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**Welfare Impact of the Health Intervention  
in Pakistan: The Case of Lady Health  
Workers Programme**

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## 1. INTRODUCTION

With the year 2015 fast approaching, Pakistan is unlikely to achieve most of the health targets set by the Millennium Development Goals (MDGs) [Government of Pakistan (2010)]. Among the key challenges it faces are high levels of child and maternal mortality. Accompanying the enhanced vulnerability of children and women is the economic divide—the poor face greater health challenges than the economically better off. Another divide is that between the rural and urban population—health facilities tend to be concentrated in the country's urban centres. The enhanced burden of tackling health issues adversely affects the poor and rural population, lowering their productivity and limiting their lifetime achievements. Without substantially improved health outcomes, it is impossible to break out of the cycle of poverty [OECD (2003)].

The government of Pakistan has taken several initiatives to improve the health of its population, particularly among women and children; the Lady Health Workers Programme (LHWP) is one such initiative. Launched in 1994, its core objective was to help reduce poverty by providing essential primary healthcare services to the public and, hence, improve national health indicators. The programme also envisaged contributing to the overall health sector goals of improving maternal, neonatal, and child health, providing family planning services, and integrating other vertical health promotion programmes.

Oxford Policy Management (OPM)'s evaluation of the LHWP in 1999 indicates that the programme has had a positive impact on health outcomes in its catchment areas. These outcomes include childhood vaccination rates, reversible methods of contraception (especially in rural areas), antenatal services, provision of iron tablets to pregnant women, child growth monitoring, and control of childhood diarrhoea among lower-income and poor households. OPM's 2008-09 evaluation report states that lady health workers (LHWs) play a substantial role in preventive and promotive care and in delivering basic curative care to their communities, along with referrals to emergency and tertiary care [OPM (2009)].

These evaluations of the LHWP do not, however, provide an in-depth analysis of the programme's distributional impact. The health and poverty nexus is well documented and the literature shows that a family's wellbeing is strongly tied to the physical health of its members [World Health Organisation (2003)]. An effective intervention in the health sector improves the delivery of health services, which impacts positively on the health status of a population. This improvement in health affects their wellbeing by enabling them to take more efficient advantage of the economic opportunities available.

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This study aims to (i) analyse whether LHWs serve the poor and vulnerable disproportionately, (ii) examine the LHWP's contribution toward improving child and maternal health, and (iii) analyse the programme's poverty reduction impact. The paper is organised into five sections. Section 2 briefly reviews the health and poverty situation in Pakistan, and outlines the main features of the LHWP. Section 3 discusses the data sources and methodology used. Section 4 questions whether the LHWP has served the poor disproportionately. Section 5 examines the health-seeking behaviour of beneficiaries (women visited by LHWs) and non-beneficiaries (women not visited by LHWs). Section 6 explores the impact of the LHWP on the health outcomes of women and children and their poverty status. Section 7 presents the study's conclusions and draws some policy recommendations.

## **2. HEALTH, POVERTY, AND THE LHWP INITIATIVE: A BRIEF REVIEW**

Child and maternal health are considered important summary indicators for a country's development. MDG 4 is to reduce child mortality while MDG 5 is to improve maternal health. While Pakistan has made some improvements in the indicators related to these goals, its progress remains slow and unsatisfactory. Table 1 presents data on child and maternal health indicators for the period 1990-91 to 2008-09 period along with the MDG targets for 2015. Pakistan lags behind on two important indicators of child health: under-five and infant mortality. It needs to reduce under-five mortality to 52 deaths per 1,000 by 2015 from its current level of 94 deaths per 1,000. Similarly, a reduction in infant mortality appears difficult to attain with a target of 40 deaths per 1,000 live births from the current level of 75 deaths per 1,000 live births. The country's progress in children's immunisation and reduction in diarrhoea cases is, however, considered satisfactory (Table 1).

The trend in indicators related to maternal health shows that, while Pakistan has made significant progress in reducing maternal mortality from 533 deaths per 100,000 live births in 1990-91 to 276 in 2006-07 (Table 1), achieving the target of 140 by 2015 may be very difficult in such a short time. Similarly, despite improvements in the proportion of women using contraceptives and receiving antenatal care, and in the number of deliveries by skilled birth attendants, progress is slow if the targets set for 2015 are to be achieved. A considerable decline in the total fertility rate from 5.4 in 1990-91 to 3.8 in 2008-09 is not sufficient to achieve the target of replacement-level fertility (2.1 births per woman) by 2015.

Table 1 also presents data on poverty trends and the MDG target for 2015. Historically, poverty has fluctuated in Pakistan over the last five decades. While it was very high in the 1960s (40 percent), it declined in the 1970s and 1980s, reaching 18 percent in 1987-88. Poverty levels began to rise again in the

Table 1

*Performance of Health Sector and Poverty Situation in Pakistan*

Indicators								MDG Target
	1990-91	2001-02	2004-05	2005-06	2006-07	2007-08	2008-09	2015
Poverty incidence	26.1	34.5	23.9	22.3	n/a	n/a	n/a	13
MDG indicators related to reducing infant and child mortality								
< 5 mortality	117	n/a	n/a	n/a	94	n/a	n/a	52
Infant mortality rate	102	77	77	76	75	n/a	n/a	40
Proportion of fully immunized children (12–23 months)	75	53	77	71	76	73	78	>90
Proportion of 1-year-old children immunized against measles	80	57	78	76	77	76	79	>90
Proportion < 5 suffered from diarrhoea	26	12	14	12	11	10	10	<10
MDG indicators related to improved maternal health								
Maternal mortality ratio	533	350	400	380	276	n/a	n/a	140
Proportion of skilled birth attendance	18	40	48	35	37	40	41	>90
Contraceptive prevalence rate	12	28	n/a	n/a	29.6	30.2	n/a	55
Total fertility rate	5.4	n/a	n/a	n/a	4.1	3.85	3.75	2.1
Proportion made at least 1 antenatal check-up (for births in last 3 years)	15	35	50	52	53	56	58	100

*Source:* Government of Pakistan (2010), Pakistan Millennium Development Goals Report, Planning Commission, Islamabad.

early 1990s till the beginning of the new millennium, when the headcount ratio rose to about 35 percent. In addition to the decline in economic growth, inflows of foreign remittances—which are believed to have been a key factor in reducing poverty during the 1970s and 1980s—also decreased markedly during the 1990s. There was a sharp fall in poverty during the first half of the 2000s, from 34.5 percent in 2000-01 to 22.3 percent in 2005-06 (Table 1). No official statistics on poverty are available after 2006. Recently, the economy has faced severe challenges, including deteriorating economic growth, double-digit inflation (particularly food inflation), power shortages, soaring oil prices, and poor law and order. Inflows of foreign remittances, however, have increased to more than US\$ 10 billion per annum. Irrespective of recent poverty estimates, historical trends show instability in poverty reduction.

Pakistan's poverty reduction strategy has, on one hand, focused on sustained high economic growth, and on the other given equal importance to income transfers and investment in human capital by improving health and education indicators. Among health sector initiatives,<sup>1</sup> the LHWP is unique in terms of its objectives, coverage, and provision of services to women and children. As mentioned earlier, the programme's core objective is to help reduce poverty by providing essential primary maternal, neonatal, and child healthcare services, family planning services, and integrating other vertical health promotion programmes. Beginning with little over 30,000 LHWs in the mid-1990s, over the years the programme has expanded to more than 100,000 LHWs currently deployed in all districts of the country.

The selection criteria for an LHW include the following: she should (i) preferably be married; (ii) be a permanent resident of the area for which she is being recruited; (iii) have attained at least eight years' schooling, preferably up to matriculate level; (iv) be between 20 to 50 years old (up to 18 years only if she is married); (v) be willing to deliver services from her home. Additionally, preference is given to women with experience of community development. The LHWP targets rural areas and communities living in urban slums across the entire country. At present, it covers almost 60 percent of the total population [Hafeez, *et al.* (2011)]. Although a large number of LHWs are stationed in almost every district, there are still some that the programme has not been able to cover, its main constraints being non-functional health facilities and the unavailability of women meeting the selection criteria set for recruitment as LHWs [Government of Pakistan (2011)].

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<sup>1</sup>The health programmes include the Expanded Programme on Immunisation, AIDS Control Programme, Malaria Control Programme, National TB Control Programme, National Programme for Family Planning and Primary Healthcare, National Programme for Prevention and Control of Blindness, National Maternal Newborn and Child Health Programme, Cancer Treatment Programme, Drug Abuse, Dengue Epidemic and Control Programme, and Food and Nutrition Programmes [Government of Pakistan (2012)].

LHWs provide communities with door-to-door healthcare services, liaise between communities and the formal healthcare system, and ensure support from NGOs and other departments. They coordinate with other maternal and healthcare providers such as midwives, traditional birth attendants, and local health facilities in the community for appropriate antenatal and postnatal services. LHWs are responsible for nutrition-related interventions, such as anaemia control, growth monitoring, assessing common risk factors causing malnutrition, and nutritional counselling. They can also treat common diseases, for which they are equipped with inexpensive drug kits.

### 3. DATA AND METHODOLOGY

This study combines qualitative and quantitative methods to accomplish its objectives. The main reason for doing so is that the latter is better suited to measuring the levels and changes brought by an intervention and for drawing inferences from observed statistical relations between those changes and other covariates. Quantitative analysis is, however, less effective in understanding processes, that is, the mechanisms by which a particular intervention triggers a series of events that ultimately result in the observed impact.<sup>2</sup>

For the quantitative portion of the study, we use a multipurpose panel dataset generated by the Pakistan Institute of Development Economics (PIDE) in August–December 2010—the Pakistan Panel Household Survey (PPHS), which covers rural and urban areas in the following 16 districts: Attock, Hafizabad, Faisalabad, Vehari, Bahawalpur, and Muzaffargarh in Punjab; Badin, Mirpur Khas, Nawabshah, and Larkana in Sindh; Dir, Mardan, and Lakki Marwat in Khyber Pakhtunkhwa (KP); and Loralai, Khuzdar, and Gwadar in Balochistan. The PPHS 2010 is the third round of a panel survey, the first and second rounds of which were carried out in rural areas in 2001 and 2004, and named the Pakistan Rural Household Survey (PRHS). The 2001 and 2010 rounds included a health module [for more detail, see Nayab and Arif (2012)]. Our study uses both these datasets, but relies primarily on the PPHS 2010 for the impact analysis.<sup>3</sup>

Our units of analysis are married women of reproductive age (15–49 years old) and children under-five in the survey sample, since they largely comprise the LHWP's target population. Both the 2010 PPHS and 2001 PRHS asked women in the sampled households whether an LHW had visited their household in the three months preceding the survey and, if so, how often. This study divides the sampled women and children into two broad categories: (i) beneficiaries, referring to those who had been visited by an LHW during the reference period; and (ii) non-beneficiaries, i.e., those not visited by an LHW in that time.

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<sup>2</sup>Vijayendren Rao and Michael Woolcock; Integrating Qualitative and Quantitative Approaches in Programme Evaluation.

<sup>3</sup>For the sample size, see Appendix Table 1.

Our quantitative analysis is carried out in three steps. First, we examine whether LHWs serve the poor more than the rich by calculating the proportion of beneficiaries (women) by income quintile and the level of their educational attainment. A multivariate analysis is also carried out using a binary dependent variable—beneficiaries (visited by LHW = 1) and non-beneficiaries (not visited = 0):

$$P(X_i) = \text{Prob}(D_i = 1 | X_i) = E(D | X_i) \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

where

$$P(X_i) = F(h(X_i))$$

$F(h(X_i))$  can follow a normal or logistic cumulative distribution.

$D_i = 1$  if a beneficiary and 0 otherwise (non-beneficiary).

$X_i$  is a vector of pre-treatment characteristics.

The second step investigates the health-seeking behaviour of beneficiaries and non-beneficiaries, focusing on the use of contraceptives, antenatal care, place of most recent delivery, and child immunisation. The third step estimates the impact of the LHWP on maternal and child health-related indicators and on the poverty level, using the propensity-score matching (PSM) method developed by Rosenbaum and Rubin (1983).

Observing the LHWP's welfare impact on the non-beneficiary sample is not, however, straightforward. Taking the mean outcome of non-beneficiaries as an approximation is not advisable because beneficiaries' and non-beneficiaries' socioeconomic characteristics are likely to differ, even in the absence of the programme, and this could lead to a selection bias [Kopeinig (2008)]. The PSM method provides a possible solution to this problem with the idea of finding a comparison group that resembles the beneficiary group in all aspects except one—the comparison group does not benefit from the programme [Ravallion (2003)].

In the PSM method, beneficiaries of the LHWP (both women and children) are considered “treated units” while non-beneficiaries are “non-treated units”. Beneficiaries are matched to non-beneficiaries on the basis of the propensity score by meeting two conditions. The first condition is the balancing of the pre-treatment variables, given the propensity score. If  $p(X)$  is the propensity score, then,

$$D_i = X_i | p(X_i) \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

If the balancing hypothesis is satisfied, both the beneficiary and non-beneficiary groups must have the same pre-treatment characteristics—for a given propensity score, exposure to benefit (or treatment) is a randomised experiment and, therefore, a beneficiary and non-beneficiary should be, on average, observationally identical.

The second condition is that of un-confoundedness, given the propensity score. Suppose that assignment to beneficiaries is un-confounded, that is,

$$\begin{aligned} Y_{1i}, Y_{0i} &= D_i | X_i \\ &= D_i | p(X_i) \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \quad \dots \end{aligned} \quad (3)$$

When assignment to beneficiaries is un-confounded conditional on the variables before benefit (or treatment), assignment to beneficiaries is un-confounded given the propensity score.

Using equation 1, we calculate the propensity scores using logistic regression and then estimate the *average treatment on the treated* (ATT) effect based on the propensity score [Rosenbaum and Rubin (1983)].

$$\begin{aligned} ATT &= E(Y_{1i} - Y_{0i}) \\ &= E(ATE | D_i = 1) \\ &= E[Y_{1i} | D_i = 1] - E[Y_{0i} | D_i = 1] \quad \dots \quad \dots \quad \dots \quad \dots \end{aligned} \quad (4)$$

where

$Y_{1i}$  is the potential outcome if the individual is treated (beneficiary) and  
 $Y_{0i}$  is the potential outcome if the individual is not treated (non-beneficiary).

In order to make the working sample comparable, it has been restricted to those units with probabilities that lie within the region known as the common support, that is, the area that contains enough control and treatment observations to proceed with comparison [Dehejia (2005)]. We apply the PSM method to the PPHS 2010 micro-dataset to analyse the impact of the LHWP on maternal and child health and on poverty. For the latter, we use the consumption approach by inflating the official poverty line for 2010.<sup>4</sup>

To supplement the findings based on the quantitative methodology described above, the study entailed qualitative work conducted in ten rural localities of eight districts: Attock (northern Punjab), Hafizabad (central Punjab), Rajanpur (southern Punjab), Mardan and Swabi (KP), Turbat (Balochistan), and Badin and Mirpur Khas (Sindh). Two villages from each of these districts were selected—one covered by the LHWP and one that was not. The villages were selected for the sake of comparison and to assess how the programme's absence affected women's health-seeking behaviour. The qualitative approaches used in both villages included focus group discussions (FGDs) with women (beneficiaries and non-beneficiaries) and in-depth interviews with LHWs.

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<sup>4</sup>The 2010 PPHS has a comprehensive consumption expenditure module. For more detail, see Arif and Farooq (2012).

#### 4. HAS THE LHWP SERVED THE POOR DISPROPORTIONATELY?

Table 2 presents data on the proportion of women visited by LHWs by quintile, and shows that not only the poor are served. About 50 percent of the poorest women (first quintile) reported having been visited by an LHW compared to 54 percent of the fifth (richest) quintile. These figures imply that LHWs do not select their patients on the basis of wealth or economic status. The regional data, however, negates this notion: while LHWs reach out to the poor (59 percent) more so than to the rich (44 percent) in urban areas, the trend is reversed in rural areas (Table 2). In terms of educational attainment, Table 2 shows that, in rural areas, LHWs visit literate/educated women slightly more often, but in urban areas, as per the quintiles, they visit illiterate women more often.

Table 2

*Percentage of Beneficiaries (Women) Visited by LHWs, 2001 and 2010*

Quintile	PPHS 2010			PRHS 2001
	Total	Urban	Rural	Rural Only
Q1	50.2	59.3	47.0	13.2
Q2	53.3	41.2	58.7	15.1
Q3	55.7	54.6	56.2	14.9
Q4	53.9	54.5	53.6	21.8
Q5	54.0	44.1	57.0	21.4
Level of educational attainment				
No education	52.2	53.0	51.9	16.1
Primary	60.8	48.5	67.8	25.7
Middle	58.3	50.0	65.4	27.7
Secondary	57.1	49.2	64.8	27.1
Higher	55.1	51.6	59.2	28.6
All	53.7	51.8	54.4	17.5

*Source:* Authors' computations based on PRHS 2001 and PPHS 2010 micro-datasets.

The results of the multivariate analysis (logistic regression) using equation 1, where the dependent variable is 1 for beneficiaries and 0 for non-beneficiaries, are presented in Table 3. LHWs are more likely to visit women aged 26–35 years and less likely to visit those who are past their prime reproductive age (i.e., 36–49 years) compared to women in the reference category (15–25 years). The literacy level of women and that of the household head is not statistically significant in relation to visits by an LHW (Table 3). Household size has a significant positive impact on LHWs' visits—an increase in size by one member raises the probability of a visit by 1.05 times. The presence of a child has a positive and statistically significant impact on LHWs' visits, reflecting the programme's emphasis on maternal and child health (Table 3).

Table 3

*Determinants of LHWs' Visits (Odd Ratio)*

Correlates	Odd Ratio	Std. Error
Age of woman (15–25 as reference)		
26–35	1.154**	0.098
36–49	0.781*	0.070
Literacy of woman (yes = 1)	0.955	0.080
Literacy of household head (literate = 1)	0.957	0.067
Household size	1.047*	0.009
Presence of a child (yes = 1)	1.301*	0.160
Sex of household head (male = 1)	1.361**	0.248
Land owned (acres)	0.997	0.003
Large animals owned (number)	1.065*	0.014
Small animals owned (number)	0.993	0.009
Structure of house ( <i>kachha</i> as reference)		
Pucca	1.064	0.097
Mix	1.212*	0.114
Region (urban = 1)	1.178**	0.100
Province (Punjab as reference)		
Sindh (yes = 1)	1.985*	0.165
KP (yes = 1)	1.771*	0.184
Balochistan (yes = 1)	0.089*	0.015
LR chi <sup>2</sup> (12)	816.44	
Log likelihood	–2683.85	
Prob. > chi <sup>2</sup>	0.0000	
Pseudo-R <sup>2</sup>	0.13	
N	4,515	

Source: Authors' computations based on PRHS 2001 and PPHS 2010 micro-datasets.

Note: \* denotes significance at 5 percent, \*\* denotes significance at 10 percent.

The relationship between land ownership (acres) or between small animals (number) and LHWs' visits is not statistically significant, although the ownership of large animals appears to have a positive impact. Brick (*pucca*) houses showed no significant association with visits from LHWs although houses built of mixed structure appeared to have a positive relationship. The significant coefficient of region shows that women in urban areas are more likely to be visited by an LHW

than rural women, suggesting that rural women have lower coverage. Relative to the reference category (non-beneficiary women in Punjab), women in Sindh and KP are more likely to be visited by LHWs while women in Balochistan are less likely to be visited (Table 3). Based on this multivariate analysis, we can safely conclude that LHWs do not generally select their patients on the basis of their economic status, and tend to serve all women and children.

These findings support the qualitative research carried out to complement the quantitative data. In-depth interviews and FGDs carried out in Attock, Hafizabad, and Rajanpur in Punjab indicate that the LHWP serves people from all segments of the population, whether poor or non-poor. (However, most people who approach LHWs—whether for health advice or medicine—are poor and cannot afford other medical assistance.) Beneficiaries of LHW visits in Sindh and KP reported a similar trend, indicating that LHWs provided services irrespective of their patients' economic situation. Beneficiaries in Badin and Mirpur Khas in Sindh, and in Mardan and Swabi in KP mentioned that the LHWs in their areas gave equal importance to all the people they served. From the standpoint of beneficiaries and LHWs in the district of Turbat in Balochistan, the programme targeted mainly poor people. The unanimous view of the LHWs interviewed was that everyone was equal and that they were there to serve all, whether poor or rich.

## **5. HEALTH-SEEKING BEHAVIOUR OF BENEFICIARIES AND NON-BENEFICIARIES**

Has the LHWP influenced women's health-seeking behaviour? The two rounds of the panel data carried out in 2001 and 2010 include a comprehensive health module, which address the use of contraception by married women, antenatal care during their last pregnancy, and the use of oral rehydrating salts (ORS) for diarrhoea among children. The use of contraceptives among beneficiary and non-beneficiary women is reported in Table 4, which also gives information on the proportion of women using modern contraceptive methods.

Overall, 35 percent of the sampled women reported using "any method" of contraception. There is a difference between rural and urban areas: more urban women report using contraceptives than rural women. Moreover, there is a difference in the contraceptive behaviour of beneficiaries and non-beneficiaries: the former have a contraceptive prevalence rate (CPR) of 39 percent, the latter, 32 percent. The difference prevails mainly, however, in rural areas where the CPR is 37 percent among beneficiary women and 27 percent among non-beneficiary women (Table 4). The use of modern methods is also higher among beneficiary women than among non-beneficiary women, particularly in rural areas. There was a marked improvement in the CPR from 2001 to 2010, indicating that LHWs have contributed positively to the use of family planning practices (Table 4).

Table 4

*CPR by Status of LHW Visit and Region (%)*

Contraception	PPHS 2010			PRHS 2001
	Urban	Rural	Total	Rural Only
<b>Beneficiaries (visited by LHW)</b>				
Using contraceptives	41.6	37.2	38.5	29.3
Using modern contraceptive methods	26.8	23.8	24.6	14.3
<b>Non-beneficiaries (not visited by LHW)</b>				
Using contraceptives	40.8	26.9	31.5	17.7
Using modern contraceptive methods	28.9	16.0	19.8	10.4

*Source:* Authors' computations based on PRHS 2001 and PPHS 2010 micro-datasets.

Table 5 presents data on antenatal care for two periods, 2001 and 2010. Compared to three quarters of beneficiary women in 2010, two thirds of non-beneficiary women received antenatal care during their last deliveries, indicating that the LHW has had some positive impact on women's health. This impact is, however, evident only in rural areas. Irrespective of LHW visits, approximately 80 percent of urban women received antenatal care during their last deliveries. Antenatal care appears to have improved among beneficiary women between 2001 and 2010 in rural areas, and there was a decline in the proportion of women giving birth at home. There was no corresponding increase, however, among non-beneficiary women in these categories. There was a modest increase between 2001 and 2010 in the proportion of beneficiary women who received tetanus injections during their last pregnancies, but a considerable decline among non-beneficiary women in this category.

Table 5

*Women Who Received Antenatal Care During Last Pregnancy  
by Status of LHW Visit and Region (%)*

Antenatal Care	2010			2001
	Urban	Rural	Total	Rural Only
<b>Beneficiaries (visited by LHW)</b>				
Received antenatal care	78.9	73.9	75.2	61.7
Received TT injections	83.9	83.4	83.5	80.6
Delivered at home	32.3	49.9	45.0	65.0
<b>Non-beneficiaries (not visited by LHW)</b>				
Received antenatal care	81.3	61.3	66.7	50.8
Received TT injections	69.0	46.8	54.1	66.1
Delivered at home	48.4	66.1	60.2	69.6

*Source:* Authors' computations based on PRHS 2001 and PPHS 2010 micro-datasets.

There is no major difference in the incidence of illness and diarrhoea between the children of beneficiary and non-beneficiary women (Table 6). However, in the case of diarrhoea, the former were more likely to use ORS than the latter. The use of traditional medicine to treat diarrhoea was higher among non-beneficiary households. Child immunisation was more or less universal but slightly higher among children of beneficiary women (Figure 1). The 2010 PPHS, in assessing health-seeking behaviour during children's illnesses, asked respondents about the first health service provider they chose to consult in such situations. The role of LHWs was negligible in such consultations because they are not necessarily authorised to prescribe medicines except advice on how to treat certain diseases such as diarrhoea.

The qualitative part of our study supports the findings of the household survey data and gives more information about variations across the provinces. The LHWs who were interviewed said that they performed whichever tasks were part of their duties and responsibilities, including family planning services, child vaccination, advice on ORS making, antenatal care, and basic information on hygiene. Some of the LHWs in Hafizabad and Attock said that they provided practical demonstrations if the community did not understand their explanations, particularly in the case of ORS making.

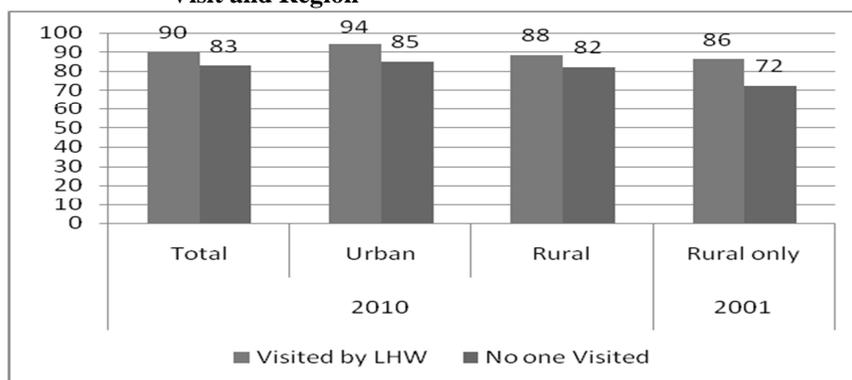
Table 6

*Use of ORS to Treat Diarrhoea by Status of LHW Visit and Region*

ORS	2010			2001
	Total	Urban	Rural	Rural Only
<b>Beneficiaries (visited by LHW)</b>				
ORS	51.08	61.22	48.35	51.32
Homemade fluids	9.09	4.08	10.44	3.95
Medicines	29	18.37	31.87	30.26
Traditional medicine	5.63	8.16	4.95	5.26
None of the above	5.19	8.16	4.4	9.21
Total	100	100	100	100
<b>Non-beneficiaries (not visited by LHWs)</b>				
ORS	42.74	53.85	41.35	44.71
Homemade fluids	6.84	7.69	6.73	6.83
Medicines	29.91	1	29.81	37.54
Traditional medicine	11.97	7.69	12.5	7.85
None of the above	8.55	0	9.62	3.07
Total	100	100	100	100

*Source:* Authors' computations based on PRHS 2001 and PPHS 2010 micro-datasets.

**Fig. 1. Proportion of Children Immunised by Status of LHW Visit and Region**



In general, the women surveyed appeared to be satisfied with the services their LHWs offered, although some had complaints. During an FGD in Attock, one woman objected:

Whenever she visits us, she asks about family planning services, or if any woman here is pregnant. She does not tell us anything else.

The FGDs held in areas not covered by the LHWP yielded interesting results. There was virtual consensus among the women there that their villages should be targeted. Non-beneficiaries said that they had to go to private clinics for check-ups, and that this was not feasible because it was expensive. They also reported that their children did not receive proper vaccinations since polio vaccination teams did not visit their villages frequently. Women in these areas had to opt for traditional birth attendants (*dais*) for deliveries, and seek family planning services that were not necessarily safe.

In Sindh, LHWs reported a gradual change local residents' attitude to maternal and child care, including vaccination. LHWs in Badin and Mirpur Khas said they were carrying out vaccination programmes for children and educating their communities about hygiene, family planning, and maternal health. They appeared satisfied with people's changing attitudes. An LHW in Badin said:

They used to resist getting vaccinated, but the community now agrees to get their children immunised. Pregnant women are also now ready to get vaccinated. It is our success and it is because of us that this change has come about.

KP yielded mixed results concerning the LHWP. In Swabi, the community responded positively, with the majority of women satisfied with the way the programme functioned. The most commonly reported services delivered by LHWs included the registration of pregnant women and newborn babies, frequent visits to expectant mothers, and EPI vaccination. People had access to

LHWs when needed at home and did not have to wait for them to visit. In Mardan, however, the results of the FGD showed that the community was not satisfied with the way the LHWP functioned, complaining that the LHWs in their area were irregular. One respondent said that her LHW was “*not performing her duty well; the last time she visited us [was] a year ago*”.

LHWs in the two districts in KP were also interviewed to find out what services they provided; they listed almost all the duties assigned to them on paper. When asked about the irregularity of their visits to some of the areas they were supposed to serve, they blamed the social milieu of the villages and said that female mobility in KP, particularly in certain areas, was not easy.

There are lots of problems in this area and its people are not very cooperative. My in-laws do not allow me to visit the community on a regular basis to deliver all the services I am supposed to offer households. Women can, however, visit me at home if they need to. They often do so for family planning methods and medicines. (LHW in Mardan, KP)

In Balochistan, the vaccination of children against polio is one of the major services that LHWs deliver. They perform this duty efficiently and regularly and people reported no complaints when surveyed. Women in the district of Turbat, however, complained that their LHWs did not provide them with any medicines, while the LHWs reported that they had no access to medicine supplies, for which they were blamed by their patients. People seemed to perceive that the LHWs were giving medicines only to their relatives or friends. A woman at an FGD in Turbat said:

She does not provide us with medicines. Whenever we go to her, she only has family planning pills and iron tablets and nothing else.

When asked about LHWs’ accessibility, women reported that they were accessible at home, even if they did not visit, but that they preferred going to the rural health centre in that case since the LHWs never had any medicine supplies. Their argument was that if they had to go that far to get medicines, they could see a doctor there as well.

Based on the discussion above, one can conclude that the LHWP’s coverage is largely satisfactory and it offers wide scope in terms of LHWs advice on improving the health of women and children. Regional differences are, however, evident: the programme’s performance in Punjab and Sindh is reported to be better than in KP and Balochistan. Security is one reason for the programme’s relatively poor performance in these two provinces, along with the erratic supply of medicines. Our qualitative study of areas that lack LHWs emphasises the need to enhance the LHWP’s coverage of all rural areas.

## **6. IMPACT ANALYSIS OF LHWP**

For our impact analysis of the LHWP, we select three sets of variables related to women’s reproductive health, child health, and poverty status.

Contraceptive use, antenatal care, vaccination (TT injections), and place of delivery represent women's reproductive health outcomes, while child immunisation, illness, and infant and child mortality are used to signify child health outcomes. The official poverty line represents the LHWP's welfare impact. Following the methodology given in Section 3, we estimate the propensity scores and calculate the ATT effect. The results of equation 1 have been discussed in the previous section, showing that women are not selected by LHWs on the basis of their economic status; rather, the programme's coverage seems to be universal within the target areas.

The results of equation 4 are presented in Tables 7–9 with ATT parameters under three measures: nearest neighbour (NN) matching, kernel matching, and stratification matching. The NN method matches each treated unit (beneficiaries) with the controlled unit (non-beneficiaries) that has the closest propensity score. The method is usually applied with replacement in the control units. In the second step, we compute the difference of each pair of matched units, finally obtaining the ATT as the average of all these differences.<sup>5</sup> In the kernel and local linear methods, all the treated units (beneficiaries) are matched with the weighted average of all the non-treated units (non-beneficiaries) using the weights, which are inversely proportional to the distance between the propensity scores of the treated (beneficiaries) and non-treated (non-beneficiaries) units. The stratification matching method consists of dividing the range of variation of the propensity score into a set of intervals (strata) such that, within each interval, the treated (beneficiaries) and non-treated (non-beneficiaries) units have the same propensity score on average [Rosenbaum and Rubin (1983)]. Both types of standard errors, analytical and bootstrapped, are reported in Tables 7–9, but the kernel matching method does not estimate the standard error by default.

### 6.1. Impact of LHWP on Women's Health

Table 7 presents the impact of the LHWP on women's health outcomes. The ATT impact on the use of contraceptives is only statistically significant when we apply the kernel method with a welfare gain of 2.5 percent. This positive effect reflects the programme's contribution in enhancing the use of contraceptives by married women. As discussed earlier, this is one of the LHWP's focal areas (some participants even complained about its over-emphasis during an FGD).

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<sup>5</sup>The NN method may face the risk of bad matches if the closest neighbour is far away. Such a risk can be avoided by imposing a tolerance level on the maximum propensity score distance (calliper). Calliper matching is one form of imposing a common support condition where bad matches can be avoided, and the matching quality rises. However, if fewer matches are performed, the variance of the estimates increases [Caliendo and Kopeining (2008); Smith and Todd (2005)].

Table 7 also shows that the programme has a positive and significant ATT impact on antenatal care under all three measures. Compared to the non-treated units (non-beneficiary women), the treated units (beneficiary women) have a positive impact of 17.7 to 21.9 percentage points. Both the bivariate analysis and the FGDs show that LHWs contribute positively toward antenatal care, particularly in rural areas. The third column in Table 7 shows the results for vaccination during the last pregnancy. The significant impact of the LHWP on this variable indicates a positive gain, ranging from 12.6 percent to 13.5 percent.

Table 7

*ATT Effects of LHWP on Women's Reproductive Health (Aged 15–49 Years)*

Method	Contraceptive Use (Yes = 1)	Antenatal Care (Yes = 1)	TT Injections (Yes = 1)	Place of Delivery (Hospital = 1)
<i>Nearest neighbour method</i>				
ATT	0.027	0.219	0.135	0.070
N. Treated	2548	2548	2548	2548
N. Control	1037	503	309	308
Standard error	0.018	0.030	0.035	0.037
t-stat	1.474	7.246	3.883	1.895
St. error bootstrap	0.022	0.035	0.040	0.044
t-stat	1.223	6.276	3.347	1.608
<i>Kernel method</i>				
ATT	0.025	0.177	0.126	0.030
N. Treated	2548	2548	2548	2548
N. Control	1945	1945	1945	1945
St. error bootstrap	0.014	0.026	0.031	0.032
t-stat	1.711	6.710	4.037	0.326
<i>Stratification method</i>				
ATT	0.020	0.187	0.131	0.004
N. Treated	2548	2548	2548	2548
N. Control	1947	1947	1947	1947
Standard error	0.014	0.017	0.016	0.018
t-stat	1.432	10.994	8.332	0.238
St. error bootstrap	0.014	0.022	0.026	0.038
t-stat	1.381	8.428	5.064	0.111

*Source:* Authors' computations based on PRHS 2001 and PPHS 2010 micro-datasets.

The LHWP's impact on delivery in a hospital is not, however, statistically significant under any of the three ATT measures. This may reflect the inability of the sampled women to afford hospital deliveries or the impracticality of travelling long distances to the nearest hospital. Women's own preference to deliver at home instead of at a health facility cannot be ruled out either. These findings of the PSM analysis as well as the study's qualitative work suggest that LHWs have created goodwill in their target areas and that women trust them enough to seek advice on different health issues.

## 6.2. Impact of LHWP on Child Health

The ATT effect of the LHWP on child health indicators is computed on the basis of estimated propensity scores, using logit regression (assigning code 1 to children from households visited by LHWs and 0 otherwise). The regression results presented in Table 8 do not show any systematic preference for LHWs, and the region and province dummies seem to be the major differentiating factors. Children in Sindh and KP are more likely to be visited by LHWs than children in Punjab, while the likelihood falls for Balochistan.

Table 8

<i>Determinants of LHW Visits (Odd Ratio)</i>		
Correlates	Odd Ratio	Std. Error
Sex of child (male = 1)	1.049	0.085
Number of children at home	0.921*	0.037
Sex of household head (male = 1)	1.316	0.312
Education of household head (years)	1.010	0.009
Number of married women in household	0.917	0.066
Household size	1.040*	0.016
Land ownership (acres)	0.998	0.004
Large animals owned (number)	1.023**	0.013
Small animals owned (number)	1.008	0.012
Structure of house ( <i>kachha</i> as reference)		
<i>Pucca</i>	1.214**	0.131
Mixed	1.381*	0.161
Region (urban = 1)	1.521*	0.167
Province (Punjab as reference)		
Sindh (yes = 1)	1.971*	0.190
KP (yes = 1)	4.523*	0.766
Balochistan (yes = 1)	0.019*	0.007
LR $\chi^2$ (15)	711.1	
Log likelihood	-1808.1813	
Pseudo- $R^2$	0.164	
N	3,333	

Source: Authors' computations based on PRHS 2001 and PPHS 2010 micro-datasets.

Note: \* denotes significance at 5 percent, \*\* denotes significance at 10 percent.

Table 9 presents the ATT effect of the LHWP on child health indicators. Beneficiary children are more likely to be vaccinated than non-beneficiary children by all three ATT measures. Child immunisation campaigns are a major part of LHWs' work nationwide. Because of their local residence and good practices, parents in the area seem to be relatively willing to have children immunised. The presence of LHWs has a negative effect on child illnesses but only under the stratification ATT measure. For the other two measures, the kernel and NN methods, the effect is not statistically significant.

Table 9

*ATT Effects of Propensity Score Matching on Child Health Indicators*

Measures/ATT	Immunisation Received (Yes = 1)	Child Illness (Yes = 1)	Infant Mortality (Yes = 1)	Child Mortality (Yes = 1)
Nearest neighbour method				
ATT	0.066	-0.013	-0.001	-0.001
N. Treated	2157	2157	2157	2157
N. Control	643	642	650	650
Standard error	0.025	0.031	0.001	0.001
t-stat	2.609	-0.411	-1.424	-1.424
St. error bootstrap	0.020	0.036	0.001	0.001
t-stat	3.290	-0.352	-1.288	-1.469
Kernel method				
ATT	0.072	-0.025	-0.001	-0.001
N. Treated	2157	2157	2157	2157
N. Control	1166	1166	1166	1166
St. error bootstrap	0.015	0.021	0.001	0.001
t-stat	4.690	-1.163	-1.230	-1.360
Stratification method				
ATT	0.063	-0.042	-0.001	-0.001
N. Treated	2157	2157	2157	2157
N. Control	2141	2141	2141	2141
Standard error	0.015	0.021	0.001	0.001
t-stat	4.172	-1.980	-1.396	-1.396
St. error bootstrap	0.015	0.019	0.001	0.001
t-stat	4.275	-2.203	-1.263	-1.258

*Source:* Authors' computations based on PRHS 2001 and PPHS 2010 micro-datasets.

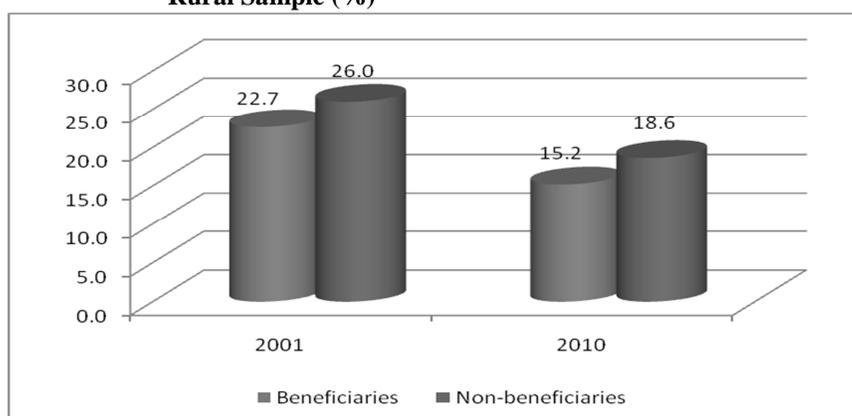
The impact of the LHWP on infant and child mortality is not statistically significant. The incidence of diarrhoea and respiratory infections are the major causes of infant and child mortality in Pakistan. While LHWs may have played a preventive role in reducing these causes of infant and child mortality, it is not sufficient to reduce either in Pakistan.

### 6.3. Welfare Impact of LHWP

Before presenting the findings of the PSM analysis on the programme's welfare impact, it is appropriate to discuss briefly the changes in households' poverty status based on the panel datasets used. Figure 2 shows poverty statistics for rural and urban areas in 2010 and 2001, when two rounds of the panel survey were carried out. As noted earlier, this study uses the official poverty line, inflating it to the year 2010.<sup>6</sup> Two points are noteworthy. First, there is no major difference between the beneficiary and non-beneficiary samples in terms of their poverty status either in 2010 or in 2001, although rural poverty among the former is slightly higher. Second, rural poverty between 2001 and 2010 declined sharply in both samples. Since these simple poverty statistics are not sufficient to gauge the welfare impact of the LHWP, we adopt the PSM methodology, which better suits the purpose.

<sup>6</sup>For more detail on the poverty line, see Arif and Farooq (2012).

**Fig. 2. Poverty Incidence in Beneficiary and Non-Beneficiary Rural Sample (%)**



Source: Authors' computations based on PRHS 2001 and PPHS 2010 micro-datasets.

Table 10 shows the estimated ATT on poverty status under the three measures, i.e., NN, kernel, and stratification. The welfare impact of the LHWP is negative and statistically significant under all three. However, the impact varies across the measures, ranging from 4.1 to 5.3 percentage points with the lowest for the kernel method and highest for the NN method. The negative signs of the three measures show that the programme reduces the probability of being poor. Thus, beneficiary women (and their households) are less likely to be poor than non-beneficiary women with similar characteristics.

Table 10

*ATT Effects Under Various Measures of Propensity Score Matching on Poverty*

ATT	Method		
	Nearest Neighbour	Kernel	Stratification
ATT	-0.053	-0.041	-0.048
N. Treated (number of observation)	2548	2548	2548
N. Control (number of observation)	1153	1945	1947
Standard error	0.019	-	0.015
t-statistics	-2.769	-	-3.155
St. error bootstrap	0.022	0.011	0.017
t-statistics	-2.401	-3.630	-2.835

Source: Authors' computations based on PPHS 2010 micro-dataset.

A logical question that extends beyond the scope of this study is: how has the LHWP contributed to poverty reduction? Since the poverty measure used in the PSM analysis is based on the consumption approach, the programme's impact would have been through an increase in the income and consumption of

the beneficiary households. The literature on health interventions and poverty suggests that an improvement in women's health could lead to their higher participation in the labour market, which would in turn enhance their wellbeing. Has the LHWP enhanced female participation in the labour market? This depends on employment opportunities for women and requires an in-depth analysis. However, the Labour Force Survey (LFS) data shows an increase in female participation in the labour market from 17 percent in 2001-02 to 27 percent in 2010-11 (LFS 2012). The LHWP may have been a contributing factor by having brought about an improvement in women's health. Rural women, however, work primarily as unpaid family helpers (LFS 2012) and may not have control over the resources earned through their engagement. Despite this, it would not be wrong to presume that women's participation as family helpers can be viewed positively since it contributes to the household's strategy to ensure food security and improves household wellbeing.

## 7. CONCLUSIONS

The Government of Pakistan has taken several initiatives to improve the country's poor health indicators; the LHWP is one such initiative. Aimed at reducing poverty by improving the health of the population, particularly that of women and children, LHWs work at the grassroots level. They are recruited from among local communities to provide preventive door-to-door healthcare services. At present, they are deployed in almost all districts and their services are available to more than half the target population.

To gauge the LHWP's welfare impact, we have combined quantitative and qualitative approaches. For the quantitative analysis, we have used the multipurpose panel datasets, PRHS 2001 and PPHS 2010 conducted by PIDE. These datasets suit our purposes because they contain comprehensive modules on child and maternal health, household consumption (necessary for poverty estimation), and the performance of LHWs. The qualitative portion of our study has been addressed through fieldwork conducted in ten rural localities of eight selected districts covering all the four provinces.

Our quantitative analysis of the panel datasets shows that slightly more than half the sampled women were visited by LHWs during the three months preceding the survey. The analysis shows that LHWs provide their services to all segments of society, irrespective of their patients' income status. The health-seeking behaviour of beneficiary women appears to have improved. The qualitative analysis supports the findings of the quantitative study.

The PSM method, which generates comparable samples of beneficiaries and non-beneficiaries of the LHWP, shows that the programme has had a significant and positive impact on contraceptive use, antenatal care, and vaccination (TT) during pregnancy. Its impact on child health has been evaluated by selecting four indicators—child immunisation, child illness, and

infant and child mortality. A significant gain is found for child vaccination and child illness. However, the LHWP does not show a significant impact on infant and child mortality. The welfare impact of the programme in terms of poverty reduction is found to be statistically significant.

The findings imply that the LHWP is a pro-poor initiative. Two factors have probably played a key role in its success: the recruitment of LHWs from within the communities to which they are assigned, and the universalisation of the programme within the target areas, providing services to all women and children in the areas covered. Above all, LHWs have generated goodwill in their communities, which has led to trust development among women seeking health advice from them.

Considering its positive impact on beneficiaries, the programme should be extended to areas it does not cover—a demand made by non-beneficiary women during the FGDs held as part of the qualitative study. Another factor that would improve the effectiveness of the programme is enhanced training for LHWs and provision of medicines, especially in KP and Balochistan. The services they provide include family planning and antenatal and postnatal check-ups. Irregular and delayed medical supplies affect their work adversely and create mistrust between LHWs and their patients.

Given the complaints that some of the women cited concerning irregular LHW visits, an effective supervision mechanism is critical and would help improve service delivery at the grassroots level, further enhancing the programme's positive impact. In order to sustain the gains made by the programme, this should be made an integral component of the district health system operating in the framework of the Primary Health Care (PHC) and MNCH programme. It would also help formalise the service structure of LHWs, which has been one of their longstanding demands. Likewise, integration with the PHC system would not only strengthen the LHWP, but also help recipients through a better referral system. As a result, everyone would benefit—the LHWs, the public, and the entire health delivery system.

## APPENDIX

Appendix Table 1

*Households Covered by PRHS 2001 and PPHS 2010*

Province	PRHS 2001	PPHS 2010		Total
	(Rural only)	Rural	Urban	
Pakistan	2721	2800	1342	4142
Punjab	1071	1221	657	1878
Sindh	808	852	359	1211
KP	447	435	166	601
Balochistan	395	292	160	452

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