

## Spatial distribution of being sick or injured in the past two weeks by district in Pakistan

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### Abstract

This study harnessed the power of geographic information system (GIS) to summarise and visualise ten-page tabular data in two maps. The data comprised of the percentage of 5-years and older males and females who fell sick or were injured during the two weeks prior to the survey, and on their health consultation by district, cumulatively from both urban and rural areas. The data was collected by the Pakistan Social and Living Standards survey (PSLM) 2014-15. District-wise pattern of the two indices were mapped for better understanding and appreciation of this spatial pattern by the health policymakers in the country. District-wise more women succumbed to illnesses and injuries in the prior two weeks compared to men. Federal and provincial government authorities in collaboration with academic institutes in the country need to make basic GIS data/shapefiles freely available in the country to better understand and address the spatial pattern of health morbidity burden.

**Keywords:** Geographic information system, Visualisation, Health, Pakistan.

### Introduction

Geographic information system (GIS) is defined as a system that "captures, stores, analyses, manages, and presents data that is linked to location".<sup>1</sup> Visualisation and exploration of health data is one of the important applications of GIS in health, in addition to statistical analysis of location-based health data.<sup>2-4</sup> In 1854, an English physician John Snow used mapping of health data for the very first time by drawing locations of cholera cases on the streets of London, and convincingly demonstrated the water source responsible for the outbreak of cholera.<sup>5</sup> There are a few studies published in Pakistan that harness the power of GIS in health,<sup>6,7</sup> although Pakistani authors have published extensively internationally, using local health data.<sup>8,9</sup>

Disease and injury morbidity burden has important health policy implications.<sup>10</sup> In this study, a GIS

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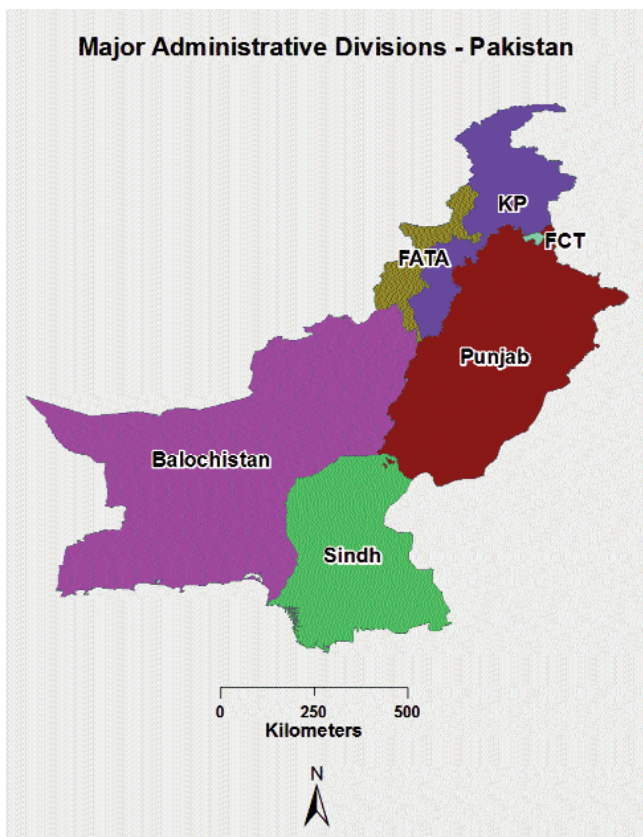
programme was used to map the Pakistan Social and Living Standards Measurement Survey (PSLM) 2014-15 data<sup>11</sup> to visualise spatial distribution in the country by district. The data and survey which was disaggregated by sex, was regarding being sick or injured in the past two weeks and seeking health consultation for it.

### Methods and Results

The PSLM 2014-15 survey was conducted by the Pakistan Bureau of Statistics, from October 2014 to June 2015, in all urban and rural areas of the four provinces based on 1998 census, excluding the Federally Administrated Tribal Areas (FATA) region. The survey used a stratified two-stage sample design that included 78,635 households to provide various indices including health, and was representative at the district level. The details of the survey and tabular data are available on the Pakistan Bureau of Statistics website.<sup>11</sup> The district-wise cumulative data on percent of 5-years and older males and females

**Table:** The 5-year and older individuals who either fell sick or were injured in the preceding two weeks prior to the Pakistan Social and Living Standards Measurement Survey 2014-15 as well as percentages of individuals who sought health consultation, disaggregated by sex and region.

Region	Fell Sick/Injured During the Past Two Weeks of Survey	Sought Health Consultation
<b>Pakistan</b>		
Male	5.78	95.95
Female	7.02	96.30
<b>Islamabad</b>		
Male	4.17	100
Female	4.70	97.02
<b>Punjab</b>		
Male	5.58	96.60
Female	6.21	96.95
<b>Sindh</b>		
Male	5.56	95.76
Female	7.16	95.87
<b>Khyber Pakhtunkhwa</b>		
Male	7.85	95.29
Female	10.44	96.19
<b>Balochistan</b>		
Male	3.60	90.58
Female	5.92	91.29



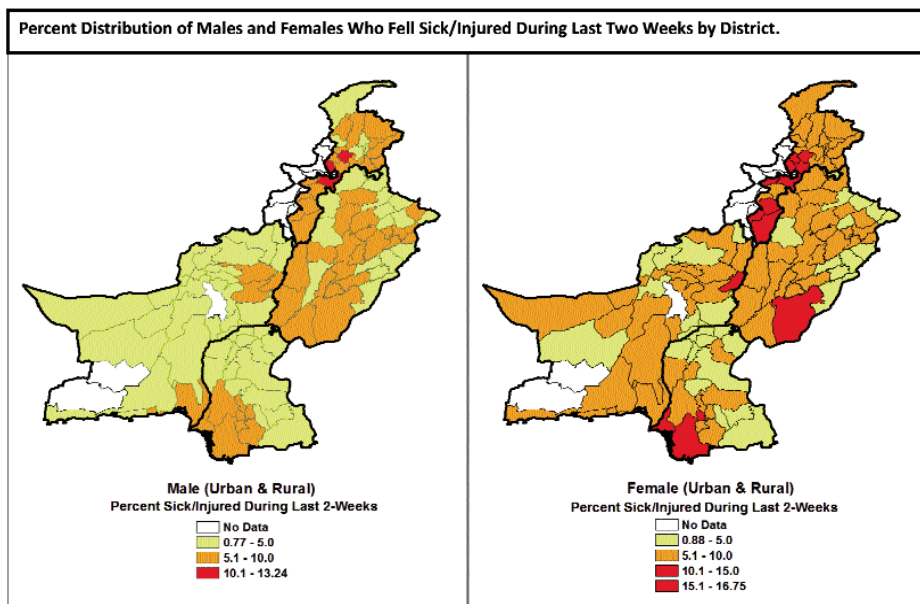
**Figure-1:** Map showing the four provinces, Federally Administered Tribal Areas (FATA) region, and Federal Capital Territory (FCT: Islamabad).

from both urban and rural areas, who fell sick or were injured during the past two weeks prior to the survey, and on their health consultation, was entered in Microsoft Excel 2016. The GIS data/shapefiles for districts were downloaded from the Pakistan Humanitarian Response Portal's archived website.<sup>12</sup> This data is available in public domain.

The PSLM 2014-15 data were joined with the geodatabase i.e. GIS shapefiles. The shapefiles included the FATA region, and the Panjgur, Kech, and Kachhi districts of the Balochistan province. However, no data were available in the PSLM 2014-15 report for FATA region and these three Balochistan districts. In addition, the Sujawal district of Sindh province that has been carved out of Thatta district was not available in the GIS shapefiles as well and therefore its data and percentages could not be displayed in the maps. Choropleth maps which use colour differences to represent numerical quantity pertaining to areas, were created to display district-wise, sex-disaggregated, percentages of both indices by using ArcGIS 10.4.

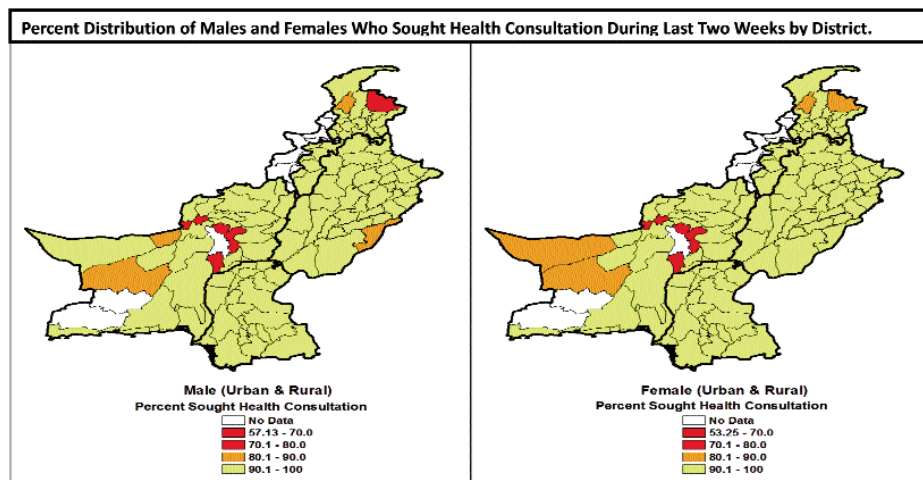
Table reproduces figures from the PSLM 2014-15 report, showing the national and provincial percentages for the 5-years and older individuals who either fell sick or were injured in the preceding two weeks prior to the survey as well as percentages of individuals who sought health consultation. In Islamabad and in every province, more women compared to men reported being either sick or

injured in the preceding two weeks of the interview. The highest percent among the males, females, as well as the difference between the two gender groups was reported in the Khyber Pakhtunkhwa province, where 10.44% females and 7.85% males reported falling sick or being injured, and a 2.59% difference between two genders was noted. In all provinces, more women reported having sought health consultation for the reported ailments and injuries in the past two weeks, compared to men. Balochistan province had the lowest percent health consultation with women having 91.29% and men 90.58%.



**Figure-2:** The 5-year and older individuals who either fell sick or were injured in the preceding two weeks prior to the Pakistan Social and Living Standards Measurement Survey 2014-15, disaggregated by sex and district.

Figure-1 shows the four provinces, FATA region, and Islamabad. Figure-2 shows the



**Figure-3:** The 5-years and older individuals who sought health consultation in the preceding two weeks prior to the Pakistan Social and Living Standards Measurement Survey 2014-15, disaggregated by sex and district.

spatial distribution of the percentage male and female population who either fell sick or injured in the last two weeks prior to the conduct of interview by district. For males, south and north eastern districts of Balochistan, south western districts of Sindh, southern, central, and north eastern districts of Punjab, and almost all districts of Khyber Pakhtunkhwa reported percentages in the 5.1% to 10% range. Some central districts of Khyber Pakhtunkhwa reported percentages in the 10.1% to 13.24% range. For the rest of districts in the country, the range was from 0.77% to 5.0%. For females, most districts of Balochistan, western and central districts of Sindh, most districts of Punjab, and northern districts of Khyber Pakhtunkhwa reported percentages in the 5.1% to 10.0% range. Two southern districts of Sindh, southern districts of Khyber Pakhtunkhwa, one southeastern district in Punjab, and one north eastern district of Balochistan reported percentages in the range of 10.1% to 15.0%. One southern district in Sindh, and central districts of Khyber Pakhtunkhwa reported percentages in the range of 15.1% to 16.75%. For the rest of districts percentages ranged from 0.88% to 5.0%.

Figure 3 shows the spatial distribution of the percentage of male and female population that sought health consultation for their sickness or injuries in the last two weeks prior to the conduct of interview by district. For males, all the districts of Sindh, all, except one, of the districts of Punjab, and most of the Balochistan and Khyber Pakhtunkhwa districts reported percentages in the range of 90.1% to 100%. Few eastern and central districts of Balochistan, and two northern districts of Khyber Pakhtunkhwa reported percentages in the range of 57.13%

to 90.0%. For females, all the districts of Punjab and Sindh, and most of the districts of Balochistan and Khyber Pakhtunkhwa reported percentages in the range of 90.1% to 100%. Few eastern and central districts of Balochistan, and two Khyber Pakhtunkhwa districts reported percentages in the range of 53.25% to 90.0%.

## Discussion

This study harnessed the power of GIS to summarise and visualise several pages of tabular data from the Pakistan Social and Living Standards survey (PSLM) 2014-15 in two maps i.e. Figure-2 and 3. The data comprised of information regarding the percentage of males and females by district, of age 5 years and older, cumulatively from urban and rural areas, who fell sick or were injured during the two weeks prior to the survey, and regarding the health consultation for the illness. District-wise pattern of the two indices were mapped for better understanding and appreciation of this spatial pattern by the health policymakers in the country. The fact that district-wise more women succumbed to illnesses and injuries in the prior two weeks compared to men needs to be further studied. To further decipher the distribution and pattern of the two mapped indices, additional mapping by rural/urban disaggregation, types of health consultation and providers sought, as well as comparison with under-5 year old population would provide added insights for improving the population health status, accessibility to healthcare services, quality of medical care, and targeted health education and promotion campaigns in the country.

A major limitation in this study was the 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. However, with the exception of few districts, the GIS shapefiles matched well and spatial distribution of the two mapped indices could be clearly deciphered. Federal and provincial government authorities in collaboration with academic institutes in the country need to make basic GIS data/shapefiles freely available in the country to better understand and address the spatial pattern of health morbidity burden, and to improve research for health.

**Disclaimer:** The district level data on two health indices was obtained from the website of 'Pakistan Bureau of

Statistics' (PBS). All the tabular data on PBS website is freely available and freely downloadable, and as such it is in the 'Public Domain' and PBS website does not state any restriction on its download and use.

**Conflict of Interest:** None.

**Funding Disclosure:** None.

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