION (Variance Reduction)	INDIVIDUAL (Regression Coefficient)
Mother's Age at First Birth (F)		1.8 (2)	
< 16	(615)		-0.45 (2)
16 ≤ 18	(2609)		-0.37 (3)
Family Social Assistance Usage (F) (Yes)	(7,171)	0.9 (6)	-0.30 (4)
Family Residential Mobility (F)		0.5 (7)	
(5 and up)	(6,705)		-0.25 (8)
(3 or 4)	(7,756)		-0.14 (11)
Male (I)	(21,202)	2.6 (1)	-0.28 (6)
Birth Order (I)		0.5 (8)	
4th born and up	(2,564)		-0.22 (10)
Child Receiving Services (Yes) (I)	(7,229)	1.6 (3)	-0.30 (5)
Child in Care (Yes) (I)	(1,526)	1.0 (5)	-0.50 (1)
ADHD/Conduct Disorders (I)		1.4 (4)	
Yes (Age 14-18)	(2,013)		-0.23 (9)
Yes (Age 9-13)	(2,634)		-0.26 (7)

In the 2 level model, the variance reduction associated with the neighbourhood SEFI score (a measure of socioeconomic status) was 2.3 per cent.

Less Important Variables

VARIABLES	POPULATION (Variance Reduction)
Family Size (F)	0.11
Family Structure History (F)	0.17
Birth weight, Gestational Age and APGAR (I)	0.09
*Congenital/Perinatal Anomalies (I)	0.00
Major Health Conditions (I)	0.00
Asthma (I)	0.04
Injury (I)	0.11

*About 1.5% of sample already excluded for intellectual disability and mental retardation.

UNIVERSITY OF MANITOBA | Faculty of Medicine
Community Health Sciences

Results

- Social Variables More Important Than Health Variables

- Only Mental Health in 'Important' Group

University of Manitoba | Faculty of Medicine
Community Health Sciences

"New" Information—Two Kinds (cont'd)

1) "Missing Pieces" Data Collection

   a) Acquiring one or more items of critical information

   b) Large N as possible

   Example: Obtaining zygosity highlights opportunities given existing twin/sibling data

UNIVERSITY OF MANITOBA | Faculty of Medicine
Community Health Sciences

"New" Information—Two Kinds (cont'd)

2) "Building on a Base" Data Collection

    a) Acquiring In-depth Information

    Example: Epigenetic data (small samples)

- Dunedin and Framington Studies
- 1958 British Birth Cohort Study

UNIVERSITY OF MANITOBA | Faculty of Medicine
Community Health Sciences

Challenge

- Adding Information from Respondents

- Data Collection/Linkage Raises Issues re: Privacy/Confidentiality

Wish to: - Add Missing Pieces

- Build on Base

UNIVERSITY OF MANITOBA | Faculty of Medicine
Community Health Sciences