

Spatial distribution of under five year olds being sick or injured in the past two weeks by district in Pakistan

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Abstract

Use of GIS to visualize the pattern and distribution of health indices in Pakistan would help in better choreographing of health policy and resource allocation decisions. In this study, district-wise spatial distribution of under five-year old children who got sick or injured in the past two weeks, and health consultation pattern was studied using the Pakistan Social and Living Standards Survey 2014-2015. Sex, urban/rural residency status, and province-based differences in the district-wise distribution of under-five year old children who fell sick/injured in the past two weeks and their having received health consultation for it, were observed. For male children, southwestern districts of Sindh, southeastern districts of Balochistan, central districts of KPK, and one southeastern of Punjab reported the highest percent of children who were sick or injured in the past two weeks. For females the pattern was similar with few exceptions.

Keywords: GIS, Visualization, Health, Pakistan.

Introduction

Spatial analysis entails analysis and display of data with geographical element. It has been defined as "The process of examining the locations, attributes, and relationships of features in spatial data through overlay and other analytical techniques in order to address a question or gain useful knowledge".¹ An important use of Geographic Information System (GIS) in health and geographical epidemiology is visualization of health data with physical location component i.e. disease mapping. Studies investigating the relationship between geography and health have been sparsely published in Pakistani biomedical journals.^{2,3} Studying the magnitude, pattern, and geographical distribution of morbidity has important implications for health policy, and resource allocation.^{4,5}

A recent study reported on the district-wise spatial distribution of five-year and older individuals who fell sick

or injured in the past two weeks and for seeking health consultation for it, disaggregated by sex, in Pakistan; using data from the Pakistan Social and Living Standards Survey 2014-2015.² However, that study used combined data, in terms of urban and rural residency status, for displaying spatial distribution.

In this study, the spatial analysis results were extended to the data for under five-year old children using the same survey i.e. Pakistan Social and Living Standards Survey 2014-2015. Additionally, maps were created by displaying district level, spatial distribution, separately for urban and rural residency level maps, in addition to combined urban and rural residency status.

Methods and Results

The Pakistan Social and Living Standards survey (PSLM) 2014-15 used a stratified two-stage sample design that included 78,635 households to provide various indices including health, representative at the district level in all

Table: Region and sex disaggregated under 5-years old children who either fell sick or were injured in the preceding two weeks prior to the PSLM 2014-15 survey and percent of them for whom health consultation was sought.

Region	Fell Sick/Injured During the Past Two Weeks of Survey	Health Consultation Sought
Pakistan		
Male	12.44	97.51
Female	11.40	98.42
Islamabad		
Male	7.19	100
Female	2.00	100
Punjab		
Male	11.26	97.67
Female	9.21	98.50
Sindh		
Male	14.08	96.49
Female	14.27	98.47
Khyber Pakhtunkhwa		
Male	16.13	99.07
Female	16.41	98.62
Balochistan		
Male	7.92	94.90
Female	7.91	95.83

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four provinces of Pakistan, based on 1998 census. While the Federally Administered Tribal Areas (FATA) were not included in this survey. The PSLM was conducted by the Bureau of Statistics, from October 2014 to June 2015; details of the survey and tabular data (as a PDF file) are freely available on the Pakistan Bureau of Statistics website.⁶

The district-wise cumulative data on percent of under five year old males and females from both urban and rural areas, who fell sick or were injured during the past two weeks prior to the survey, and on their seeking health consultation for it, was entered in Excel 2016. The geographic (GIS) data/shapefiles for districts were downloaded from the Humanitarian Data Exchange website.⁷ The Excel file with PSLM 2014-15 data, was joined with the GIS shapefiles. The shapefiles included the FATA region, and the four districts of Balochistan province i.e. Kech, Lehri, Panjgur, Sohbatpur, but no data were available in the PSLM 2014-15 report for these areas/districts. As such, no data were displayed for these areas in the maps created.

Using colour differences to represent numerical quantity for districts i.e. choropleth maps were created using ArcGIS 10.4; depicting district-wise, sex disaggregated, residency status disaggregated (urban, rural, and combined) to depict percent of under-five children who were sick/injured in the past two weeks and who were provided health consultations for it.

Table reproduces figures from the PSLM 2014-15 report, for the national and provincial percentages for the under 5-year old children who either fell sick or were injured in

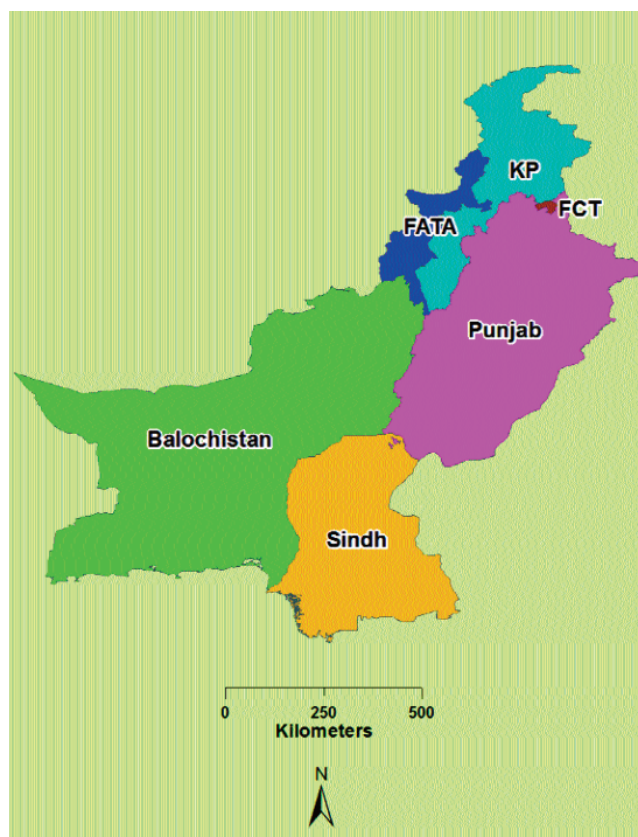


Figure-1: Map showing the Federal Capital Territory (FCT: Islamabad), FATA and four provinces of Pakistan.

the preceding two weeks prior to the survey as well as percentages of individuals who sought health consultation. In the country as a whole, slightly more male children got sick than female children in the previous two-weeks, but slightly more female children received

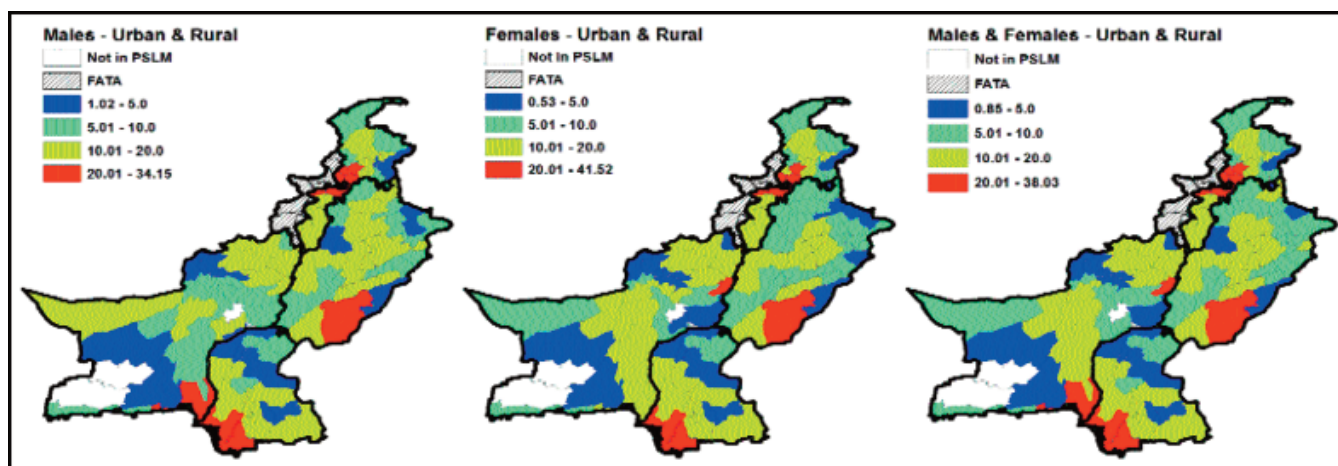
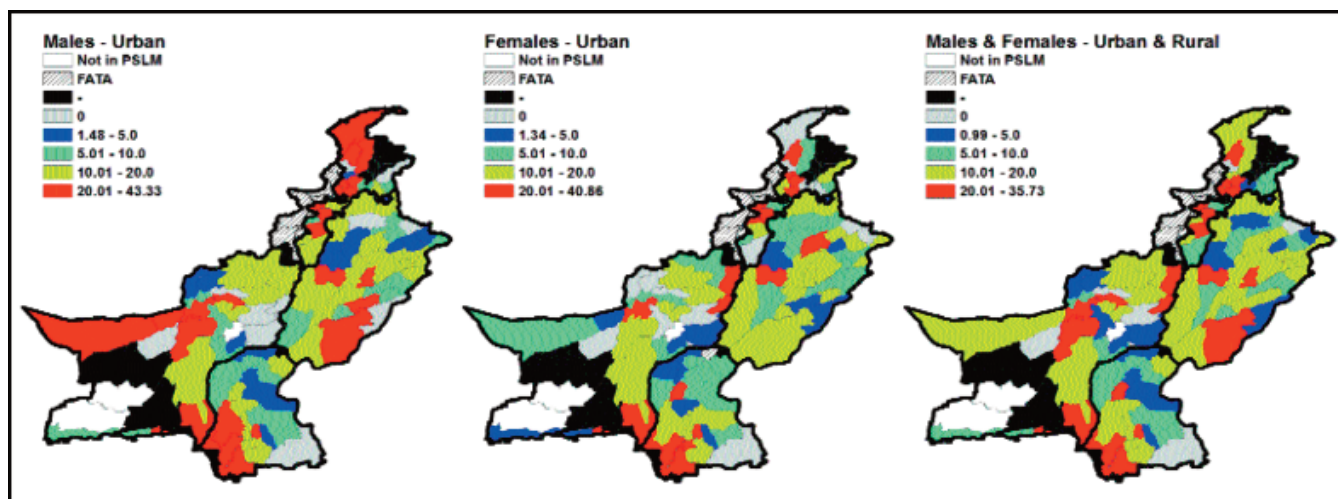


Figure-2: Percent under 5-year old children (Urban & Rural) who either fell sick or were injured in the preceding two weeks prior to the PSLM 2014-15 survey, disaggregated by sex and district.



* Hyphen (-) implies no data reported for the district; signifying districts with no urban areas.

Figure-3: Percent under 5-year old urban children who either fell sick or were injured in the preceding two weeks prior to the PSLM 2014-15 survey, disaggregated by sex and district.

health consultations compared to males.

Figure-1 shows the four provinces, FATA region, and the Islamabad Capital Territory (ICT). Figure-2 shows the spatial distribution of percent total i.e. combined urban and rural, under-5 population by district, that fell either sick or injured in the last two weeks prior to the conduct of interview in three side by side maps for male, female, and both genders combined. For male children, southwestern districts of Sindh, southeastern districts of Balochistan, central districts of KPK, and one southeastern of Punjab reported the highest percent of children who were sick or injured in the past two weeks, ranging from 20.01% to 34.15%. While for female children, the pattern was similar in terms of districts, with the exception of Balochistan reporting

highest percent in one northeastern district. However, for females the highest group ranged from 20.01% to 41.52%. Figures-3 and 4 depict the spatial distribution of percent urban and rural male, female, and combined under-5 population by district, that fell either sick or injured in the last two weeks prior to the conduct of interview. Maps in these two figures provide more granular pattern on the spatial distribution of under-five children by sex and residency status in the districts of Pakistan.

Figure-5 shows the spatial distribution of percent total i.e. combined urban and rural, under-5 population by district, for whom health consultation was sought, in three side-by-side maps for male, female and both genders combined. For male children the lowest

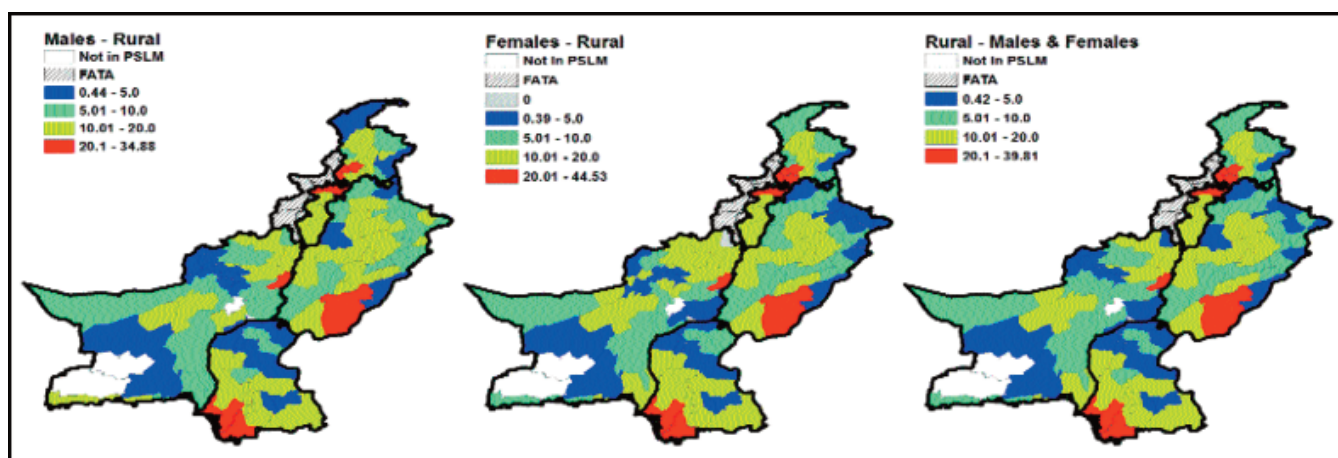


Figure-4: Percent under 5-year old rural children who either fell sick or were injured in the preceding two weeks prior to the PSLM 2014-15 survey, disaggregated by sex and district.

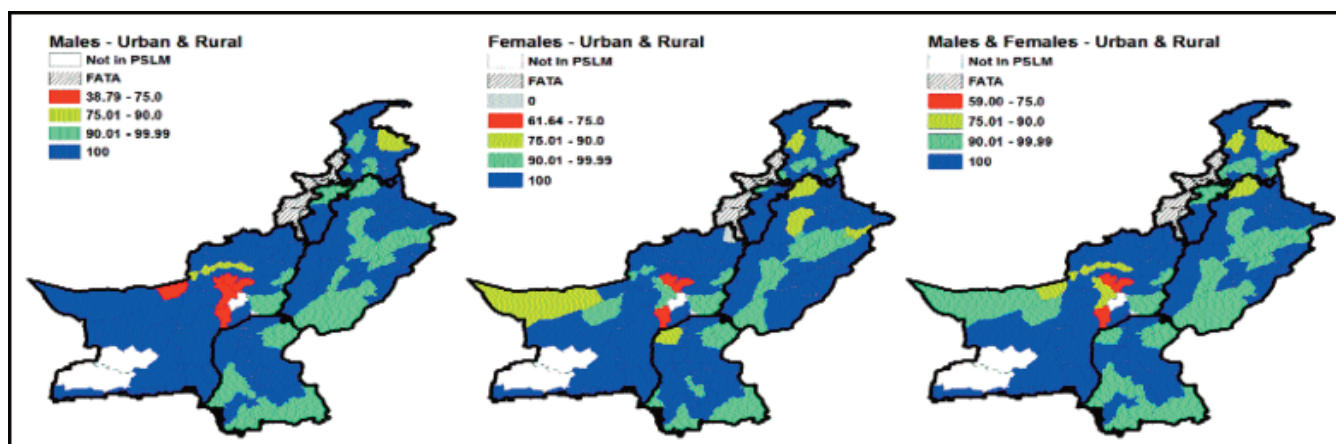


Figure-5: Under 5-year old (Urban & Rural) children who received health consultation in the preceding two weeks prior to the PSLM 2014-15 survey, disaggregated by sex and district.

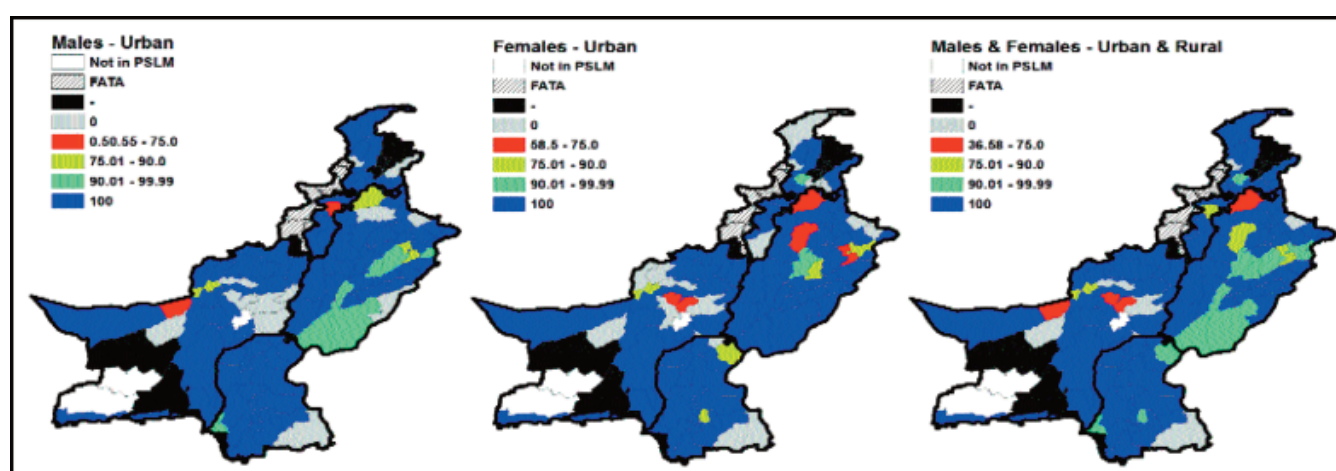


Figure-6: Under 5-year old urban children who received health consultation in the preceding two weeks prior to the PSLM 2014-15 survey, disaggregated by sex and district.

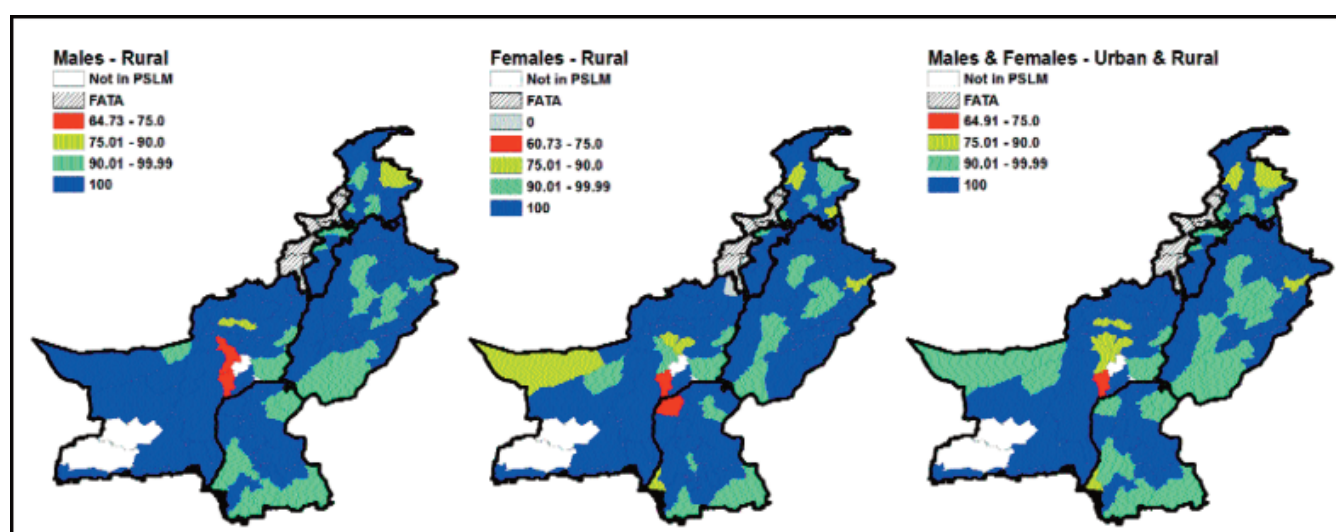


Figure-7: Under 5-year old rural children who received health consultation in the preceding two weeks prior to the PSLM 2014-15 survey, disaggregated by sex and district.

percent of seeking health consultation i.e. between 39.79% to 75.0%, was reported from few central districts of Balochistan. In all the other districts in the country the percent of seeking care for sick/injured male children was above 75.0%. In one northern district of KPK, and few central districts of Balochistan the percent of seeking consultation was from 75.01 to 90.0 percent. In rest of the country, percent of seeking consultation was above 90%. While for female children, again few central districts of Balochistan reported the lowest percent seeking consultations i.e. from 61.64 to 75.0%. One northern district of KPK, one western district of Balochistan and Sindh, and few northern districts Punjab reported the percent seeking consultations in the range of 75.01% to 90.0%. In all the other districts in the country, above 90% of children were provided health consultations.

Figures-6 and 7 depict the spatial distribution of percent urban and rural male, female, and combined under-5 population by district, for whom health consultation was sought that fell either sick or injured in the last two weeks prior to the conduct of interview. Maps in these two figures provide more nuanced pattern on the spatial distribution of under-five children by sex and residency status in the districts of Pakistan.

Discussion

Use of GIS to visualize the pattern and distribution of health indices in Pakistan would help in better choreographing of health policy and resource allocation decisions. For the first time in Pakistan, this study shows the spatial distribution of under-five population who fell sick or injured during the past weeks prior to the survey in both urban, rural, and combined, district-wise, gender disaggregated choropleth maps. Using the Pakistan Social and Living Standards survey (PSLM) 2014-15 data. Future iterations of PSLM would also help in studying space and time i.e. spatiotemporal patterns of these and other health indices at the district level in the country.

There were clear sex, urban/rural residency status, and province based differences in the district-wise distribution of under-five year old children who fell sick/injured in the past two weeks and their having received health consultation for it. For male children, southwestern districts of Sindh, southeastern districts of Balochistan, central districts of KPK, and one southeastern of Punjab reported the highest percent of children who were sick or injured in the past two weeks. However, for female children, the pattern was

similar in terms of districts, with the exception of Balochistan reporting highest percent in one northeastern district. Regarding spatial distribution of percent total i.e. combined urban and rural, under-5 population by district, for whom health consultation was sought; male children with the lowest percent of seeking health consultation was reported from few central districts of Balochistan. In all the other districts in the country the percent of seeking care for sick/injured male children was high i.e. above 75.0%. In most of the districts, percent of seeking consultation was above 90%. While for female children, few central districts of Balochistan reported the lowest percent seeking consultations. One northern district of KPK, Balochistan and Sindh each, and few northern districts Punjab reported the percent seeking consultations in the range of 75.01% to 90.0%.

The effectiveness of GIS analysis for health is contingent upon availability of up-to-date shapefiles i.e. map files to depict distribution of health indices. Unavailability of the latest GIS shapefiles for the districts in the country that would match with the district level data in the PSLM 2014-15, was one limitation of this study. Nonetheless, barring few districts, the available GIS shapefiles matched well and spatial distribution of the two indices mapped are clearly depicted.

Conclusion

Using Pakistan Social and Living Standards Survey 2014-2015 results, district-wise spatial distribution of under five-year old children who got sick or injured in the past two weeks was depicted using GIS to visualize and better understand sex, urban/rural residency status, and province-based differences in the country. For male children, southwestern districts of Sindh, southeastern districts of Balochistan, central districts of KPK, and one southeastern of Punjab reported the highest percent of children who were sick or injured in the past two weeks. For females, the pattern was similar albeit with few exceptions.

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Conflict of Interest: None to declare.

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