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## Original Research

# What is causing high polio vaccine dropout among Pakistani children?



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## ABSTRACT

**Objectives:** Although the antipolio drive is undertaken across Pakistan, there are still children who have not received any oral polio vaccine or are unable to complete recommended doses of polio vaccine. This study aims at empirically analyzing the associated factors with the no oral polio vaccination (OPV) and OPV dropout groups of children in Pakistan.

**Study design:** This is a cross-sectional study.

**Methods:** Data were obtained from the three waves of Pakistan Demographic and Health Survey of children aged between 12 and 23 months (1990–1991:  $n = 1214$ ; 2006–2007:  $n = 1522$ ; 2012–2013:  $n = 2074$ ). Children who received no OPV and those who drop out of polio vaccination (OPV1–OPV3) were considered as outcome variables. The bivariate relationship of outcome variable with each socio-economic, demographic, and spatial variable is estimated with a P-value of  $<0.01$ . For both no OPV and OPV dropout children, we used logistic regression analysis separately.

**Results:** The percentage of children aged 12–23 months who dropped out of OPV1–OPV3 vaccination was about 76% in the year 1990–1991; 21% in 2006–2007, and 17.5% in 2012–2013 at the national level. Among all indicators, provinces, rural versus urban residence, the mother's age at marriage, the child's birth place (home versus hospital), parental education, and household wealth status are significant predictors of no OPV and/or OPV dropout in Pakistan. Among provinces, Balochistan, Khyber Pakhtunkhwa (KPK), and Sindh are the lagging provinces.

**Conclusion:** Improving the socio-economic status of women helps decrease the chance of polio dropout and thus improves service delivery and program implementation.

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## Introduction

There is a dearth of empirical studies that trace the children with no oral polio vaccination (OPV) and OPV dropout in

Pakistan. Poliomyelitis is a disease that creates disability and thus compromises the full potential of human beings. Immunization saves millions of lives across the globe; thus, sustainable development goals (SDGs-3) put emphasis on immunizing children and providing them with better

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opportunities in life from the very beginning, thus ensuring healthy lives and well-being for everyone (children and adults, regardless of their gender) across the life span. In Pakistan, the Expanded Program on Immunization<sup>1–3</sup> was launched in 1978 with the main objectives of eradicating polio by 2012, eliminating measles and neonatal tetanus by 2015, and minimizing the incidence of other vaccine-preventable diseases.<sup>4</sup> Later, vaccines against hepatitis B (2002) and hemophilic influenza type B (2008) were also added with support from the government and development partners.<sup>3,5</sup> About 19.5 million children who are unable to receive routine lifesaving vaccinations remained worldwide.<sup>6</sup> Almost 60% of these unvaccinated children of age less than 5 years live in 10 developing countries, including Pakistan.<sup>6</sup> Across Pakistan, the vaccination percentage of children increased from 85% in August 2016 to 92% in May 2017.<sup>7–11</sup> Furthermore, there is a remarkable achievement in terms of reducing the incidence of polio cases to 20 in the year 2016 as against 144 in the year 2010.<sup>6,12,13</sup>

Pakistan represents more than 85% of the global wild poliovirus caseload,<sup>9,14,15</sup> thus becoming the last region (besides Afghanistan and Nigeria) on the planet to have wild poliovirus.<sup>12</sup> For the first time in the 21st century, the annual reported cases of polio in Pakistan exceeded 300 in the year 2014.<sup>9</sup> Pakistan poses a major hurdle toward achieving global polio eradication because of unvaccinated pockets; dropouts from vaccination and positive environmental samples continue to persist.<sup>16,17</sup> Suspected threats to the population of northern frontier territories and antipeace activists had created a life-threatening environment in the country because of the war on terror. It has demotivated parents to let their children get vaccinated against polio because of insecurity and negative local propaganda about adverse effects of vaccination.<sup>18</sup> These activities have made the Federally Administered Tribal Areas (FATA) and their attached areas a prominent polio reservoir in Pakistan.<sup>19</sup> Besides these tribal areas, the polio campaign has been severely affected in the Balochistan region. To maintain peace, an antiterrorist military operation 'Zarb-e-Azb (2014–2015)' had created a peaceful sociopolitical environment, especially in the Khyber Pakhtunkhwa region and frontier tribal areas of Pakistan.<sup>20</sup> It has retrieved and built confidence in affected families to support the polio vaccination campaign. Supported by all these propeace initiatives, the Government of Pakistan is motivated to make polio campaigns a successful program in all areas of the country. According to independent monitoring, in Pakistan, from September 2016 to May 2017, nine high-quality Supplementary Immunization Activities were conducted by Pakistan Polio Eradication Initiative. Across Pakistan, during the same time, the vaccination percentage of children increased from 85% in August 2016 to 92% in May 2017. There is a remarkable achievement in terms of reducing the incidence of polio cases in Pakistan from 2010 to 2016 (144 polio cases vs 20 reported cases in Pakistan, respectively).<sup>2,5,12</sup>

Therefore, there is a need to examine empirically the evidence-based risk factors of no OPV and OPV dropout across Pakistan. Thus, this study aims to examine the factors associated with never-vaccinated children (no OPV) and OPV dropouts (missed any one dose of OPV) among children aged 12–23 months using three waves of Demographic and Health Survey data of Pakistan (1990–1991, 2006–2007, and 2012–2013).

## Methods

### Data

This study uses data from three waves of the nationally representative Pakistan Demographic and Health Survey (PDHS) conducted in 1990–1991, 2006–2007, and 2012–2013 for the analysis of polio dropout incidences and of those children (aged 12–23 months) who were never vaccinated against polio. Information on the vaccination status of children (12–23 months old) was taken from 'Women's Questionnaire' either through mother recall or through the vaccination card. The first round of PDHS was conducted in 1990–1991 with 1215 targeted children; the second round was conducted in 2006–2007 with 1522 children; and the third round was conducted in 2012–2013 with 2074 children of age 12–23 months (see [Table Appendix-II](#)). PDHS data were collected by the National Institute of Population Studies, Islamabad, Pakistan, and Macro International Inc. (now ICF International) Calverton, Maryland, US (for details, see elsewhere).<sup>21</sup> The variables used in this study for analysis are comparable across the three waves of PDHS. The survey is nationally representative except Azad Jammu and Kashmir, FATA, and restricted military and protected areas that were not part of the survey. Moreover, the three waves of PDHS provide information on vaccination coverage from surviving children only. There was no need for ethical clearance as the PDHS data are a publicly available data set.

### Dependent variable

Unit of analysis in this research comprised all children aged 12–23 months because all the children by this age have had the opportunity to receive the recommended doses of OPV. Never-vaccinated children are those who have not received any dose of OPV, and OPV dropout children are those who received any one dose of OPV but remain unable to complete the recommended doses of OPV by the age of 12–23 months (see [Appendix-I](#)). The dropout rate is the difference between the initial vaccine dose (OPV1) and the final vaccine dose (OPV3) such that  $OPV\ dropout = (OPV1 - OPV3 / OPV1) \times 100$ .<sup>22</sup> In our study, the response was measured through two types of dependent variables, i.e. (a) if a child is a dropout and did not take his/her subsequent doses of OPV, the score is 1; else, 0 and (b) if never vaccinated with OPV, the score is 1; else, 0.

### Associated risk factors

Following Andersen's (1995) health behavioral model in our analysis, we used child-specific factors (place of birth of the child, child birth order, and sex of the child), mother- and father-specific factors (the woman's age at the first marriage, the mother and father's level of education, and the mother's occupation), household-specific factors (sex of the household head and household wealth status), and spatial factors (place of residence and province of residence). Specification of independent factors associated with dropout and never-vaccinated children of age 12–23 months are as follows: The child's birth place includes home and institutional delivery. Institutional delivery includes both private and public hospital delivery.

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