

## RESEARCH PAPER

# High economic impacts of poor water and sanitation in various communities in Pakistan (an environmental economic perspective)

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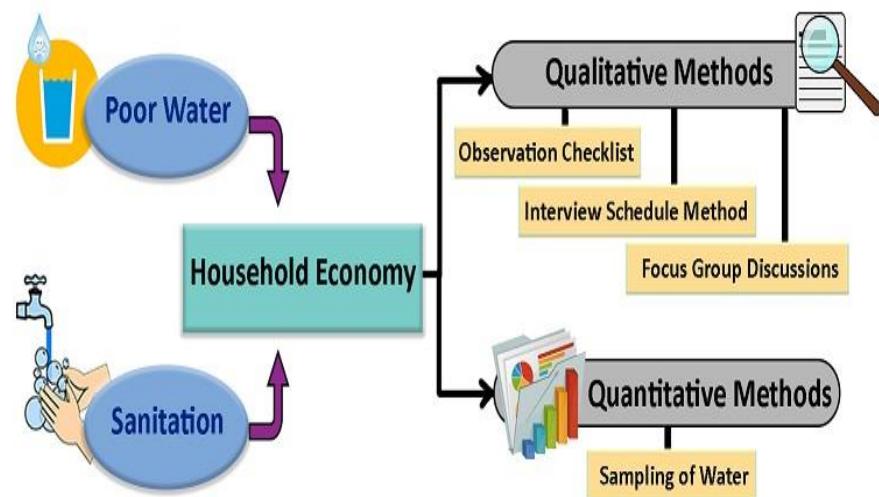
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## Highlights

- Impact of poor water and sanitation on household economy was investigated.
- Qualitative and quantitative approaches were used to assess the impact of poor water and sanitation on households economy.
- People have not access to proper sanitation facilities in most of the rural settlements.
- The diseases ratio was very high because of poor water and sanitation condition.
- Unawareness of WATSAN related diseases affect adversely on household economy by hospitalization, transportation and medical costs.

## Graphical Abstract



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## Abstract

Large number of residents in Pakistan suffers from adequate access to safe drinking water and proper sanitation facilities. For this purpose, the present study investigates the impact of poor water and sanitation (WATSAN) on household economy. Qualitative and quantitative approaches including data collection using questionnaire method and laboratory tests of water quality were used. Results demonstrate the inhabitants have not access to proper sanitation facilities in most of the rural settlements. Besides, although some WATSAN facilities were available in urban area but the diseases ratio was very high in both studied areas. Therefore, WATSAN related diseases affect adversely on household economy by hospitalization, transportation and medical costs. The present research concludes that due to poor WATSAN facilities the residents in the study area are confronted with food, health and education and living standard obstacles.



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## 1. Introduction

In developing countries, poor inhabitants frequently suffer from diseases due to inadequate water supply, sanitation, and hygiene (Ebadi and Hisoriev, 2017; Nawab et al., 2006). The eighth Millennium Development Goal of the United Nations Millennium Declaration reflects the global importance of water sanitation and hygiene for development, poverty reduction, and health improvement (Cook and Bakker, 2012; Raisy et al., 2010; Zhang et al., 2019). In most developing countries, the major cause of sickness and death among young children is a diarrheal disease (Ebadi and Hisoriev, 2017; Revelas, 2012). Governments cannot provide primary needs to the inhabitants because of the rapid increase in the urban population (O'Neill, 2017; Sarfraz et al., 2019). Increased health problems and greater vulnerability are caused by lower socioeconomic status, including water-related diseases (Sarfraz et al., 2019; Stephens et al., 1997). Household residents face great hardship when a large amount of money is spent on medical expenditures due to illness (Maconachie, 2019). In Nepal, an economic loss of US\$153 million, equivalent to 4.1% of the GDP is associated with inadequate sanitation in 1996 (Moe and Rheingans, 2006). Financial cost or impact due to low water and sanitation is divided into eight components which are included in the current and future costs.

### 1.1. Current and future costs

Measures that are taken to reduce the risk of diseases such as immunization comprise direct costs. The cost of transport, medication, the room at the hospital, medical care, and hospital fee is also the direct cost. Time loss of the sick individual and the caretaker; time lost while traveling to the hospital due to death or disease; and suffering of the patient and other family members, as well. The future cost may include Time loss of children due to absentees from school and reduction in learning abilities; Long term disabilities because of chronic morbidity effect, loss in future productivity, Welfare losses because of premature mortality (Brown and Kyttä, 2014). Medical costs of illness due to low water and sanitation (physician care, drugs, and hospitalization costs) also include the indirect cost of lost wages during days missed from work. Medical expenditure on hospitalization, transportation cost of every trip to hospital associated with the cost of fuel, and the productivity loss related to low water and sanitation's economic value significantly affects the household economy (El-Fadel et al., 2003). Government and private sectors and NGO's can play a very vital role in promoting and support water and sanitation improvements and interventions. Pakistan's current population is around 180 million, and only 65% access safe water. Sanitation facilities are available to 42% of the population (Zulfiqar and Thapa, 2017). In KPK, 90% of people live in rural areas, and the community that lives in poverty is more than 36% (Nawab et al., 2006). Throughout the KPK province, the sanitation coverage varies in the 24 districts, which is highest in the Chitral district (65%) and lowest in the Kohistan district (3%). It is estimated that 63% of households in KPK have access to safe water (Zulfiqar and Thapa, 2017). It is reported that water pollution, poor sanitation, poor housing, and low family income are the risk factors for many diseases and create health problems. It is inevitably clear that the households were more forced with poverty when confronted with essential medical costs, especially household income loss costs due to ill health.

They have not paid enough attention to Pakistan. The inhabitants have no access to adequate sanitation facilities in most rural settlements and lack toilets and sanitation systems. These poor populations, mostly living in rural areas or urban slums, in addition to suffering from financial resources, also lack access to primary requirements, including education, health, safe water supply, and environmental sanitation facilities. Polluted water, low socioeconomic state, poor sanitation, coupled with low literacy rates, lead to health problems (Hussein and Meerkhan, 2019). The present study's objectives include, 1) To find out the causes of poor water and sanitation, 2) To study the impact of poor water and sanitation on the health of people, and 3) To analyze the economic impacts of poor water and sanitation on the household.

## 2. Materials and Methods

This study investigates the impacts of poor water and sanitation on health and household economy in Abbottabad, Pakistan. Different tools were used to collect data. Data-collection techniques provide a systematic

collection of information about people, objects, phenomena, and settings in which they occurred. Both qualitative and quantitative methods were used in this present research. Also, the following approaches were applied in the study:

1. Group discussion with the respondents for valid data collection so that a group of 8-12 informants freely discuss the issue. Through this qualitative method, in-depth information on concepts, perceptions, and ideas of a group is obtained.

2. Interview schedule method with the questionnaire helps in knowing the real situation and shortages of the population. Questionnaires are used with a fixed list of questions in a standard sequence. There was a mixture of open and pre-categorized answers.

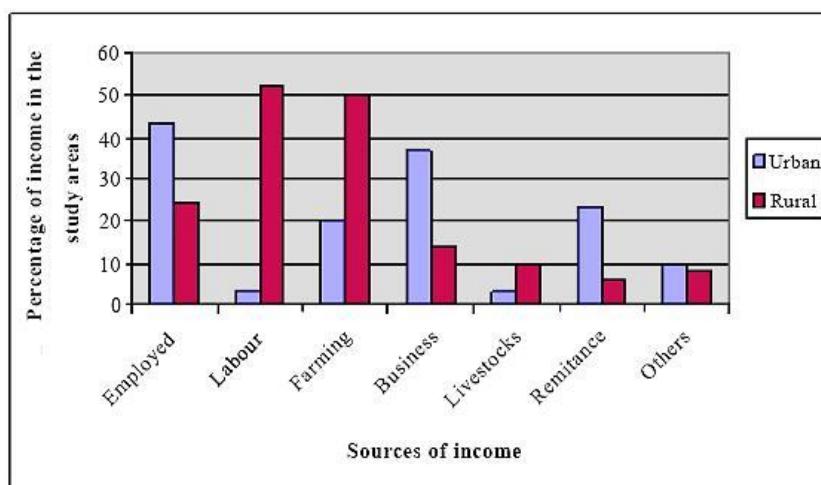
The interview schedule method was useful for literate and illiterate respondents as it permitted the clarification of questions and enabled the collection of more relevant information. Besides, individual observation shows the reality. To gain deep understanding of a particular situation, an observation checklist was developed, which effectively conceived other individuals' life situations. Data observed was recorded and noted in the field notes being written on the spot or at the end of the day. Prolonged engagement in the field allowed gathering more detailed and accurate information through observation. Finally, an economic analysis was conducted, took averages and means of the obtained values, and the economic cost of poor water and sanitation was obtained. The various methods applied were qualitative methods that included observation checklist, interview schedule method, focus group discussions, and quantitative methods, including water sampling.

### 3. Results and Discussion

**Fig. 1** shows different sources of income in the study area. It was evident that 43 and 24% of the population were employed in urban and rural areas. 3% were laborers in urban, while 52% were in rural areas. Overall, 20% population was associated with farming, 37% with business, 3% with livestock, 23% with the remittance, and 10% with others in the selected urban area. While in the selected rural area, the majority of people earned from farming (50%), other income sources comprised business (14%), livestock (10%), remittance (6%), and others (8%). In urban areas, 27% of people visit a specialist, and 37% take patients to the hospital. While in a rural area, 6% visit to the specialist, 16% visit to the local dispenser, 12% to homeopathic, and 78% to the hospital.

**Table 1.** Percentage of people in urban and rural areas visiting the government and private hospitals.

Areas/visit	Sensitivity %	Sampling Frequency %
Urban area	57	77
Rural area	86	58



**Fig. 1.** Sources of income in the study areas.

As shown in **Table 3**, 57% of people visit government hospitals, while 77% visit private hospitals in selected urban areas. **Table 3** shows the annual individual average expenses on different age groups in the selected urban area. Results demonstrate that the higher average expenses were recorded for adults,' i.e., 25 and above; younger between 11-25; and children 1-10. **Table 1** estimates how many diseases influence the household economy, especially in the low-income category. Mostly, in rural areas, government hospitals are selected by 86% of the population free of charges, and medicines are also free, while only 58% of people visit private hospitals. **Table 4** shows the higher average expenses for adults of 25 and above age than on children 1-10 and then young 11-25, respectively, in the rural area. **Figs. 2 and 3** show the average monthly income from different sources.

**Table 2.** The unit cost of health in the urban and rural areas.

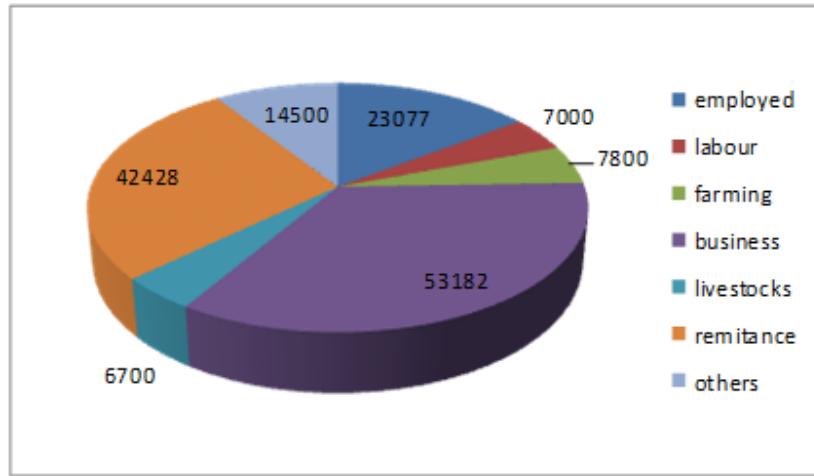
Areas/cost	Average transportation cost Rs	Average medicines cost Rs	Average doctor fee Rs	Total
Urban	125	730	330	1185
Rural	104	968	267	1339

**Table 3.** Average annual individual costs in selected urban area.

Children 1-10 Rs	Young 11-25 Rs	Adults 25 and above Rs
4633	5117	6197

**Table 4.** Average annual individual costs in the selected rural area.

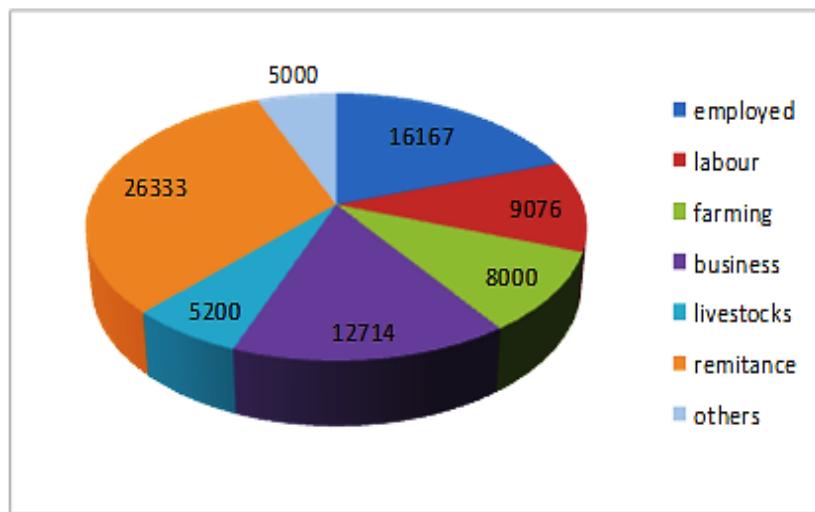
Children 1-10 Rs	Young 11-25 Rs	Adults 25 and above Rs
4896	2702	9830



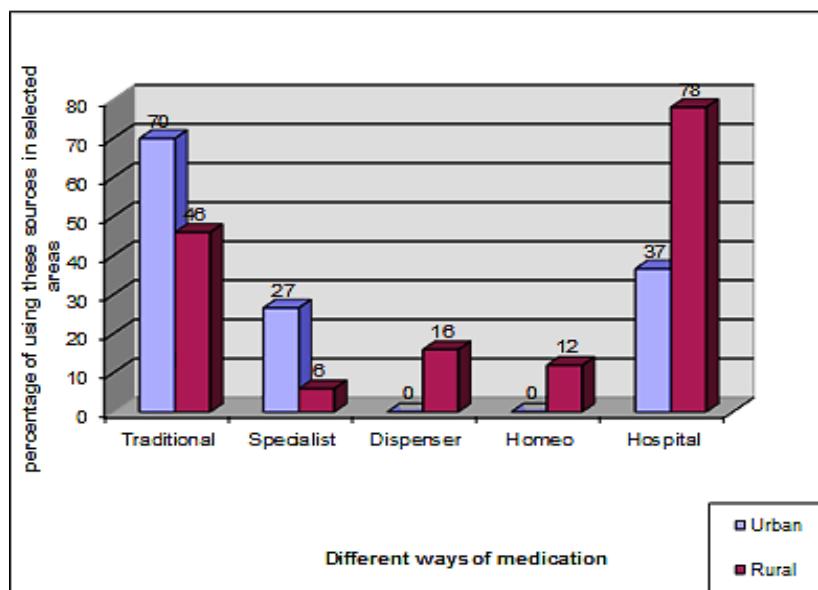
**Fig. 2.** Average monthly income from sources in the selected urban area.

**Fig. 3** also shows that most people's income source is through employment rather than business and remittance in the studied urban areas. While in a rural area, the significant source of income is laboring than employment and so on. It was evident that people who gain income thru labor, farming, and livestock had the lowest income. Most people in the urban community depend on employment and business; thus, their monthly income was good enough to manage daily life. As mentioned in the income source chart, most people gain income by farming and laboring, but what they earn from these sources is the least; thus, most people suffer a lot and live below standard levels. Then, they replied in questionnaires that it is very difficult for them to manage life, and thus they have to compromise on better food, health, life standard, education, and many other things in their lives. **Fig. 4** shows that 70% of people apply traditional methods to treat disease for immediate results in selected urban areas. They believe that herbs are useful and good for health and have no side effects

as an old traditional method, they can be useful first aid, easy, simple, cheap, and reduce medical costs. 46% of selected rural people use traditional methods to treat different diseases. They give the same answer; according to them, there is no need to visit doctors if they get relief through these ways, but if the problem is getting worse, then visiting will be Inevitable. It is a quick remedy, cheap, one of the respondents said that medicines could stunt the growth of children, so must be avoided, it's our old habit to use it, but some say it is not useful and useless.



**Fig. 3.** Average monthly income from sources in the selected rural area.



**Fig. 4.** Routine practices of medication in study areas.

In rural area least number of people visits specialist doctors and more to the government hospital, they prefer household remedies or went to the local dispenser, same is the case in an urban area, traditional methods are usually followed along with the government hospital but also use to visit specialist doctors, the main reason for that people prefer to treat diseases at home to whatever extent they can is because of economic pressure on household. The number of visits to a private hospital is more because people were not satisfied with the government hospital treatment and doctors (Asaolu and Ofoezie, 2003). Medical expenditure on hospitalization and transportation cost of every trip to the hospital is associated with fuel cost. During the whole of this, productivity loses. It all is associated with an economic value of poor water and sanitation, which greatly affects the household economy (El-Fadel et al., 2003). Suppose investment in drinking water and sanitation is made. In

that case, lots of economic benefits can be obtained, health care savings US\$ 340 million for individuals, and 15 to 59 years age group, 320 million productive days gain ([Cook and Bakker, 2012](#); [Zhang et al., 2019](#)).

### **3.1. Expenditure on health for the urban and rural population**

In the urban community, they spend 9% of their total income on health expenses/year. Expenditure on health for the rural population is in the rural community; they spend 18% of their total income on health expenses/year ([Table 5](#)).

**Table 5.** Sources of income and direct economic loss due to water-born diseases (Rural area).

S. No	Sources Of Income						
	Employed	Labor	Farming	Business	Livestock	Remittance	Others <sup>a</sup>
Respondents	12	26	25	7	5	3	4
Percentage %	24	52	50	14	10	6	8
Days of IPM <sup>b</sup> Avg.	2	5	4	3	2	-	-
Income/month (Rs)	16167	9076	8000	12714	5200	26333	5000
Per day income (Rs)	735	304	267	424	173	-	-
Total LWPM <sup>c</sup> (Rs)	1470	1520	1068	1272	346	-	-

<sup>a</sup> Pension Rent; <sup>b</sup> Illness per month; <sup>c</sup> Loss of wages per month

**Table 6.** Direct and indirect costs due to poor water and sanitation.

Impact category	Sub-impacts evaluated	Direct Economic cost attributable due to poor water and sanitation	The indirect economic cost attributed due to poor water and sanitation
Health	Health care costs	Full costs of health-seeking, including formal health care services and traditional healers	Stress Time loss Family effect Care in food/sometimes special food prepared for ill person Traveling cost of the family welfare cost
	Productivity costs	Welfare or income loss due to adult and child sickness time	School absentees Physical strength (reduced due to diseases)

### **3.2. Direct and Indirect cost due to poor water and sanitation**

It is noted that indirect cost may not be quantifiable and varies from person to person and household to household; therefore, the indirect cost has not been calculated in symbolic form. These are costs on households, either direct or indirect costs, because of which there is an excellent impact on the household economy. This study would help to know if the disease ratio is reduced by having good water, sanitation, and hygienic practices that will greatly impact raising the household economy, and one would be able to live with a good life, high education, and better living standards. The study shows a 42-48% reduction in diarrhea diseases, with an intervention focused on handwashing involving soap ([Cairncross et al., 2010](#); [Waddington and Snistveit, 2009](#)). The reduction in diarrheal disease morbidity is 20 to 30% due to water quality and hygiene interventions; this is the great impact of water, sanitation hygiene intervention ([Brown et al., 2013](#); [Ives and Lawrence, 2018](#)). Reducing the use of unimproved water sources and using improved water quality can reduce the disease burden ([Table 6](#)).

#### 4. Conclusions

The present study concluded that the water and sanitation condition in urban, as well as in the rural community of Pakistan is very poor. However, in the case of rural communities its more worst than urban community, in terms of sanitation, no garbage collection points, lack of gray water management, uncovered and garbage filled drains. Income from the sources is less compared to the expenditure of the house especially in management of waterborne diseases treatment. In rural and urban areas people are spending 18 and 9% of their total income on health because of water borne diseases, respectively.

#### References

- Asaolu, S.O., Ofoezie, I.E., 2003. The role of health education and sanitation in the control of helminth infections. *Acta Trop.* 86, 283–294. [https://doi.org/10.1016/S0001-706X\(03\)00060-3](https://doi.org/10.1016/S0001-706X(03)00060-3)
- Brown, G., Kyttä, M., 2014. Key issues and research priorities for public participation GIS (PPGIS): A synthesis based on empirical research. *Appl. Geogr.* 46, 122–136. <https://doi.org/10.1016/j.apgeog.2013.11.004>
- Brown, J., Cairncross, S., Ensink, J.H.J., 2013. Water, sanitation, hygiene and enteric infections in children. *Arch. Dis. Child.* 98, 629–634. <http://dx.doi.org/10.1136/archdischild-2011-301528>
- Cairncross, S., Hunt, C., Boisson, S., Bostoen, K., Curtis, V., Fung, I.C.H., Schmidt, W.P., 2010. Water, sanitation and hygiene for the prevention of diarrhoea. *Int. J. Epidemiol.* 39, i193–i205. <https://doi.org/10.1093/ije/dyq035>
- Cook, C., Bakker, K., 2012. Water security: Debating an emerging paradigm. *Glob. Environ. Chang.* 22, 94–102. <https://doi.org/10.1016/j.gloenvcha.2011.10.011>
- Ebadi, A., Hisoriev, H., 2017. Biodiversity of Algae from the Tajan River Basin (Mazandaran-Iran). *Egypt. J. Aquat. Biol. Fish.* 21, 33–52. <https://doi.org/10.21608/ejabf.2018.5034>
- Ebadi, A.G., Hisoriev, H., 2017. Metal pollution status of Tajan River – Northern Iran. *Toxicol. Environ. Chem.* 99, 1358–1367. <https://doi.org/10.1080/02772248.2017.1345191>
- El-Fadel, M., Maroun, R., Semerjian, L., Harajli, H., 2003. A health - based socioeconomic assessment of drinking water quality: the case of Lebanon. *Manag. Environ. Qual.* 14, 353–368. <https://doi.org/10.1108/14777830310479441>
- Hussein, J.N., Meerkhan, A.A., 2019. The Incidence Of Intestinal Parasites Among Children In Hivi Pediatric Hospital, Duhok, Iraq. *Sci. J. Univ. Zakho* 7, 1–4. <https://doi.org/10.25271/sjuz.2019.7.1.571>
- Ives, J.T., Lawrence, T., 2018. A tale of two Great Lakes conferences: Urging global collaboration on our largest freshwater resources. *J. Great Lakes Res.* 44, 1289–1292. <https://doi.org/10.1016/j.jglr.2018.04.007>
- Maconachie, R., 2019. Green grabs and rural development: How sustainable is biofuel production in post-war Sierra Leone? *Land use policy* 81, 871–877. <https://doi.org/10.1016/j.landusepol.2017.01.013>
- Moe, C.L., Rheingans, R.D., 2006. Global challenges in water, sanitation and health. *J. Water Health* 4, 41–57. <https://doi.org/10.2166/wh.2006.0043>
- Nawab, B., Nyborg, I.L.P., Esser, K.B., Jenssen, P.D., 2006. Cultural preferences in designing ecological sanitation systems in North West Frontier Province, Pakistan. *J. Environ. Psychol.* 26, 236–246. <https://doi.org/10.1016/j.jenvp.2006.07.005>
- O'Neill, P., 2017. Managing the Private Financing of Urban Infrastructure. *Urban Policy Res.* 35, 32–43. <https://doi.org/10.1080/08111146.2016.1235034>
- Raiissi, M., Rahimi, E., Ansari, M., Ghaffar Ebadi, A., 2010. Determination of mercury and arsenic levels in fish caught in the Beheshtabad River, Chaharmahal and Bakhtiari Province, Iran. *Toxicol. Environ. Chem.* 92, 1627–1631. <https://doi.org/10.1080/02772241003689876>
- Revelas, A., 2012. Acute gastroenteritis among children in the developing world. *South Afr. J. Epidemiol. Infect.* 27, 156–162. <https://doi.org/10.1080/10158782.2012.11441503>
- Sarfraz, M., Sultana, N., Tariq, M.I., 2019. Hazardous Pollutants in Potable Groundwater Sources of Public Schools, Southern Punjab (Pakistan). *Rev. Int. Contam. Ambient.* 35, 797–805. <http://dx.doi.org/10.20937/RICA.2019.35.04.02>
- Stephens, C., Akerman, M., Avle, S., Maia, P.B., Campanario, P., Doe, B., Tetteh, D., 1997. Urban equity and

- urban health: using existing data to understand inequalities in health and environment in Accra, Ghana and São Paulo, Brazil. *Environ. Urban.* 9, 181–202. <https://doi.org/10.1177/095624789700900115>
- Waddington, H., Snilstveit, B., 2009. Effectiveness and sustainability of water, sanitation, and hygiene interventions in combating diarrhoea. *J. Dev. Effect.* 1, 295–335. <https://doi.org/10.1080/19439340903141175>
- Zhang, X., He, Y., Zhang, B., Qin, L., Yang, Q., Huang, H., 2019. Factors affecting microbiological quality of household drinking water supplied by small-scale ultrafiltration systems: A field study. *Sci. Total Environ.* 689, 725–733. <https://doi.org/10.1016/j.scitotenv.2019.06.327>
- Zulfiqar, F., Thapa, G.B., 2017. Agricultural sustainability assessment at provincial level in Pakistan. *Land use policy* 68, 492–502. <https://doi.org/10.1016/j.landusepol.2017.08.016>

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