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UNIVERSITY OF WASHINGTON STRATEGIC ANALYSIS, RESEARCH & TRAINING (START) CENTER

REPORT TO THE BILL & MELINDA GATES FOUNDATION

APRIL 15, 2018

PRODUCED BY: PAUL, S; BABIGUMIRA, JB.

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- A logistic regression analysis to identify household- and district-level determinants of immunization status among children aged 12-23 months in Indonesia from 2008-2013.



8. The investment for hepatitis B and C in South Africa: adaption and innovation in policy analysis for disease program scale-up.

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9. Challenges of interpreting epidemiologic surveillance pertussis data with changing diagnostic and immunization practices: the case of the state of Sao Paulo, Brazil.

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- An observational study to assess the introduction of new diagnostic techniques and new vaccination strategies, enhanced disease awareness, and challenges to interpretation of the combined impact of cyclic epidemic variation of pertussis cases in children in Sao Paulo, Brazil from 2001-2015.

10. Role of health determinants in a measles outbreak in Ecuador: a case-control study with aggregated data.

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- An ecological case-control study to identify population characteristics associated with measles outbreak in children in Ecuador from 2011-2012.

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DETAILS OF ARTICLES

1. [Towards the introduction of pneumococcal conjugate vaccines in Bhutan: A cost-utility analysis to determine the optimal policy option.](#)

Dorji K, Phuntsho S, Pempa, Kumluang S, Khuntha S, Kulpeng W, et al.

Vaccine. 2018 Mar 20;36(13):1757-1765.

PubMed ID: 29478752

ABSTRACT

BACKGROUND:

Due to competing health priorities and limited resources, many low-income countries, even those with a high disease burden, are not able to introduce pneumococcal conjugate vaccines.

OBJECTIVE:

To determine the cost-utility of 10- and 13-valent pneumococcal conjugate vaccines (PCV10 and PCV13) compared to no vaccination in Bhutan.

METHODS:

A model-based cost-utility analysis was performed in the Bhutanese context using a government perspective. A Markov simulation model with one-year cycle length was used to estimate the costs and outcomes of three options: PCV10, PCV13 and no PCV programmes for a lifetime horizon. A discount rate of 3% per annum was applied. Results are presented using an incremental cost-effectiveness ratio (ICER) in United State Dollar per quality-adjusted life year (QALY) gained (USD 1 = Ngultrum 65). A one-way sensitivity analysis and a probabilistic sensitivity analysis were conducted to assess uncertainty.

RESULTS:

Compared to no vaccination, PCV10 and PCV13 gained 0.0006 and 0.0007 QALYs with additional lifetime costs of USD 0.02 and USD 0.03 per person, respectively. PCV10 and PCV13 generated ICERs of USD 36 and USD 40 per QALY gained compared to no vaccination. In addition, PCV13 produced an ICER of USD 92 compared with PCV10. When including PCV into the Expanded Programme on Immunization, the total 5-year budgetary requirement is anticipated to increase to USD. 3.77 million for PCV10 and USD 3.75 million for PCV13. Moreover, the full-time equivalent (FTE) of one health assistant would increase by 2.0 per year while the FTE of other health workers can be reduced each year, particularly of specialist (0.6-1.1 FTE) and nurse (1-1.6 FTE).

CONCLUSION:

At the suggested threshold of 1xGDP per capita equivalent to USD 2708, both PCVs are cost-effective in Bhutan and we recommend that they be included in the routine immunization programme.

WEB: [10.1016/j.vaccine.2018.02.048](https://doi.org/10.1016/j.vaccine.2018.02.048)

IMPACT FACTOR: 3.41

CITED HALF-LIFE: 5.90

START EDITORIAL COMMENT: A model-based cost-utility analysis (CUA), analyzed from the perspective of government stakeholders was used to determine the feasibility of pneumococcal disease vaccination policies. Compared to no vaccination, the introduction of PCV10 program was projected to more cost-effective than introduction of PCV13 although the incremental cost-effectiveness ratios were close (\$36 per QALY gained and \$50 per QALY gained, respectively). Compared to introduction of PCV10, introduction of PCV13 was cost-effective (ICER of \$92 per QALY gained). This study will be pivotal to the assessment of feasibility and sustainability of pneumococcal vaccination policies in Bhutan.

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2. [Correlation between measles vaccine doses: implications for the maintenance of elimination.](#)

McKee A, Ferrari MJ, Shea K.

Epidemiol Infect. 2018 Mar;146(4):468-475.

PubMed ID: 29465027

ABSTRACT

Measles eradication efforts have been successful at achieving elimination in many countries worldwide. Such countries actively work to maintain this elimination by continuing to improve coverage of two routine doses of measles vaccine following measles elimination. While improving measles vaccine coverage is always beneficial, we show, using a steady-state analysis of a dynamical model, that the correlation between populations receiving the first and second routine dose also has a significant impact on the population immunity achieved by a specified combination of first and second dose coverage. If the second dose is administered to people independently of whether they had the first dose, high second-dose coverage improves the proportion of the population receiving at least one dose, and will have a large effect on population immunity. If the second dose is administered only to people who have had the first dose, high second-dose coverage reduces the rate of primary vaccine failure, but does not reach people who missed the first dose; this will therefore have a relatively small effect on population immunity. When doses are administered dependently, and assuming the first dose has higher coverage, increasing the coverage of the first dose has a larger impact on population immunity than does increasing the coverage of the second. Correlation between vaccine doses has a significant impact on the level of population immunity maintained by current vaccination coverage, potentially outweighing the effects of age structure and, in some cases, recent improvements in vaccine coverage. It is therefore important to understand the correlation between vaccine doses as such correlation may have a large impact on the effectiveness of measles vaccination strategies.

WEB: [10.1017/S0950268817003077](https://doi.org/10.1017/S0950268817003077)

IMPACT FACTOR: 1.31

CITED HALF-LIFE: 6.60

START EDITORIAL COMMENT: This study assessed the correlation between child coverage of the first dose of measles vaccination (v1) and the second dose of measles vaccination (v2). Correlations were categorized as independent and non-independent and the variables 0 and 1 were used: 0 denoted that the second dose was administered independently regardless of the child's receipt of the first dose, and 1 denoted that the second dose was administered to children who had the first dose. Data was also divided into groups by age yielding four vaccine classes: unvaccinated; first-dose recipient; second-dose recipient; and, a recipient of both first-and-second doses. Results show that the correlation between the first dose and the second dose of measles immunization has direct implications for coverage rates and population level immunity. The results can be applied to vaccination strategies to increase vaccination rates in vaccine-hesitant groups or groups with poor access to healthcare.

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3. [Community perception regarding childhood vaccinations and its implications for effectiveness: a qualitative study in rural Burkina Faso.](#)

Kagoné M, Yé M, Nébié E, Sié A, Müller O, Beiersmann C.

BMC Public Health. 2018 Mar 6;18(1):324.

PubMed ID: 29510684

ABSTRACT

BACKGROUND:

Vaccination has contributed to major reductions in global morbidity and mortality, but there remain significant coverage gaps. Better knowledge on the interplay between population and health systems regarding provision of vaccination information and regarding health staff organization during the immunization sessions appears to be important for improvements of vaccination effectiveness.

METHODS:

The study was conducted in the Nouna Health and Demographic Surveillance System (HDSS) area, rural Burkina Faso, from March to April 2014. We employed a combination of in-depth interviews (n = 29) and focus group discussions (n = 4) including children's mothers, health workers, godmothers, community health workers and traditional healers. A thematic analysis was performed. All material was transcribed, translated and analyzed using the software ATLAS.ti4.2.

RESULTS:

There was better social mobilization in the rural areas as compared to the urban area. Most mothers know the Expanded Program of Immunization (EPI) target diseases, and the importance to immunize their children. However, the great majority of informants reported that mothers don't know the vaccination schedule. There is awareness that some children are incompletely vaccinated. Mentioned reasons for that were migration, mothers being busy with their work, the practice of not opening vaccine vials unless a critical number of children are present, poor interaction between women and health workers during immunization sessions, potential adverse events associated with vaccination, geographic inaccessibility during rainy season, and lack of information.

CONCLUSIONS:

Well organized vaccination programs are a key factor to improve child health and there is a clear need to consider community perceptions on program performance. In Burkina Faso, a number of factors have been identified which need attention by the EPI managers for further improvement of program effectiveness.

WEB: [10.1371/journal.pntd.0006211](https://doi.org/10.1371/journal.pntd.0006211)

IMPACT FACTOR: 2.21

CITED HALF-LIFE: 4.30

START EDITORIAL COMMENT: This qualitative study used semi-structures interviews, focus group discussions, and observations in the Nouna Health District of north-western Burkina Faso to assess perceptions regarding childhood immunization. A surprising finding was the positive influence of social pressure on vaccination rates—women in the community know which mothers attend vaccination sessions and which mothers do not, and while there is no social punishment for not attending a vaccination session, the process of searching for the missing women in the community leads to lower rates of vaccination default. This study provides recommendations for utilizing community health workers and to promote collaboration among health facilities during vaccination sessions.

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4. [Nasopharyngeal Pneumococcal Carriage in Nigeria: a two-site, population-based survey.](#)
Adetifa IMO, Adamu AL, Karani A, Waithaka M, Odeyemi KA, Okoromah CAN, et al.
Sci Rep. 2018 Feb 22;8(1):3509.
PubMed ID: 29472635

ABSTRACT

Changes in nasopharyngeal (NP) carriage of vaccine-type (VT) *Streptococcus pneumoniae* can be used to assess the effectiveness of a pneumococcal conjugate vaccine (PCV10). We conducted a baseline carriage survey in rural (Kumbotso, Kano) and urban (Pakoto, Ogun) Nigeria. In this cross-sectional study, we obtained data on demography, clinical history, risk factors, and took NP swabs for pneumococcal culture. We calculated crude and age-standardised carriage prevalence and used log-binomial regression to assess risk factors for carriage. Among children aged <5 years, 92% (95% CI: 88-95%) and 78% (73-82%), respectively, carried any pneumococcus and 48% and 50%, respectively, carried PCV10 serotypes. In Kumbotso, carriage prevalence was >40% across all ages. The age-standardized prevalence of pneumococcal carriage was 66% in Kumbotso and 40% in Pakoto. The most commonly identified serotypes were 19 F, 6 A and 23 F. Risk factors for carriage were young age, recent rhinorrhoea, cohabitation with ≥ 2 children aged <5 years, and sharing a bed with ≥ 2 persons. Pneumococcal carriage prevalence is high in this Nigerian population. Persisting prevalence of VT-carriage in older children and adults suggests that PCV10 introduction in children will not eliminate transmission of vaccine serotypes rapidly. High vaccine coverage will therefore be required to ensure full protection of children..

WEB: [10.1038/s41598-018-21837-5](https://doi.org/10.1038/s41598-018-21837-5)

IMPACT FACTOR: 4.25

CITED HALF-LIFE: NA

START EDITORIAL COMMENT: This study was conducted at two sites in Nigeria: Pakoto, Ogun State, and Kumbotso, Kano State. At the time of the study, PCV10 was relatively new to the sites: Pakoto only had access to PCV10 for 4 months and Kumbotso had access to PCV10 for 5 months before the study began. Additionally, few children had vaccination records (6.5% or 41 of 630 children under 5 years) and vaccination rates were low (12% or 5 of 41 children under 5 had received 2 or more doses of PCV10). The age standardized prevalence of pneumococcal carriage was high—66% in Kumbotso and 40% in Pakoto—suggesting that high coverage rates of PCV10 vaccination will be required to protect children. Additionally, the prevalence of vaccine-type *streptococcus pneumoniae* was persistent, suggesting slow elimination of vaccine serotypes with introduction of PCV10. Study limitations included seasonal factors influencing rates of pharyngeal carriage and non-probability-based sampling of participants.

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5. [Routine immunization in Pakistan: comparison of multiple data sources and identification of factors associated with vaccination.](#)

Imran H, Raja D, Grassly NC, Wadood MZ, Safdar RM, O'Reilly KM.

Int Health. 2018 Mar 1;10(2):84-91.

PubMed ID: 29432552

ABSTRACT

Background:

Within Pakistan, estimates of vaccination coverage with the pentavalent vaccine, oral polio vaccine (OPV) and measles vaccine (MV) in 2011 were reported to be 74%, 75% and 53%, respectively. These national estimates may mask regional variation. The reasons for this variation have not been explored.

Methods:

Data from the Multiple Indicator Cluster Surveys (MICS) for Balochistan and Punjab (2010-2011) are analysed to examine factors associated with receiving three or more doses of the pentavalent vaccine and one or more MVs using regression modelling. Pentavalent and OPV estimates from the MICS were compared to vaccine dose histories from surveillance for acute flaccid paralysis (AFP; poliomyelitis) to ascertain agreement.

Results:

Adjusted coverage of children 12-23 months of age were estimated to be 16.0%, 75.5% and 34.2% in Balochistan and 58.0%, 87.7% and 72.6% in Punjab for the pentavalent vaccine, OPV and MV, respectively. Maternal education, healthcare utilization and wealth were associated with receiving the pentavalent vaccine and the MV. There was a strong correlation of district estimates of vaccination coverage between AFP and MICS data, but AFP estimates of pentavalent coverage in Punjab were biased toward higher values.

Conclusions:

National estimates mask variation and estimates from individual surveys should be considered alongside other estimates. The development of strategies targeted towards poorly educated parents within low-wealth quintiles that may not typically access healthcare could improve vaccination rates.

WEB: [10.1093/inthealth/ihx067](http://dx.doi.org/10.1093/inthealth/ihx067)

IMPACT FACTOR: 1.78

CITED HALF-LIFE: NA

START EDITORIAL COMMENT: This study analyzed data from a cohort of children 0-2 years of age in Balochistan and Punjab. Data were available on histories of coverage for pentavalent vaccine, oral polio vaccine (OPV), and measles vaccine (MV). Adjusted coverage of children 12–23 months of age were estimated to be 16.0%, 75.5% and 34.2% in Balochistan and 58.0%, 87.7% and 72.6% in Punjab for the pentavalent vaccine, OPV and MV, respectively. Factors positively associated with routine vaccination were divided by vaccination type. For example, factors positively associated with full pentavalent vaccinations were mothers education, possession of a vaccination card, and access to a television. Surprisingly, measles vaccine coverage is higher than pentavalent vaccine coverage in the study regions, most likely due to use of supplementary measles immunizations. Additional research is necessary to identify how gender, access to healthcare, and access to education impact the variation in coverage for pentavalent vaccine, OPV, and MV vaccines in Pakistan.

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6. [Growth, developmental achievements and vaccines timeliness of undocumented migrant children from Eritrea compared with Israelis.](#)

Mor Z, Amit Aharon A, Sheffer R, Nehama H.

PLoS One. 2018 Mar 8;13(3):e0193219.

PubMed ID: 29518105

ABSTRACT

INTRODUCTION:

Israel has absorbed >40,000 Eritrean undocumented migrants since 2007, while the majority live in the southern neighborhoods of Tel-Aviv. As non-citizens and citizens infants in Israel receive free preventive treatment at the mother and child health clinics (MCHC), this study aimed to compare development and growth achievements between children of Eritrean mothers (CE) to children of Israeli mothers (CI), and assess their compliance to routine follow-up and vaccination-timeliness.

METHODS:

This cohort study included all Israeli-born CE between 2009 and 2011, compared with a random sample of CI and treated at the same MCHC and followed-up to the age of 30-months. Dependent outcomes included anthropometric measurements, developmental achievements and adherence to immunization schedule.

RESULTS:

Of all 271 CE who were compared with 293 CI, no statistically significant differences were found in birth anthropometric measurements. Yet, CE had increased weight and length than CI after reaching one year of age ($p < 0.05$). CE were more likely to fail in tests assessing fine-motor skills, linguistic and socio-emotional domains than CI, while no statistical difference was found in gross-motor achievements. At the end of follow-up, 203 (74.9%) of the CE and 271 (74.1%) of the CI completed the vaccination schedule, $p = 0.9$.

CONCLUSION:

CE had greater anthropometric measurements than CI after one year of age, and showed higher impairments in fine motor, linguistic and socio-emotional domains. Adherence to vaccination was similar. The inequalities in child health should be responded in the MCTC, and Eritrean mothers should be trained with the current recommendations for child well-being.

WEB: [10.1371/journal.pone.0193219](https://doi.org/10.1371/journal.pone.0193219)

IMPACT FACTOR: 3.23

CITED HALF-LIFE: 2.70

START EDITORIAL COMMENT: Within the study population of Eritrean and Israeli mothers in Israel, Eritrean mothers were younger, had lower levels of education, had higher unemployment rates, and their children were more likely to lack health insurance. Before 6 months of age, anthropometric measurements were similar in Eritrean and Israeli children but after 6 months Eritrean children had higher anthropometric measurements (85th percentile) than Israeli children (50th percentile). At the end of follow-up, 74.9% of the Eritrean children and 74.1% of Israeli children completed the vaccination schedule, $p = 0.9$. Although vaccine coverage was similar in Eritrean and Israeli children, Eritrean children were taller and heavier but performed worse on developmental milestones. Authors recommended additional research to guide health system-level adaptations and reduce disparities in developmental milestones between Eritrean and Israeli children.

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7. [Determinants of immunization status among 12-23-month-old children in Indonesia \(2008-2013\): a multilevel analysis.](#)

Holipah, Maharani A, Kuroda Y.

BMC Public Health. 2018 Feb 27;18(1):288.

PubMed ID: 29482562

ABSTRACT

BACKGROUND:

Immunization is one of the most cost-effective public health interventions to prevent children from contracting vaccine-preventable diseases. Indonesia launched the Expanded Program for Immunization (EPI) in 1977. However, immunization coverage remains far below the United Nations International Children's Emergency Fund (UNICEF) and World Health Organization (WHO) target of 80%. This study aims to investigate the determinants of complete immunization status among children aged 12-23 months in Indonesia.

METHODS:

We used three waves of the Indonesian National Socioeconomic Survey (2008, 2011, and 2013) and national village censuses from the same years. Multilevel logistic regression was used to conduct the analysis.

RESULTS:

The number of immunized children increased from 47.48% in 2008 to 61.83% in 2013. The presence of health professionals, having an older mother, and having more educated mothers were associated with a higher probability of a child's receiving full immunization. Increasing the numbers of hospitals, village health posts, and health workers was positively associated with children receiving full immunization. The MOR (median odds ratio) showed that children's likelihood of receiving complete immunization varied significantly among districts.

CONCLUSIONS:

Both household- and district-level determinants were found to be associated with childhood immunization status. Policy makers may take these determinants into account to increase immunization coverage in Indonesia.

WEB: [10.1186/s12889-018-5193-3](https://doi.org/10.1186/s12889-018-5193-3)

IMPACT FACTOR: 2.21

CITED HALF-LIFE: 4.30

START EDITORIAL COMMENT: In this study, a total of 69,639 children between 12 and 23 months of age participated in the survey in 2008, 2011, and 2013. Eight household determinants of immunization for tuberculosis (BCG); diphtheria, tetanus and pertussis (DTP); oral polio vaccine (OPV); measles; and, hepatitis B were identified: residence type (urban or rural), presence of a professional attendant during childbirth, mother's employment status, mother's age, mother's education, parity status, wealth index and household income. Immunization status determinants were divided by household-level and district-level. Across the three-year categories (2008, 2011, 2013), BCG had the highest full vaccination rates in 2008 (89.49%) while polio had the lowest vaccination rates (9.21%) in the same year. The study suggests that immunization rates in Indonesia could be increased for all vaccine-preventable diseases by improving the quality of education and health services, increasing mother's knowledge and awareness of immunizations, and improving access to health facilities and healthcare providers in rural areas.

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8. [The investment for hepatitis B and C in South Africa: adaption and innovation in policy analysis for disease program scale-up.](#)

Hecht R, Hiebert L, Spearman WC, Sonderup MW, Guthrie T, Hallett TB, et al. [Epub ahead of print]

Health Policy Plan. 2018 Feb 26.

PubMed ID: 29529282

ABSTRACT

Even though WHO has approved global goals for hepatitis elimination, most countries have yet to establish programs for hepatitis B and C, which account for 320 million infections and over a million deaths annually. One reason for this slow response is the paucity of robust, compelling analyses showing that national HBV/HCV programs could have a significant impact on these epidemics and save lives in a cost-effective, affordable manner. In this context, our team used an investment case approach to develop a national hepatitis action plan for South Africa, grounded in a process of intensive engagement of local stakeholders. Costs were estimated for each activity using an ingredients-based, bottom-up costing tool designed by the authors. The health impact and cost-effectiveness of the Action Plan were assessed by simulating its four priority interventions (HBV birth dose vaccination, PMTCT, HBV treatment and HCV treatment) using previously developed models calibrated to South Africa's demographic and epidemic profile. The Action Plan is estimated to require ZAR3.8 billion (US\$294 million) over 2017-2021, about 0.5% of projected government health spending. Treatment scale-up over the initial 5-year period would avert 13 000 HBV-related and 7000 HCV-related deaths. If scale up continues beyond 2021 in line with WHO goals, more than 670 000 new infections, 200 000 HBV-related deaths, and 30 000 HCV-related deaths could be averted. The incremental cost-effectiveness of the Action Plan is estimated at \$3310 per DALY averted, less than the benchmark of half of per capita GDP. Our analysis suggests that the proposed scale-up can be accommodated within South Africa's fiscal space and represents good use of scarce resources. Discussions are ongoing in South Africa on the allocation of budget to hepatitis. Our work illustrates the value and feasibility of using an investment case approach to assess the costs and relative priority of scaling up HBV/HCV services.

WEB: [10.1093/heapol/czy018](https://doi.org/10.1093/heapol/czy018)

IMPACT FACTOR: 3.47

CITED HALF-LIFE: 7.20

START EDITORIAL COMMENT: Various tools and frameworks were used to develop the Viral Hepatitis National Action Plan. An ingredients-based costing tool was created to assess the plan's financial cost and affordability and a disease model was adapted to estimate the impact of potential investments on disease burden. The impact of the Action Plan could result in 10% of HBV and HCV deaths averted in the subsequent 5 years. A screen-and-treat approach to HBV combined with increasing HBV birth dose vaccination to 90% coverage would decrease new infections by 63% over 60 years. The cost effectiveness analysis in the Action Plan suggests value-for-money attribution and feasibility. Investment case approaches, such as the one in this report, can be a beneficial method for conducting comprehensive feasibility analysis and leveraging evidence-based data to provide recommendations for scaling up HBV and HCV programs.

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9. [Challenges of interpreting epidemiologic surveillance pertussis data with changing diagnostic and immunization practices: the case of the state of Sao Paulo, Brazil.](#)

Fernandes EG, Sartori AMC, de Soárez PC, Carvalhanas TRMP, Rodrigues M, Novaes HMD.

BMC Infect Dis. 2018 Mar 13;18(1):126.

PubMed ID: 29534683

ABSTRACT

BACKGROUND:

A significant increase in pertussis incidence occurred in Brazil, from 2011 to 2014, despite high coverage of childhood immunization with whole-cell-pertussis (wP) containing vaccines. This study presents pertussis surveillance data from São Paulo state and discusses the challenges to interpret them considering pertussis cyclic epidemic behavior, the introduction of new diagnostic techniques and new vaccination strategies, and enhanced disease awareness during epidemics.

METHODS:

Observational study including pertussis cases reported to the Surveillance System in São Paulo state, from January 2001 to December 2015. Pertussis cases data were retrieved from the National Notifiable Diseases Information System (SINAN) website and from São Paulo state Epidemiological Surveillance Center (CVE/SP) database. Vaccination coverage and homogeneity data were collected from the Unified Health System Department of Informatics (DATASUS). We presented cases distribution by year, age group and diagnostic criteria and calculated pertussis incidence rates. The proportions of cases among different age groups were compared using chi-square test for trend.

RESULTS:

Infants less than 1 year of age were the most affected during the whole period, but the proportions of cases in this age group had a significant decreasing trend, with significant increase in the proportions of cases reported among older age groups (1-4, 5-10 and ≥ 20 years). Cases among infants aged less than 6 months represented $\geq 90\%$ of all cases in children less than 1 year of age in all but 2 years (2012 and 2015). A non-significant decrease in the proportion of cases among infants aged < 2 months was observed in parallel to a significant increase in the proportion of cases in infants aged 6-11 months.

CONCLUSIONS:

A pertussis outbreak has occurred in a state with universal use of wP vaccine. The disease cyclic behavior has probably had a major role in the increased incidence rates registered in São Paulo state, from 2011 to 2014, as well as in the decreased incidence in 2015. Maternal vaccination cannot explain the drop in the number of cases among all age groups, in 2015, as herd protection is not expected, but may have had an impact on the number of cases in infants aged < 2 months.

WEB: [10.1186/s12879-018-3004-1](https://doi.org/10.1186/s12879-018-3004-1)

IMPACT FACTOR: 2.61

CITED HALF-LIFE: 3.80

START EDITORIAL COMMENT: Cyclic epidemic peaks of pertussis directly impacted the health of children under 1 year of age. Surveillance data analyzed in this study found while children under 1 year of age were most affected, there was an increasing proportion of cases among older children. The demonstrated increase in maternal vaccination was unlikely to explain the reduced 2015 incidence given that herd immunity was not expected but was likely the reason for a demonstrated reduction in pertussis incidence among children less than 2 months of age in 2015 relative to 2011-2014.

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10. [Role of health determinants in a measles outbreak in Ecuador: a case-control study with aggregated data.](#)

Rivadeneira MF, Bassanesi SL, Fuchs SC.
BMC Public Health. 2018 Feb 20;18(1):269.
PubMed ID: 29458349

ABSTRACT

BACKGROUND:

In 2011-2012, an outbreak of measles occurred in Ecuador. This study sought to ascertain which population characteristics were associated.

METHODS:

Case-control study of aggregate data. The unit of analysis was the parish (smallest geographic division). The national communicable disease surveillance database was used to identify 52 case parishes (with at least one confirmed case of measles) and 972 control parishes (no cases of measles). A hierarchical model was used to determine the association of measles with population characteristics and access to health care.

RESULTS:

Case parishes were mostly urban and had a higher proportion of children under 1 year of age, heads of household with higher educational attainment, larger indigenous population, lower rates of measles immunization, and lower rates of antenatal care visit attendance. On multivariate analysis, associations were found with educational attainment of head of household ≥ 8 years (OR: 0.29; 95%CI 0.15-0.57) and $\geq 1.4\%$ indigenous population (OR: 3.29; 95%CI 1.63-6.68). Antenatal care visit attendance had a protective effect against measles (OR: 0.98; 95%CI 0.97-0.99). Measles vaccination was protective of the outbreak (OR: 0.97; 95%CI 0.95-0.98). The magnitude of these associations was modest, but represents the effect of single protective factors, capable of acting at the population level regardless of socioeconomic, biological, and environmental confounding factors.

CONCLUSION:

In Ecuador, the parishes with the highest percentage of indigenous populations and those with the lowest vaccination coverage were the most vulnerable during the measles outbreak.

WEB: [10.1186/s12889-018-5163-9](https://doi.org/10.1186/s12889-018-5163-9)

IMPACT FACTOR: 2.21

CITED HALF-LIFE: 4.30

START EDITORIAL COMMENT: This study analyzed population characteristics for a measles outbreak in Ecuador. A hierarchical model was used to categorize socioeconomic characteristics, biological characteristics, environmental characteristics, and access to healthcare services associated with the measles outbreak (Figure 1) based on the 2010 Ecuador population census. A positive association was observed between measles and heads of households with ≥ 8 years of education, migrant populations (after adjusting for confounders), and parishes with over 1.4% indigenous populations (Table 2) creating a more specific profile of factors associated with potential measles outbreaks. Vulnerable groups should be targeted for increased antenatal care coverage and vaccination programs to prevent population-level measles outbreaks.

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APPENDIX

(((((vaccine[tiab] OR vaccines[tiab] OR vaccination[tiab] OR immunization[tiab] OR immunisation[tiab] OR vaccine[mesh] OR immunization[mesh]) AND (logistics[tiab] OR supply[tiab] OR "supply chain"[tiab] OR implementation[tiab] OR expenditures[tiab] OR financing[tiab] OR economics[tiab] OR "Cost effectiveness"[tiab] OR coverage[tiab] OR attitudes[tiab] OR belief[tiab] OR beliefs[tiab] OR refusal[tiab] OR "Procurement"[tiab] OR timeliness[tiab] OR systems[tiab])) OR ("vaccine delivery"[tiab])) NOT ("in vitro"[tiab] OR "immune response"[tiab] OR gene[tiab] OR chemistry[tiab] OR genotox*[tiab] OR sequencing[tiab] OR nanoparticle*[tiab] OR bacteriophage[tiab] OR exome[tiab] OR exogenous[tiab] OR electropor*[tiab] OR "systems biology"[tiab] OR "animal model"[tiab] OR cattle[tiab] OR sheep[tiab] OR goat[tiab] OR rat[tiab] OR pig[tiab] OR mice[tiab] OR mouse[tiab] OR murine[tiab] OR porcine[tiab] OR ovine[tiab] OR rodent[tiab] OR fish[tiab])) AND (English[LA]) ("2018/2/15"[PDAT] : "2018/3/14"[PDAT]))

* March 30, 2017, this search of English language articles published between February 15, 2017 and March 14, 2017 and indexed by the US National Library of Medicine resulted in 225 unique manuscripts.

