Session 3: Describe how research in LMICs can create a (1) better understanding of how different social environments and public policies influence health outcomes related to aging; and (2) provide lessons that can be used in other settings, including the United States.

David Canning

Harvard University

Workshop on Developing an Agenda for Population Aging and Social Research
in Low- and Middle-Income Countries (LMICs)

National Academy of Sciences, Washington DC
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Possible effects on health

- Biology of Aging
- Evolutionary pressure, genetic markers, epigenetics, animal models
- SES and health in the elderly
- Cardiovascular health
- Alzheimer's and dementia
  - Measurement – mechanisms – prevalence, SES gradient, time trends, air pollution
- Physical ADL frailty
- Life course exposures and health
  - Long terms effects of childhood infection and nutation, effects of childbearing,
- Work Retirement and pensions
  - Retirement and health, savings and wealth of the elderly,
- Aging and Health Care
  - Demand, Heath care utilization, caregiving, long term care

Effect of Pensions

- Work related pensions more complex
  - Stop working, lower income than when working

- Non-contributary pensions : South Africa , China

- RCTs on cash transfers and health

Pension exposure and health: Evidence from a longitudinal study in South Africa

Carlos Riumallo Herl [a] [b] , Chodziwadziwa Kabudula [c], Kathleen Kahn [c] [e], Stephen Tollman [c] [e], David Canning [d]

Routledge
Taylor & Francis Group

Check for updates

Effects of Pension Eligibility Expansion on Men's Cognitive Function: Findings from Rural South Africa

Janet Jock MPP [a], Lindsay Kobayashi PhD [b], Rishika Chakraborty MSc [c], Xiwei Chen M.S. [d], Coady Wing PhD [a], Lisa Berkman PhD [e,f], David Canning PhD [e], Chodziwadziwa Whiteson Kabudula PhD [f], Stephen Tollman PhD [f,g,h], and Molly Rosenberg PhD [d,f]

- Positive effect of pension on health in Agincourt, South Africa

- Effect cumulates over time in the long run

- Some negative short run effects on men

- Large positive effects of rural pension in China on health

Why International comparisons are useful

$$Y_i = \beta X_i + \varepsilon_i$$

$$\hat{\beta} = (X'X)^{-1} X'Y$$

$$\mathrm{var}(\hat{\beta}) = \frac{\mathrm{var}(\varepsilon)}{N \, var(X)}$$

Odds on neonatal materiality with in utero and early life exposure to PM2.5
69 DHS country samples

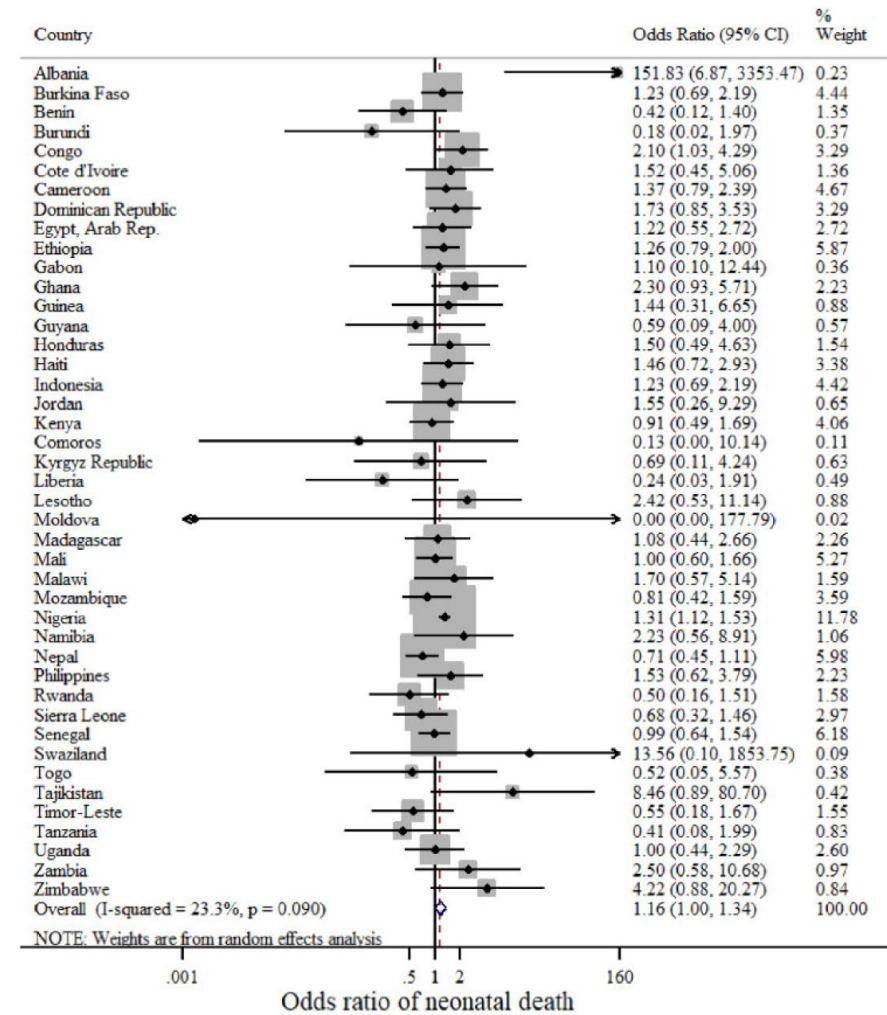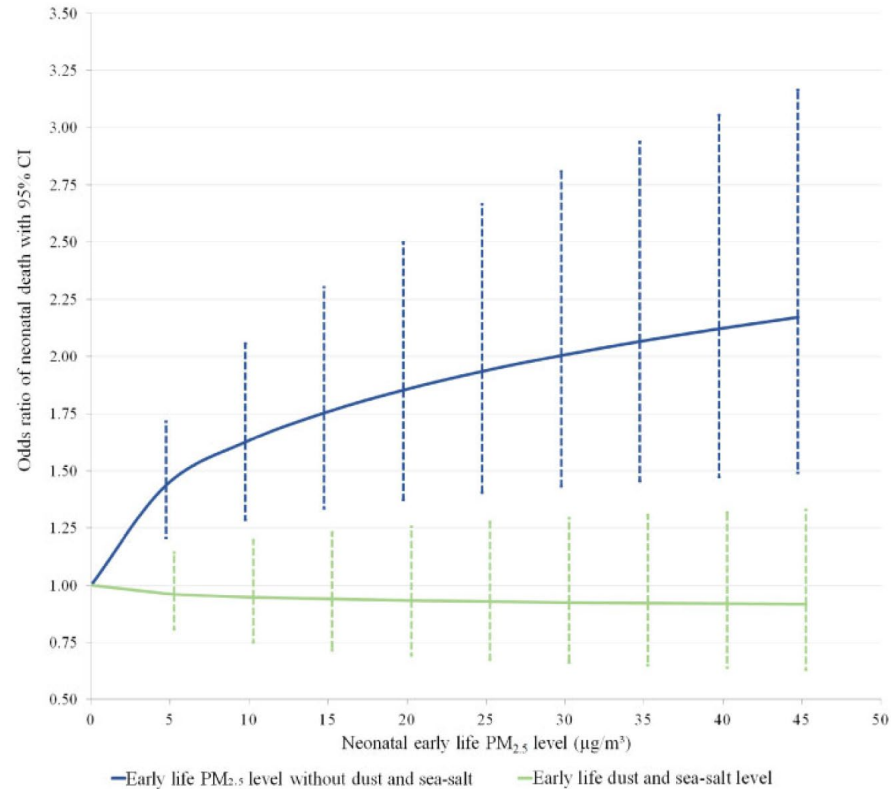| Country	Odds Ratio (95% CI)	% Weight
Albania	151.83 (6.87, 3353.47)	0.23
Burkina Faso	1.23 (0.69, 2.19)	4.44
Benin	0.42 (0.12, 1.40)	1.35
Burundi	0.18 (0.02, 1.97)	0.37
Congo	2.10 (1.03, 4.29)	3.29
Cote d'Ivoire	1.52 (0.45, 5.06)	1.36
Cameroon	1.37 (0.79, 2.39)	4.67
Dominican Republic	1.73 (0.85, 3.53)	3.29
Egypt, Arab Rep.	1.22 (0.55, 2.72)	2.72
Ethiopia	1.26 (0.79, 2.00)	5.87
Gabon	1.10 (0.10, 12.44)	0.36
Ghana	2.30 (0.93, 5.71)	2.23
Guinea	1.44 (0.31, 6.65)	0.88
Guyana	0.59 (0.09, 4.00)	0.57
Honduras	1.50 (0.49, 4.63)	1.54
Haiti	1.46 (0.72, 2.93)	3.38
Indonesia	1.23 (0.69, 2.19)	4.42
Jordan	1.55 (0.26, 9.29)	0.65
Kenya	0.91 (0.49, 1.69)	4.06
Comoros	0.13 (0.00, 10.14)	0.11
Kyrgyz Republic	0.69 (0.11, 4.24)	0.63
Liberia	0.24 (0.03, 1.91)	0.49
Lesotho	2.42 (0.53, 11.14)	0.88
Moldova	0.00 (0.00, 177.79)	0.02
Madagascar	1.08 (0.44, 2.66)	2.26
Mali	1.00 (0.60, 1.66)	5.27
Malawi	1.70 (0.57, 5.14)	1.59
Mozambique	0.81 (0.42, 1.59)	3.59
Nigeria	1.31 (1.12, 1.53)	11.78
Namibia	2.23 (0.56, 8.91)	1.06
Nepal	0.71 (0.45, 1.11)	5.98
Philippines	1.53 (0.62, 3.79)	2.23
Rwanda	0.50 (0.16, 1.51)	1.58
Sierra Leone	0.68 (0.32, 1.46)	2.97
Senegal	0.99 (0.64, 1.54)	6.18
Swaziland	13.56 (0.10, 1853.75)	0.09
Togo	0.52 (0.05, 5.57)	0.38
Tajikistan	8.46 (0.89, 80.70)	0.42
Timor-Leste	0.55 (0.18, 1.67)	1.55
Tanzania	0.41 (0.08, 1.99)	0.83
Uganda	1.00 (0.44, 2.29)	2.60
Zambia	2.50 (0.58, 10.68)	0.97
Zimbabwe	4.22 (0.88, 20.27)	0.84
Overall (I-squared = 23.3%, p = 0.090)	1.16 (1.00, 1.34)	100.00

NOTE: Weights are from random effects analysis

Figure 7. Country-specific analysis of the association of early-life PM$_{2.5}$ level without dust and sea-salt with neonatal death.

Generalizability and transportability

- External Validity versus internal validity

- Generalizability: Can we apply the lessons from a study sample to the population it drawn from

- Transportability: Can we apply lessons from one setting to another?

- Degtiar, Irina, and Sherri Rose. "A review of generalizability and transportability." Annual Review of Statistics and Its Application 10 (2023): 501-524.

Assumptions needed for external validity

- 1 Conditional Exchangeability.

- 2 Selection Positivity

- 3 Stable unit treatment value assumption for study selection

Conditional exchangeability for study selection

- Study sample and target population have the same distribution of unobserved effect modifiers

- Satisfied by random sample of population – generalizability

- Satisfied if we measure and correct for all effect modifiers – transportability
  - Testable
    - Either
      - Test for parameter equality across study sample and population
      - Test for predictions from study sample fit the population outcomes

Positivity of selection

- Every type has positive probability of section
  - Type defined on covariates that modify treatment effect

- Testable – match study sample to target population

- Limit implications to population that has positive probability of selection

  - Average treatment effect is uses as weights the inverse of the probability of being in the sample (requires positivity)

Testing STUVA (Stable unit treatment value assumption for study selection)

- Same measures and outcomes in study sample and target population (harmonization)
- Does being in a health study change outcomes?
  - Being in the study affects outcomes
  - Exposure to health issues; referrals for treatment based on biomarkers

- Testable

  - Compare panel data sample over time with new cross sections
  - Have a control group: eligible for study but randomly not selected – follow up once

Recommendations for transporting results

- Check of effect heterogeneity and measure effect modifiers

- Generalizability from random study sample to population
  - Check representativeness to selection effect
  - Check for study participation effect on outcomes

- Transportability from study sample to different population
  - Check for effect modification
  - Test for parameter equality in pooled models – multilevel models
  - Limit comparison to sridy sampel and population where modifying covariates overlap
  - Estimate weighted effects

SAPRIN Health and Demographic Surveillance System (HDSS) Nodes
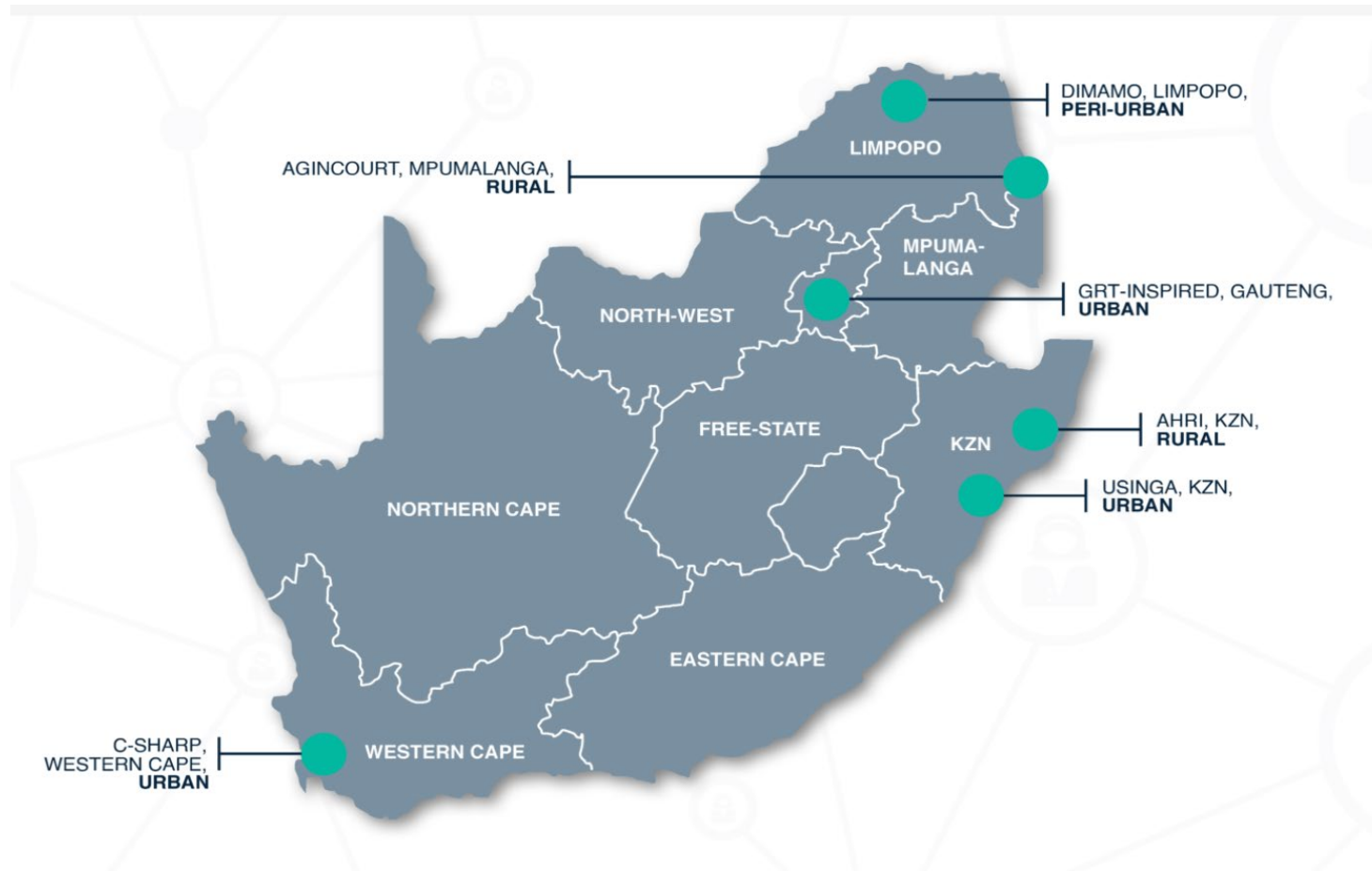
HAALSI : Generalizability – Using 6 HDSS communities

- Test for selection effects
  - Characteristics of refusals from HDSS : baseline and follow up

- Test for study participation health effect
  - Compare divergence over time pf those randomly selected for study with control group of eligible not selected (Agincourt 2014/15)

- Evidence with high internal validity
  - RCT in HDSS
  - Does not contaminate national sample

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The impact of a randomized cash transfer intervention on mortality of adult household members in rural South Africa, 2011–2022

Molly Rosenberg [a e], Erika Beidelman [a], Xiwei Chen [b], David Canning [c], Lindsay Kobayashi [d e], Kathleen Kahn [e f g], Audrey Pettifor [e h], Chodziwadziwa Whiteson Kabudula [e]

Transportability to USA

- Very different settings

- Some low-income people ; higher than in low-income countries but relatively poor in USA – pension effects smaller

- Test for parameter heterogeneity – what drives effect modification?

- Some interesting subgroups for Transportability
  - Living with HIV, migrants from LMIC, early life adversity