Evolution of the funding landscape and its impact: A case from RMNCH over the last 35 years in Nepal

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Background

- Foreign aid has supported Nepal's development since the 1950s.
- Foreign aid has played an important role in the development efforts of Nepal since long (Kharel et al., 2021).
- Government of Nepal sets priority areas for external support through policies and plans.
- Development assistance has been almost stagnant in recent years (Development Cooperation Report 2019).
- Health sector: >15 external development partners (EDPs) and 40+ INGOs provide aid.
- However, linkage between large aid inflows and health-sector improvements remains under-investigated.
- Literatures revealed that foreign aid has significant positive impact on life expectancy and improving under five mortality, and positive impact on maternal health (Bendavid & Bhattacharya, 2014).

Objectives

- This study examines aid mobilization and RMNCH outcomes over ~3 decades+, identifying enablers and barriers for efficient use of resources.
- Describe long-term trends in external (EDP) and government financing, including health and RMNCH-related allocations.
- Assess associations between funding flows and RMNCH outcomes.

Methodology – design, data, and analytic scope

Study design

- Retrospective observational national time-series study.
- Unit of analysis: nation-year; annual observations from 1989 to 2023.
- Primary target: dynamic association between external health aid and population-level outcomes.

Exposures and outcomes

- Three real per-capita DAH series: total health, RMNCH, and other health services.
- Nineteen outcomes spanning service coverage, fertility/nutrition, mortality, and life expectancy.
- Monetary series deflated to constant 2023 prices and log-transformed.

Core data sources

Aid flows	Government of Nepal EDP budget records cross-referenced with IHME Financing Global Health/OECD.
Service indicators	Nepal DHS and MICS series.
Mortality / longevity	UN-IGME, WHO Global Health Observatory, and World Bank series.
Controls screened	Fiscal, demographic, socioeconomic, and women's empowerment variables.

35 annual observations; interpolation limited to short gaps of up to two years.

Lag structure
One lag of the outcome plus contemporaneous and one-year-lagged aid.

Covariates
Fifteen candidates screened, but none retained in final primary models.

Methodology – analytical workflow and model family assignment

1. **Descriptive**

   Summary statistics, raw trends, and average annual rates of change.

2. **Stationarity and breaks**

   ADF, PP, and KPSS tests plus Bai–Perron screening for structural instability.

3. **Framework assignment**

   ARDL/UECM for I(0)/I(1) specifications; stationary transformed models for likely I(2) outcomes.

4. **Primary estimation**

   Long-run multipliers from ARDL/UECM and one-year lag coefficients from stationary-form models.

5. **Robustness and synthesis**

   ARIMA-error checks, diagnostics, and structured evidence classification.

ARDL/UECM (24 slots): ANC1, mCPR, married by age 18, stunting, ARI treatment, ORS treatment, under-5 mortality, and neonatal mortality.

Stationary transformed series (33 slots): skilled birth attendance, adolescent pregnancy, married by age 15, wanted fertility, full / BCG / measles immunisation, maternal mortality, and overall / male / female life expectancy.

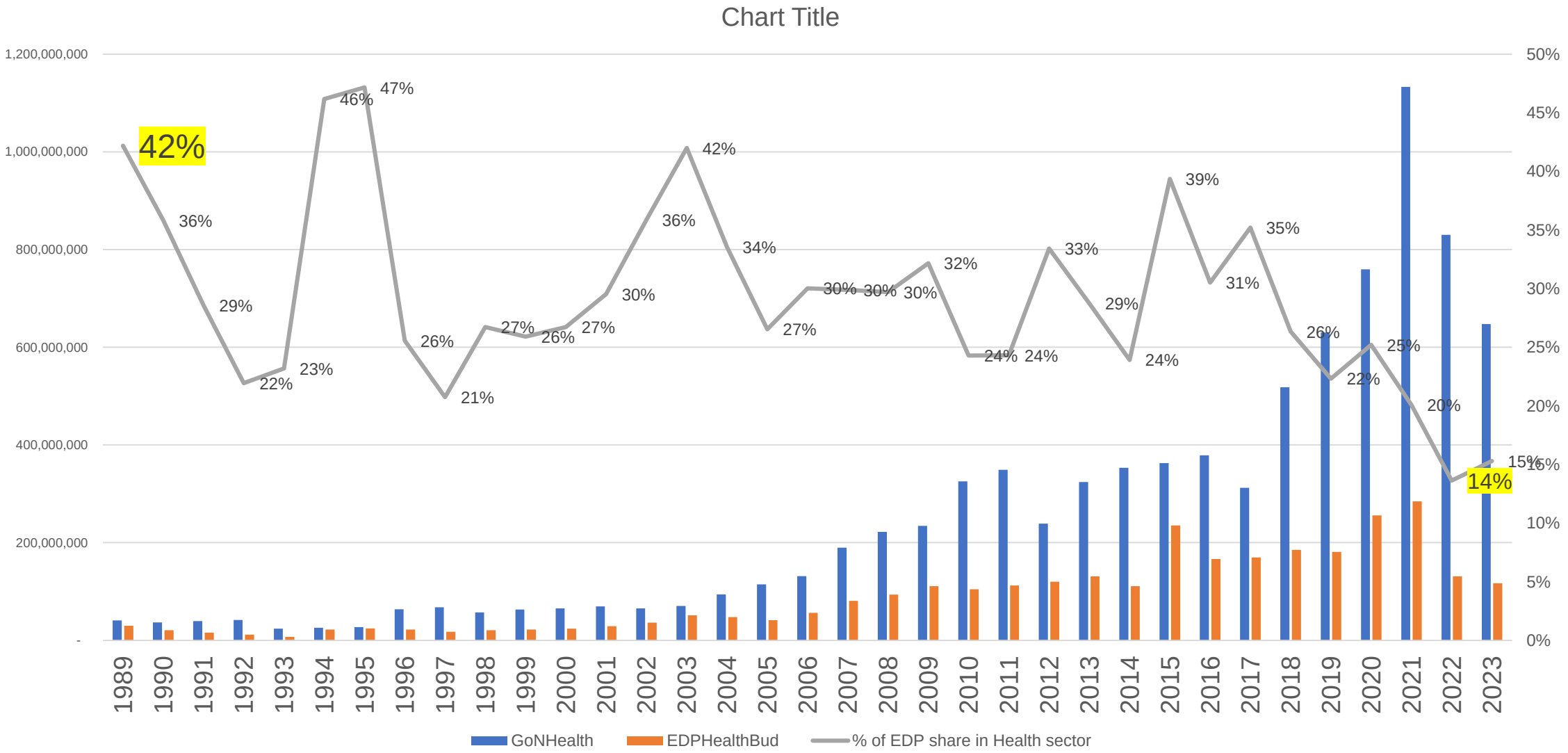
Interpretation

ARDL cells are long-run multipliers or elasticities; stationary-form models capture short-run lagged associations.

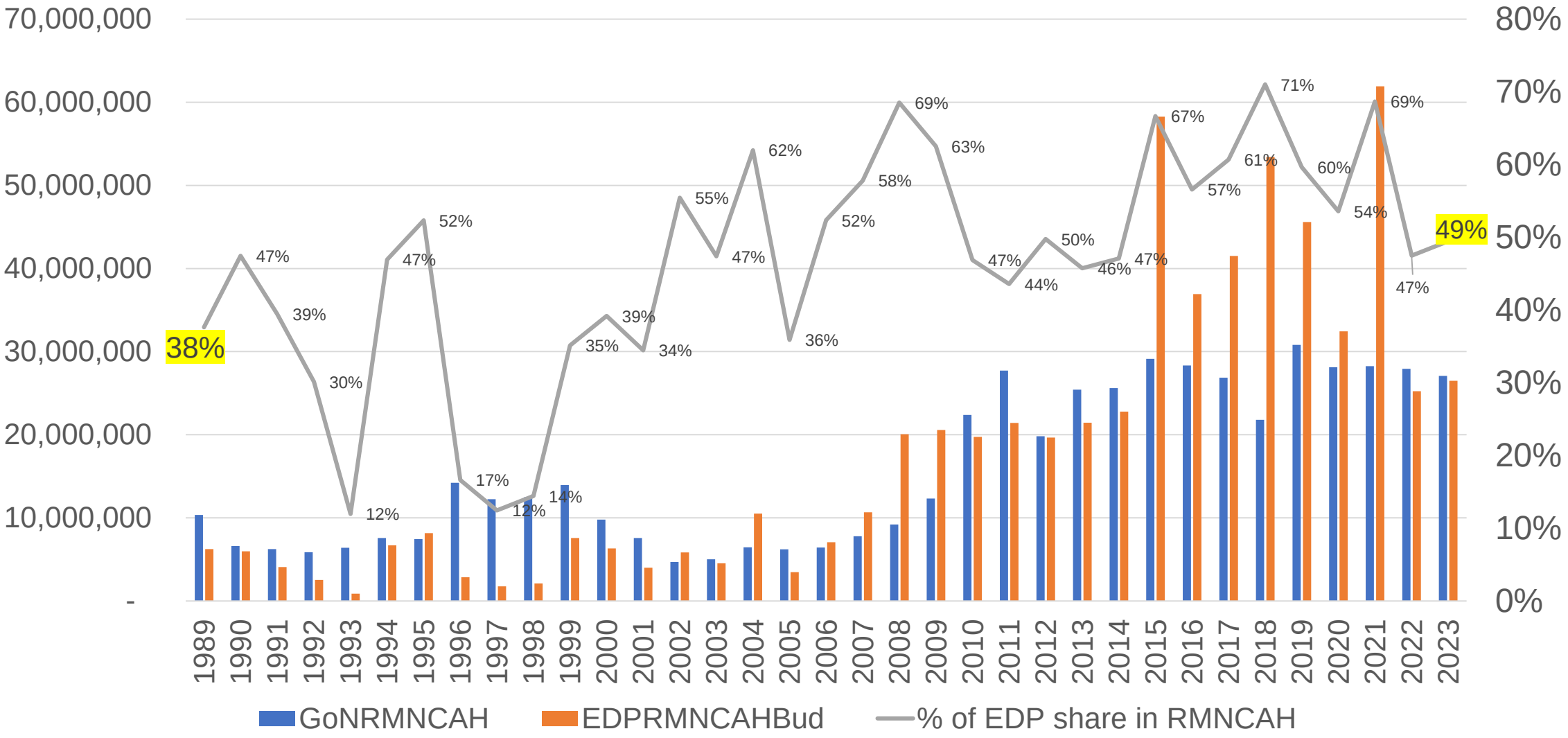
Diagnostics

Breusch–Godfrey, Breusch–Pagan, Jarque–Bera, and CUSUM were assessed for all retained primary models.

Trend of budget from Government and the development partners in health - 1989-2023 (USD)



Trend of budget from Government and the development partners in RNMCH 1989-2023 (USD)



Results – Trends

Selected outcomes

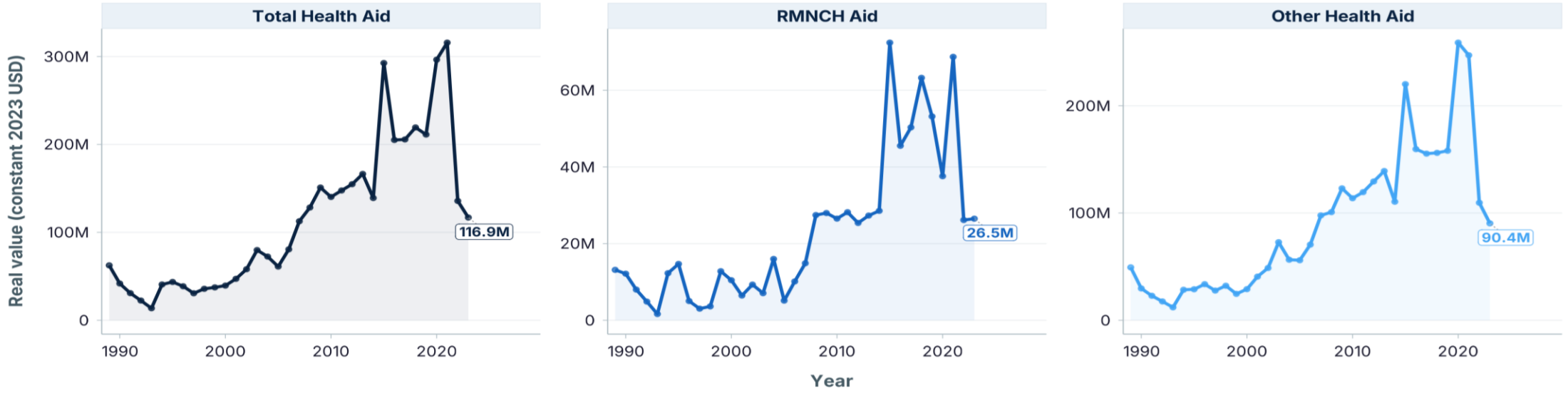
- ANC1 coverage rose from 12.1% to 95.7%;
- skilled birth attendance from 6.76% to 94.5%;
- stunting declined from 68.2% to 22.6%;
- under-5 mortality fell from 146 to 22 per 1,000 live births;
- and life expectancy increased from 54.1 to 69.6 years.

Major pattern

- Real per-capita total health aid averaged US$4.19 over 1989–2023;
- RMNCH aid averaged US$0.85
- other-category aid US$3.34.

Secular trend

Aid grew over the study period but followed episodic surges rather than smooth accumulation, especially in the mid-2000s and around 2015–2016.



Results – stationarity and framework assignment

Stationarity findings

- All three DAH exposure series were classified as I(1).
- Several outcomes were likely I(2), including SBA, adolescent pregnancy, married by age 15, wanted fertility, all three immunisation series, maternal mortality, and life expectancy series.

- Likely I(2) outcomes were not entered into the ARDL bounds framework.
- Those series were redirected to stationary transformed models, tightening interpretation to short-run changes.

Controls retained

Fifteen candidate controls were screened, but none met the joint criteria of theoretical relevance, admissible integration order, and feasibility within the short annual sample.

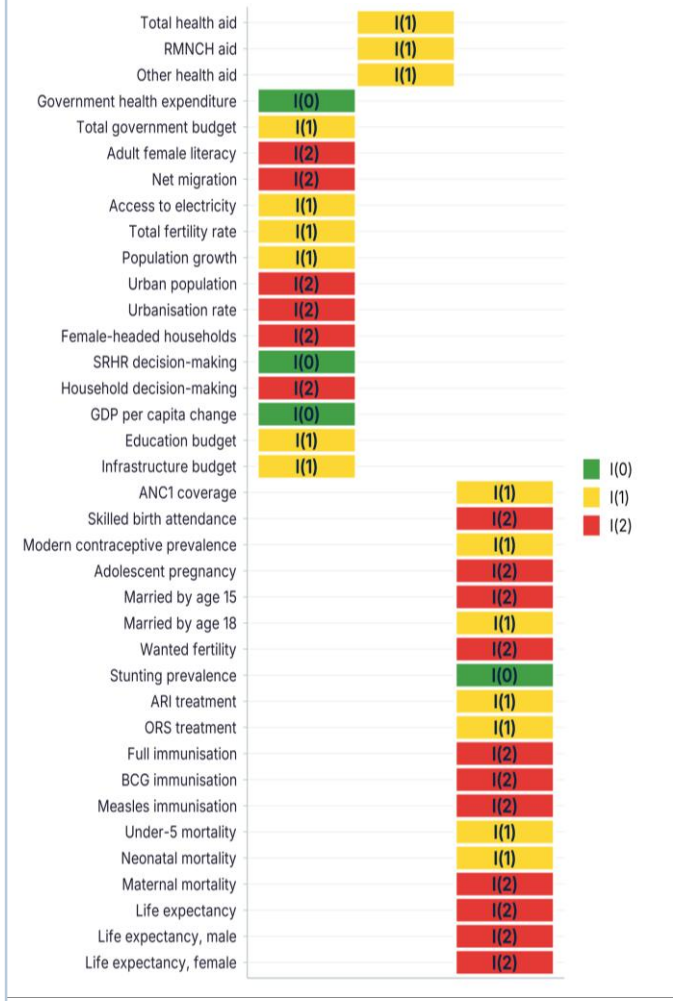
Estimation Framework assignment

ARDL/UECM outcomes

- ANC1
- Modern contraceptive prevalence
- Married by age 18
- Stunting prevalence
- ARI treatment coverage
- ORS treatment coverage
- Under-5 mortality
- Neonatal mortality

Stationary transformed outcomes

- Skilled birth attendance
- Adolescent pregnancy
- Married by age 15
- Wanted fertility
- Full, BCG, and measles immunisation
- Maternal mortality and life expectancy series



Results – maternal and reproductive health

Outcome	Total health aid	RMNCH aid	Other health aid
ANC1 coverage	**55.21** ,p =0.002	**59.76** ,p =0.235	**56.92** ,p =0.003
Skilled birth attendance	**0.37** ,p =0.767	**0.22** ,p =0.735	**0.27** ,p =0.841
Modern contraceptive prevalence	**49.67** ,p =0.653	**-58.27** ,p =0.808	**42.41** ,p =0.600
Adolescent pregnancy	**0.03** ,p =0.448	**0.03** ,p =0.142	**0.02** ,p =0.654
Married by age 15	**0.04** ,p =0.860	**0.09** ,p =0.439	**-0.03** ,p =0.893
Married by age 18	**-41.83** ,p =0.756	**-39.8** ,p =0.753	**-69.41** ,p =0.897

- ANC1 was the only maternal outcome with clear robust evidence in the primary synthesis.
- Total health aid: 55.21 (95% CI 22.87 to 87.56) ,p =0.002; other health aid: 56.92 (22.00 to 91.84), p =0.003.
- RMNCH aid for ANC1 was positive in sign but imprecise: 59.76, ,p =0.235.
- All other maternal / reproductive outcomes were null across exposures.

Results – child health and immunisation

Outcome	Total health aid	RMNCH aid	Other health aid
Stunting prevalence	**-27.48,** p=0.264	**-25.8,** p=0.174	**-26.12,** p=0.141
ARI treatment coverage	**50.54,** p=0.427	**54.19,** p=0.676	**51.91,** p=0.485
ORS treatment coverage	**12.71,** p=0.092	**11.37,** p=0.099	**12.22,** p=0.127
Full immunisation	**-0.71,** p=0.270	**-0.66,** p=0.041	**-0.35,** p=0.612
BCG immunisation	**-0.13,** p=0.571	**-0.06,** p=0.613	**-0.15,** p=0.558
Measles immunisation	**-0.37,** p=0.416	**-0.43,** p=0.061	**-0.12,** p=0.797

- No robust evidence was observed for stunting or ARI treatment.
- ORS treatment showed only suggestive positive long-run signals: 12.71 (,p =0.092) for total aid and 11.37 (,p =0.099) for RMNCH aid.
- Full immunisation showed a robust negative RMNCH association: -0.66, ,p =0.041.
- Measles immunisation showed a suggestive negative RMNCH association: -0.43, ,p =0.061.

Results – mortality and life expectancy

Outcome	Total health aid	RMNCH aid	Other health aid
Under-5 mortality	**-0.77**p<0.001	**-0.68**p=0.001	**-0.77**p<0.001
Neonatal mortality	**-0.26**p=0.225	**-0.09**p=0.730	**-0.27**p=0.211
Maternal mortality ratio	**-0.02**p=0.456	**<-0.01,** p=0.745	**-0.02**p=0.499
Life expectancy	**<0.01,** p=0.944	**<0.01,** p=0.755	**<-0.01,** p=0.838
Male life expectancy	**<0.01,** p=0.884	**<0.01,** p=0.552	**<-0.01,** p=0.806
Female life expectancy	**<0.01,** p=0.997	**<0.01,** p=0.974	**<-0.01,** p=0.879

- Under-5 mortality produced the most consistent protective associations in the study.
- Total and other health aid both yielded -0.77 long-run elasticities with p<0.001 in the primary models and concordant ARIMA-error support.
- RMNCH aid for under-5 mortality was also protective in the primary model (-0.68, ,p =0.001) but only suggestive overall.
- No robust associations were detected for neonatal mortality, maternal mortality, or life expectancy.

Results – Diagnostics and robustness

- No serial correlation was detected in the retained ANC1, mCPR, marriage18, ARI, and ORS ARDL models.
- All ANC1 models showed heteroskedasticity, but CUSUM stability and ARIMA-error confirmation supported the main ANC1 inference.
- All stunting models showed CUSUM instability, which is why those results were not treated as robust.

Robustness checks

- ANC1 total health aid: ARIMA-error 1.67 [0.36, 2.98], ,p =0.013, with directionally consistent two-lag and nominal-price variants.
- Under-5 mortality with total and other-category aid remained directionally consistent across ARIMA-error, two-lag, and nominal-price checks.
- Interpretation remains associational rather than causal because no retained controls entered the final primary models.

Conclusion and way forward

Across 1989–2023, external health aid and RMNCH-related outcomes in Nepal moved substantially over time, but robust dynamic evidence was concentrated in only a small subset of outcomes.

- EDP financing matters, but domestic public financing appears critical once considered jointly, declining aid share can signal reduced aid dependence.
- The clearest positive service-coverage result was ANC1, with robust associations for total health aid and other health aid.
- The clearest protective mortality result was under-5 mortality, again for total health aid and other health aid, with RMNCH aid remaining only suggestive.
- RMNCH-earmarked aid did not consistently outperform broader aid categories;
- Most outcome–exposure pairs remained null after formal dynamic modelling, especially for neonatal mortality, maternal mortality, and life expectancy.
- These estimates support an associational, not causal, interpretation because the short annual series, likely I(2) outcomes, and the absence of retained controls limit attribution.

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Thank you very much

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