

Re: BMJGH-2018-001333 - "Scale and implications of delivering multiple interventions through Integrated Child Health Events"—
Kamatsuchi, Gheorghe, Balabanova.

APPENDICES

Appendix 1. Results of sensitivity analyses

(See Appendix 5 for Description of regression specifications)

| | <i>Dependent variable:</i> | | | | | | | | |
|---|---|-----------------|----------------|-----------------|-----------------|----------------|-----------------|-----------------|-------------------|
| | Vit A coverage (%), only observations with coverage > 40% | | | | | | | | |
| | Base | OLS | FE | FE2w | FE2w+ | RE | RE2w+ | WB | WB+ |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| # interventions | -0.22 (0.55) | -0.25 (0.45) | 0.02 (0.49) | -0.45 (0.50) | -0.33 (0.44) | 0.03 (0.57) | -0.06 (0.61) | | |
| log Govt health expenditure per capita (IntUSD) | | | | | -1.55 | | -1.82 (1.35) | | |
| log External health expenditure per capita (IntUSD) | | | | | 3.30 | | 3.20* (1.79) | | |
| log total population <5y | | | | | -30.94 | | 1.28 (1.09) | | |
| Average nurse and midwife density | | | | | | | 0.02 (0.06) | | 0.02 (0.07) |
| Average # interventions (country) | | | | | | | | -0.26 (1.18) | -2.81** (1.31) |
| Difference from average # interventions (country) | | | | | | | | -0.02 (0.48) | 0.02 (0.55) |

| | | | | | | | | | | |
|--|-----------------------------|--------------------|--------------------|--------------------|---------------------|-----------|----------|----------|----------|---------|
| Average log Govt health expenditure per capita | | | | | | | | | | -2.93* |
| | | | | | | | | | | (1.53) |
| Difference from average log Govt health expenditure per capita | | | | | | | | | | 1.13 |
| | | | | | | | | | | (3.74) |
| Average log External health expenditure per capita | | | | | | | | | | 2.61 |
| | | | | | | | | | | (1.95) |
| Difference from average log External health expenditure per capita | | | | | | | | | | 4.21** |
| | | | | | | | | | | (2.00) |
| Average log total population <5y | | | | | | | | | | 1.45 |
| | | | | | | | | | | (1.01) |
| Difference from average log total population <5y | | | | | | | | | | 9.16 |
| | | | | | | | | | | (17.45) |
| Constant | 85.85*** | 87.92 | | | | 84.79*** | 66.97*** | 85.92*** | 80.58*** | |
| | (2.70) | | | | | (2.80) | (19.08) | (5.12) | (17.44) | |
| Observations | 556 | 556 | 556 | 556 | 524 | 556 | 419 | 556 | 418 | |
| R ² | 0.001 | 0.001 | 0.0000 | 0.004 | 0.02 | 0.20 | 0.03 | 0.004 | 0.09 | |
| Adjusted R ² | -0.001 | -0.001 | -0.15 | -0.17 | -0.17 | 0.20 | 0.02 | 0.0005 | 0.07 | |
| F Statistic | -9.24 | 0.53 (df = 1; 554) | 0.01 (df = 1; 482) | 2.02 (df = 1; 471) | 2.13* (df = 4; 440) | 122.41*** | 5.83 | -9.37 | 35.14*** | |
| Note: | *p<0.1; **p<0.05; ***p<0.01 | | | | | | | | | |

| | <i>Dependent variable:</i> | | | | | | | | |
|--|---|-----------------|----------------|-----------------|----------------|----------------|-----------------|-----------------|------------------|
| | Vit A coverage (%), only observations with coverage > 60% | | | | | | | | |
| | Base | OLS | FE | FE2w | FE2w+ | RE | RE2w+ | WB | WB+ |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| # interventions | 0.02 (0.55) | -0.40 (0.45) | 0.25 (0.49) | -0.08 (0.50) | 0.05 (0.44) | 0.12 (0.57) | 0.22 (0.61) | | |
| log Govt health expenditure per capita (IntUSD) | | | | | -3.03 | | -1.48 (1.35) | | |
| log External health expenditure per capita (IntUSD) | | | | | 4.10 | | 3.31* (1.79) | | |
| log total population <5y | | | | | 1.54 | | 0.41 (1.09) | | |
| Average nurse and midwife density | | | | | | | 0.01 (0.06) | | -0.02 (0.07) |
| Average # interventions (country) | | | | | | | | -1.40 (1.18) | -2.32* (1.31) |
| Difference from average # interventions (country) | | | | | | | | 0.16 (0.48) | 0.25 (0.55) |
| Average log Govt health expenditure per capita | | | | | | | | | -1.48 (1.53) |
| Difference from average log Govt health expenditure per capita | | | | | | | | | -0.85 (3.74) |
| Average log External health expenditure per capita | | | | | | | | | 1.76 (1.95) |

| | | | | | | | | | |
|--|----------|--------------------|--------------------|--------------------|-----------------------|-----------|----------|----------|----------|
| Difference from average log External health expenditure per capita | | | | | | | | | 4.98** |
| | | | | | | | | | (2.00) |
| Average log total population <5y | | | | | | | | | 0.53 |
| | | | | | | | | | (1.01) |
| Difference from average log total population <5y | | | | | | | | | 11.03 |
| | | | | | | | | | (17.45) |
| Constant | 88.73*** | 91.74 | | | | 88.35*** | 79.32*** | 94.21*** | 91.75*** |
| | (2.70) | | | | | (2.80) | (19.08) | (5.12) | (17.44) |
| Observations | 509 | 509 | 509 | 509 | 481 | 509 | 396 | 509 | 395 |
| R ² | 0.005 | 0.005 | 0.002 | 0.0002 | 0.04 | 0.41 | 0.01 | 0.03 | 0.10 |
| Adjusted R ² | 0.003 | 0.003 | -0.16 | -0.19 | -0.16 | 0.41 | 0.001 | 0.03 | 0.08 |
| F Statistic | -9.74 | 2.50 (df = 1; 507) | 1.04 (df = 1; 438) | 0.10 (df = 1; 427) | 3.73*** (df = 4; 399) | 325.33*** | -15.31 | 5.85* | 36.76*** |

Note:

*p<0.1; **p<0.05; ***p<0.01

| | <i>Dependent variable:</i> | | | | | | | | |
|--|---|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| | Vit A coverage (%), only observations with coverage > 80% | | | | | | | | |
| | Base | OLS | FE | FE2w | FE2w+ | RE | RE2w+ | WB | WB+ |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) |
| # interventions | -0.17 (0.55) | -0.30 (0.45) | -0.10 (0.49) | -0.28 (0.50) | -0.24 (0.44) | -0.13 (0.57) | -0.09 (0.61) | | |
| log Govt health expenditure per capita (IntUSD) | | | | | -1.44 | | -0.67 (1.35) | | |
| log External health expenditure per capita (IntUSD) | | | | | 2.31 | | 1.11 (1.79) | | |
| log total population <5y | | | | | -3.89 | | 0.23 (1.09) | | |
| Average nurse and midwife density | | | | | | | -0.01 (0.06) | | -0.01 (0.07) |
| Average # interventions (country) | | | | | | | | -0.42 (1.18) | -0.47 (1.31) |
| Difference from average # interventions (country) | | | | | | | | -0.15 (0.48) | -0.11 (0.55) |
| Average log Govt health expenditure per capita | | | | | | | | | -0.82 (1.53) |
| Difference from average log Govt health expenditure per capita | | | | | | | | | -0.17 (3.74) |
| Average log External health expenditure per capita | | | | | | | | | 0.99 (1.95) |

| | | | | | | | | | |
|--|--------------------|------------------------|-----------------------|-----------------------|------------------------|--------------------|---------------------|--------------------|---------------------|
| Difference from average log External health expenditure per capita | | | | | | | | | 1.29 (2.00) |
| Average log total population <5y | | | | | | | | | 0.26 (1.01) |
| Difference from average log total population <5y | | | | | | | | | 5.43 (17.45) |
| Constant | 93.85*** (2.70) | 95.19 | | | | 93.71*** (2.80) | 90.04*** (19.08) | 94.80*** (5.12) | 91.96*** (17.44) |
| Observations | 421 | 421 | 421 | 421 | 398 | 421 | 327 | 421 | 326 |
| R ² | 0.01 | 0.01 | 0.001 | 0.01 | 0.03 | 0.78 | 0.02 | 0.01 | 0.03 |
| Adjusted R ² | 0.01 | 0.01 | -0.18 | -0.21 | -0.20 | 0.78 | 0.01 | 0.01 | 0.005 |
| F Statistic | -6.53 | 3.80* (df = 1; 419) | 0.44 (df = 1; 355) | 2.69 (df = 1; 344) | 2.34* (df = 4; 321) | 1,418.02*** | 1.54 | -4.16 | 5.58 |

Note:

*p<0.1; **p<0.05; ***p<0.01

| | <i>Dependent variable:</i> | | | | | | | |
|---|---|----------------------|---------------------|-----------------------|--------------------|---------------------|---------------------|---------------------|
| | Measles vaccine coverage (%), only observations with coverage > 40% | | | | | | | |
| | Base | OLS | FE | FE2w | FE2w+ | RE | RE2w+ | WB |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| # interventions | -1.78** (0.91) | -1.82* (1.06) | -2.17 (1.99) | -5.29** (2.32) | -3.62*** (0.88) | -1.78* (0.91) | -1.24 (1.04) | |
| log Govt health expenditure per capita (IntUSD) | | | | | -11.02 | | -0.94 (1.22) | |
| log External health expenditure per capita (IntUSD) | | | | | -2.46 | | -0.21 (1.91) | |
| log total population <5y | | | | | 28.59 | | 0.46 (1.33) | |
| Average # interventions (country) | | | | | | | | -2.19 (1.67) |
| Difference from average # interventions (country) | | | | | | | | -1.64 (1.29) |
| Constant | 100.86*** (3.67) | 101.04 | | | | 100.86*** (3.68) | 96.16*** (19.95) | 102.35*** (5.71) |
| Observations | 77 | 77 | 77 | 77 | 72 | 77 | 72 | 77 |
| R ² | 0.12 | 0.12 | 0.21 | 0.40 | 0.38 | 0.42 | 0.08 | 0.12 |
| Adjusted R ² | 0.10 | 0.10 | -1.42 | -1.87 | -3.37 | 0.41 | 0.03 | 0.09 |
| F Statistic | 9.83*** | 9.83*** (df = 1; 75) | 6.46** (df = 1; 25) | 10.46*** (df = 1; 16) | 1.56 (df = 4; 10) | 53.46*** | 6.09 | 9.81*** |

Note:

* p<0.1; ** p<0.05; *** p<0.01

| <i>Dependent variable:</i> | | | | | | | | | |
|---|-----------|----------|--------------|--------------------|--------------------|------------------|----------|----------|----------|
| Measles vaccine coverage (%), only observations with coverage > 60% | | | | | | | | | |
| | Base | OLS | FE | FE2w | FE2w+ | RE | RE2w+ | WB | |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | |
| # interventions | -1.61* | -1.67* | -1.45 | -3.20** | -0.23 | -1.60* | -1.21* | | |
| | (0.87) | (0.92) | (1.47) | (1.56) | (0.83) | (0.88) | (0.65) | | |
| log Govt health expenditure per capita (IntUSD) | | | | | -6.14 | | -0.25 | | |
| | | | | | | | (0.76) | | |
| log External health expenditure per capita (IntUSD) | | | | | -2.41 | | 0.14 | | |
| | | | | | | | (1.67) | | |
| log total population <5y | | | | | -85.16 | | 1.43* | | |
| | | | | | | | (0.85) | | |
| Average # interventions (country) | | | | | | | | -0.74 | |
| | | | | | | | | (1.13) | |
| Difference from average # interventions (country) | | | | | | | | -2.02** | |
| | | | | | | | | (0.93) | |
| Constant | 101.08*** | 101.29 | | | | 101.04*** | 79.89*** | 97.98*** | |
| | (3.30) | | | | | (3.33) | (14.88) | (4.30) | |
| Observations | 75 | 75 | 75 | 75 | 70 | 75 | 70 | 75 | |
| R ² | 0.14 | 0.14 | 0.13 | 0.21 | 0.22 | 0.42 | 0.17 | 0.16 | |
| Adjusted R ² | 0.13 | 0.13 | -1.67 | -2.89 | -4.94 | 0.41 | 0.11 | 0.14 | |
| F Statistic | 12.25*** | 12.27*** | (df = 1; 73) | 3.74* (df = 1; 24) | 4.00* (df = 1; 15) | 0.65 (df = 4; 9) | 52.92*** | 12.87** | 13.80*** |

Note:

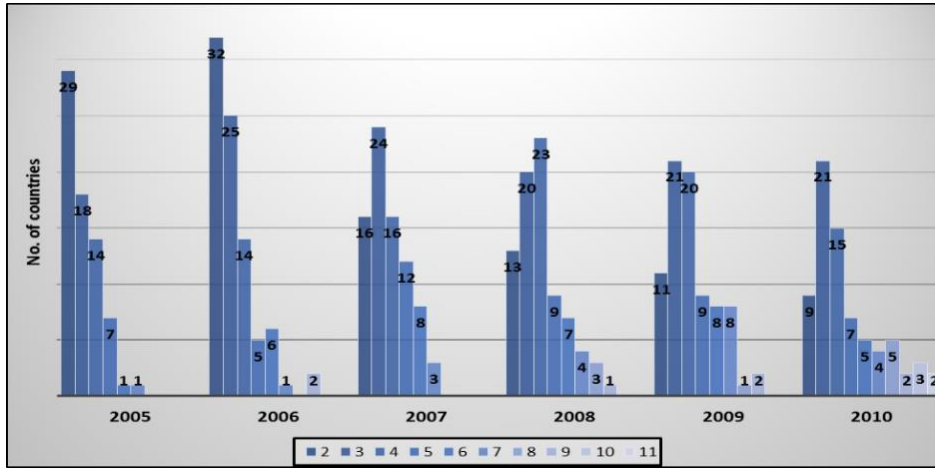
*p<0.1; **p<0.05; ***p<0.01

| <i>Dependent variable:</i> | | | | | | | | |
|---|--------------------|-------------------|-------------------|-------------------|--------------------|--------------------|---------------------|--------------------|
| Measles vaccine coverage (%), only observations with coverage > 80% | | | | | | | | |
| | Base | OLS | FE | FE2w | FE2w+ | RE | RE2w+ | WB |
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
| # interventions | -0.55 (0.41) | -0.55 (0.42) | -0.55 (0.50) | -0.62 (0.74) | -1.05*** (0.36) | -0.55 (0.41) | -0.65 (0.41) | |
| log Govt health expenditure per capita (IntUSD) | | | | | 0.62 | | -0.13 (0.56) | |
| log External health expenditure per capita (IntUSD) | | | | | 5.01 | | 2.50*** (0.80) | |
| log total population <5y | | | | | 44.01 | | 1.31** (0.64) | |
| Average # interventions (country) | | | | | | | | -0.35 (0.75) |
| Difference from average # interventions (country) | | | | | | | | -0.60 (0.43) |
| Constant | 98.08*** (1.43) | 98.13 | | | | 98.08*** (1.44) | 73.74*** (10.12) | 97.34*** (2.61) |
| Observations | 69 | 69 | 69 | 69 | 66 | 69 | 66 | 69 |
| R ² | 0.04 | 0.04 | 0.09 | 0.05 | 0.30 | 0.88 | 0.16 | 0.04 |
| Adjusted R ² | 0.02 | 0.02 | -2.08 | -4.85 | -5.48 | 0.87 | 0.11 | 0.01 |
| F Statistic | 2.49 | 2.50 (df = 1; 67) | 2.06 (df = 1; 20) | 0.62 (df = 1; 11) | 0.76 (df = 4; 7) | 471.08*** | 10.65** | 2.43 |

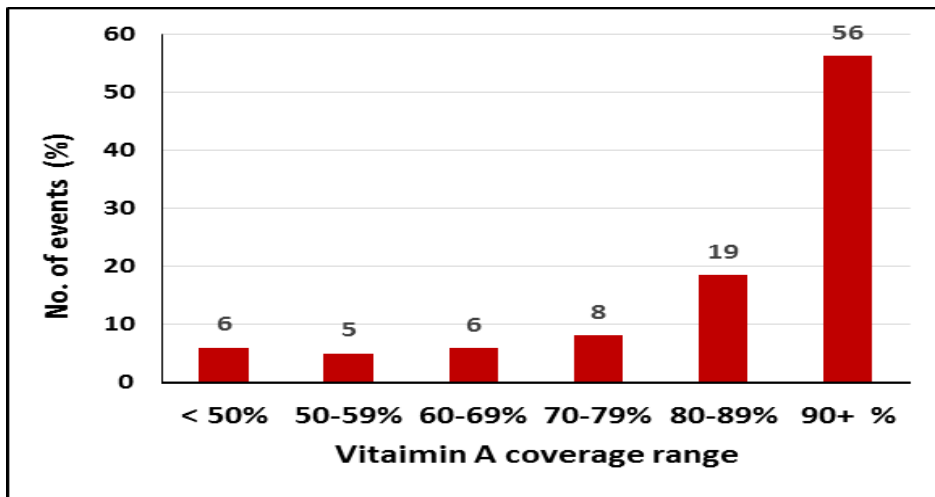
Note:

*p<0.1; **p<0.05; ***p<0.01

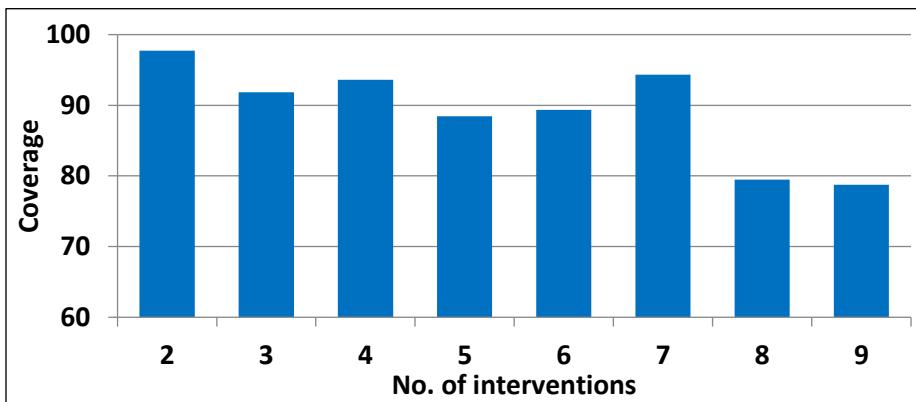
Appendix 2. Number of countries delivering multiple interventions, by year



Appendix 3. Distribution of vitamin A coverage in ICHes, global (2005–2010)



Appendix 4. Median measles coverage by number of interventions, 2005–2010 (n=79)



Appendix 5. Description of regression specifications

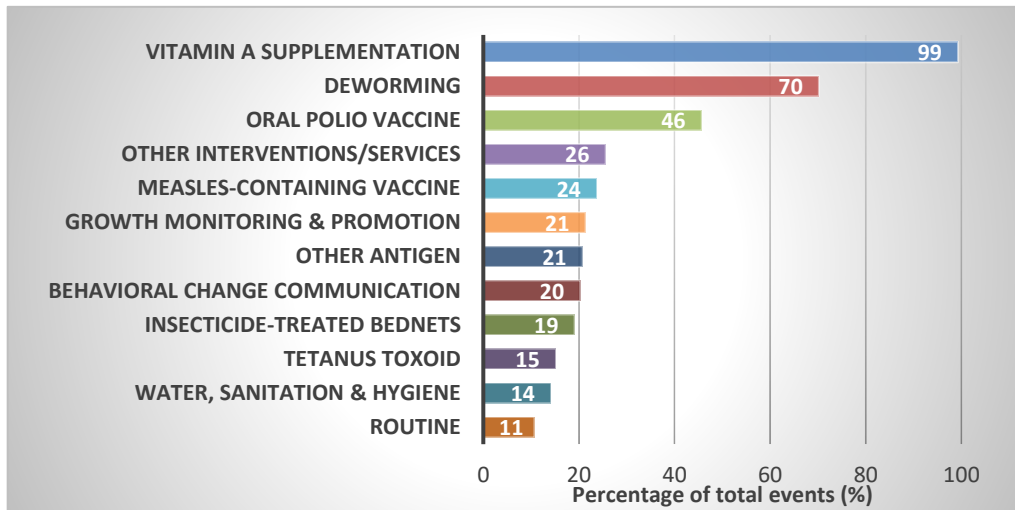
- “Base”: panel regression with country-level random effects and time effects
- “OLS”: simple ordinary least squares regression that pools all the data together and ignores the country and year structure of the dataset, assuming every data point is independent of the others; exploratory only.
- “FE” (fixed effects): panel regression with country fixed effects and no time effects;
- “FE2w” (fixed effects two-way): panel regression with country fixed effects and time effects;
- “FE2w+”: model FE2w with additional predictors;
- “RE” (random effects): panel regression with country random effects and no time effects;
- “RE2w+” (random effects two-way): Base model with additional predictors;
- “WB” (within-between): panel regression using the within-between estimator, whereby the number of interventions is modelled using two variables – the average number of interventions at country-level over the entire time interval (variable “*Average # interventions (country)*”) and the demeaned number of interventions, i.e. difference between each value and the country-level average number of interventions (variable “*Difference from average # interventions (country)*”).
- “WB+”: model WB with additional predictors, also modelled as country average and demeaned values.

The additional country-level predictors used in models FE2w+, RE2w+ and WB+ are:

- Log Government health expenditure per capita (IntUSD): yearly values downloaded from the WHO Global Health Expenditure Database
- Log External health expenditure per capita (IntUSD): yearly values downloaded from the WHO Global Health Expenditure Database
- Log total population <5y: male and female population ages 00-04 downloaded from the World Bank DataBank portal (accessed 21 March 2019) <https://databank.worldbank.org/data/home.aspx> and aggregated to obtain the total yearly population with ages below 5 years.
- Average nurse and midwives density: density of nurses and midwives (per 10,000 population) downloaded from the WHO Global Health Workforce Statistics portal (accessed 21 March 2019) <http://apps.who.int/gho/data/node.main.HWFGRP?lang=en> and averaged at country-level over the 2004-2010 interval because of large cross-country variability in data completeness. Included in regressions as fixed over time.

In all regression results presented below standard errors are robust to heteroscedasticity and computed using the HC3 estimator

Appendix 6. Key child health & nutrition interventions co-delivered during ICHEs (2005–2010)



(Out of a total of 597 events)

- Percentage indicators show how frequent the intervention appeared in the total amount of events shown in the merged database.
- **Behaviour change communication** includes behaviour change communication message promotion regarding breastfeeding, diarrhoea prevention, HIV/AIDS awareness, consumption of iodized salt promotion, neonatal care, nutritional screening, birth registration, maternal health care, among others.