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Provincial Development Monitor

A Derived Human Development Index Approach

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Executive Summary

The Provincial Development Monitor 2024 conducts an assessment of human development situation at district level using the generally accepted dimensions viz. education, health, and living standards. It is motivated by two factors:

i. The available studies (e.g. UNDP's Human Development Report 2024) are based on pre-Covid data from Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20. We try to address this gap by using 2023-24 data from multiple sources. Consequently, our findings capture a critical baseline point for capturing the pre-2025 Floods socio-economic landscape at sub-national level. Comparison of 2023 values with the 2019 values can also be used to assess the costs of Covid-19 and 2022 floods.
ii. Provide the sub-national units with a tool to benchmark their socio-economic progress, while fostering a sense of positive competition among them.

Methodology and Enhancements

The update improves accuracy through methodological refinements, including:

- **Approach**: We followed the following three steps to construct Derived Human Development Index (DHDI):

  Step 1: Constructing the Reference Index (RIX) for 2019

  We first constructed a Reference Index (RIX) for 2019 using a set of specific indicators, which are detailed in the following section. This RIX-2019 was then validated by matching it against the existing single-source HDI-2019 (e.g., the official UNDP report data). The fact that the RIX-2019 and the single-source HDI-2019 demonstrated a significant correlation confirms the robustness and reliability of our chosen indicators and methodology.

  Step 2: Measuring the RIX for 2023–24

  We proceeded to measure the RIX-2023 based on the same set of indicators and using data collected from multiple contemporary sources (2023–24).

  Step 3: Deriving the DHDI (HDI for 2023–24)

  The core step in deriving our contemporary index is the application of the observed progress rate:

1. We calculated the growth rate observed between our constructed RIX-2023 and RIX-2019.
2. This calculated growth rate was then directly applied to the officially published single-source HDI-2019 value.

3. The result yields our Derived Human Development Index (DHDI) for 2023–24, providing an updated and methodologically consistent measure of human development.

- **Component Index Adjustments**: The RIX's education, health, and living standards indices are constructed from indicators that align closely with traditional HDI indicators, maintaining strong correlation with past HDI measurements.
- **Avoidance of Extrapolation**: This approach relies on actual district-level data trends from 2019 to 2023, providing a realistic measure of changes in human development.

Indicators, Data Sources, and Coverage:

i. Education sub-index is based on four indicators (Literacy Rate for 10 years and above population, Enrolment Rate for 5-16 years old, Teacher-Student Ratio, and Basic Facilities in Schools). Health sub-index is computed from 2 indicators (Number of beds per 10,000 population, and Patients treated (indoor and outdoor) per 10,000 population). Six indicators are used to compute the Housing and Living Standards sub-index (Type of housing, Access to electricity, Type of cooking fuel, Improved source of sanitation, Improved source of drinking water, and Open defecation).
ii. Data sources include Census 2023, Annual School Census, and Provincial Development Statistics.
iii. Given the availability of data, the study covers 116 districts (ICT:1, Balochistan: 25, KP: 30, Punjab: 36, Sindh: 24 [Karachi is cumulative])

Key Findings

The Provincial Development Monitor 2024 reveals nuanced insights into human development trends across Pakistan. The findings highlight significant progress in urban areas such as Islamabad, Karachi, and Lahore, where advancements in healthcare, education, and living standards reflect resilience and robust socio-economic frameworks. However, persistent challenges remain in rural and underdeveloped regions, particularly in Balochistan and interior Sindh, where systemic issues in education, health access, and economic opportunities hinder equitable development. highlighting both progress and persistent challenges. Key observations include:

1. **National Trends**:
    - The Human Development Index (HDI) decreased slightly from 0.699 in 2019 to 0.691 in 2023, reflecting minor regressions in education, health, and living standards.

- The Education Index showed decline in all the provinces, emphasizing systemic issues in educational access and quality.
- The Health Index remained stable or improved in urban areas but regressed in many rural districts, underscoring disparities in healthcare access.
- The Living Standards Index declined between 2019 and 2023 in most regions, pointing to economic challenges exacerbated by recent shocks like COVID-19 and floods.

2. **Regional Highlights**:
   - Islamabad emerged as a resilient region, with a marginal increase in HDI to 0.931, driven by advancements in healthcare and living standards.
   - Balochistan faced the sharpest decline, with HDI dropping from 0.444 to 0.396. Persistent education, health, and economic challenges demand targeted interventions.
   - Punjab and Sindh experienced moderate declines, with notable regressions in health and living standards, despite improvements in certain urban districts.
   - Khyber Pakhtunkhwa saw HDI drop from 0.650 to 0.623, reflecting economic and healthcare challenges.
3. **Intra-Provincial Disparities**:
   - Top-performing districts exhibited higher HDI scores due to better healthcare access, educational quality, and economic opportunities.
   - In descending order, the districts are Islamabad, Lahore, Rawalpindi, Sialkot, Abbottabad, Gujranwala, Narowal, Gujrat, Karachi, and Faisalabad, representing seven districts from Punjab and one each from the Islamabad Capital Territory (ICT), Khyber Pakhtunkhwa (KP), and Sindh.
   - Conversely, districts in Balochistan and rural Sindh remain at the lower end, with significant lags in all development indices.

4. Provincial Trends

- ***Punjab:***
  - HDI Ranking: 12 advanced in ranking (Bahawalpur, Layyah, Multan, Okara, Faisalabad, Bahawalnagar, Lahore, Vehari, Mianwali, Muzaffargarh, Narowal, Gujranwala). 3 remained unchanged, while 21 recorded a decline.

- HDI Score: 4 districts showed improvement, while 31 recorded lower scores.
- Sub-Index Performance: Improvements were recorded in Education scores across 28 districts, in Health scores across 2 districts only, and in Housing and Living Standards across 11 districts.

- ***Khyber Pakhtunkhwa:***
  - HDI Ranking: 15 districts improved (Swabi, North Waziristan, Abbottabad, Mardan, Mansehra, Peshawar, Malakand, Dera Ismail Khan, Swat, Bajaur, Mohmand, Hangu, Kohat, Chitral, Nowshera). 1 remained unchanged, and 14 experienced a decline.
  - HDI Score: 2 districts improved whereas 27 registered lower scores.
  - Sub-Index Performance: 13 districts recorded gains in Education, 05 in Health, and 07 in Housing and Living Standards.

- ***Sindh*:**
  - HDI Ranking: 20 districts improved (Naushero Feroze, Hyderabad, Matiari, Shaheed Benazirabad, Khairpur, Karachi, Tando Allah Yar, Tharparkar, Ghotki, Shikarpur, Umerkot, Sukkar, Mirpur Khaas, Sujawal, Larkana, Jamshoro, Dadu, Sanghar, Badin, and Tando Muhammad Khan). 3 remained unchanged, and 1 declined.
  - HDI Score: 11 districts improved whereas 13 registered lower scores.
  - Sub-Index Performance: 21 districts recorded gains in Education, 25 in Health, and 02 in Housing and Living Standards.

- ***Balochistan*:**
  - HDI Ranking: 7 districts improved in ranking (Gwadar, Kohlu, Nushki, Ziarat, Sohbatpur, Kalat, and Harnai). 5 remained unchanged, and 13 experienced a decline.
  - HDI Score: 5 districts improved whereas 25 registered lower scores.
  - Sub-Index Performance: Education scores improved in 7 districts and Health scores got better in 8 districts. Housing and Living Standards improved in 10 districts.
  - Gwadar is top ranked district within Balochistan, but ranks 50th (55th in 2019) in the national ranking.

5. **Sectoral Trends**:
   - Education: Declines in education indices across all regions underscore urgent issues with access, quality, and retention.

- Health: Improvements in urban areas such as Karachi and Hyderabad were offset by declines in rural districts, indicating uneven healthcare access.
- Living Standards: The economic dimension was particularly strained post-COVID-19, with widespread regressions in rural areas.

6. **District-Level Insights**:
   - Top districts like Islamabad, Lahore, and Rawalpindi achieved high HDI scores, reflecting socio-economic resilience.
   - Bottom-ranking districts such as Sherani and Khuzdar in Balochistan highlight acute development deficits.

These findings emphasize the need for region-specific, data-driven policies to address disparities and foster equitable development across provinces. By leveraging detailed insights, policymakers can design interventions targeting lagging areas, prioritize education and healthcare infrastructure, and enhance resilience to future socio-economic shocks.

Key Lessons

The updated Human Development Index (HDI) for 2024 i.e. DHDI provides several valuable lessons for provincial development planning, offering insights into regional disparities, sectoral needs, and areas for targeted interventions. Here are some of the key lessons that can inform provincial strategies:

1. **Address Regional Disparities:**
   - The HDI reveals disparities among Pakistan's provinces and districts, with Islamabad and some urban areas showing resilience, while provinces like Balochistan and parts of Khyber Pakhtunkhwa continue to lag in development indicators.
   - Lesson: Provincial planning should prioritize underdeveloped regions, particularly those with consistently low scores in education, health, and living standards. Tailored, region-specific programs can help bridge these gaps and promote balanced growth.
2. **Focus on Health and Education:**
   - Declines in education and health indices are evident across most provinces, indicating areas that need urgent attention to improve human capital.
   - Lesson: Investments in healthcare infrastructure and education quality are critical for sustainable human development. Provinces should allocate

resources to build healthcare facilities, improve access, and enhance educational quality, especially in rural and underserved areas.

3. **Leverage Local Data for Informed Decisions:**
    - The updated HDI's reliance on recent, local-level data provides a more accurate view of socio-economic conditions post-COVID-19 and recent climate events, highlighting the need for data-driven planning.
    - Lesson: Provincial governments should institutionalize data collection at the district level, updating HDI-related metrics regularly to track progress, evaluate policy impact, and adjust plans according to real-time developments.
4. **Develop Disaster Resilience:**
    - As we use a midpoint data between Covid-19/2022 Floods and 2025 Floods, the HDI estimated by us captures the adverse effects of recent floods and the COVID-19 pandemic on health and living standards, illustrating how such shocks can disrupt development progress.
    - Lesson: Provincial plans should integrate disaster resilience strategies, focusing on strengthening healthcare, infrastructure, and social safety nets to mitigate the effects of future shocks on human development.
5. **Strengthening Public Finance Management:**
    - Variations in provincial HDI scores also reflect differences in public finance management and resource allocation, with provinces facing deficits often lagging in HDI performance.
    - Lesson: Efficient financial planning and equitable resource distribution are essential. Provinces should strive for fiscal discipline while prioritizing sectors critical to human development, such as health, education, and infrastructure.
6. **Prioritize Inclusive Growth and Equity:**
    - HDI underscores the importance of inclusive development by tracking disparities within and among provinces. It shows that rural and marginalized areas consistently score lower across all indices.
    - Lesson: Provincial strategies should focus on inclusive growth, ensuring that development benefits reach all communities. Policies should prioritize equitable access to services, reduce income inequalities, and address specific needs of marginalized groups to promote social cohesion.

7. **Monitor and Evaluate Development Interventions:**
    - HDI tracking at the district level offers a robust framework for assessing policy effectiveness over time, making it easier to hold governments accountable.
    - Lesson: Provinces should integrate HDI metrics into their monitoring and evaluation systems, setting up regular reviews of development programs. This will help identify successful strategies, rectify shortcomings, and build on the areas where positive changes are achieved.

By integrating these lessons into provincial planning, provinces can create targeted, evidence-based strategies that promote sustainable and inclusive development, ultimately improving the quality of life for their residents.

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List of Abbreviations

DEI	Derived Education Index
DHDI	Derived Human Development Index
DHI	Derived Health Index
DLSI	Derived Living Standards Index
EI	Education Index
FY	Fiscal Year
GDP	Gross Domestic Product
HDI	Human Development Index
HI	Health Index
ICT	Islamabad Capital Territory
KP	Khyber Pakhtunkhwa
LSI	Living Standards Index
NFC	National Finance Commission
NHDR	National Human Development Report
PDM	Provincial Development Monitor
PSLM	Pakistan Social and Living Standards Measurement Survey
RIX	Reference Index
SDG	Sustainable Development Goals
UNDP	United Nations Development Programme

1 Introduction

The Human Development Index (HDI)[1] is a crucial tool for monitoring and tracking development at the local level, as it provides a multi-dimensional view of human well-being beyond economic indicators alone. The Provincial Development Monitor, 2024 (PDM 2024) also builds upon the key HDI metrics like health, education, and living standards. It offers a comprehensive measure that captures various aspects of quality of life. This allows policymakers to understand how sub-national units (like provinces and districts) compare in terms of fundamental human development, identifying areas where residents may lack essential services or opportunities. Tracking development at the local level helps make the development process more inclusive and people-centered, creating a clearer picture of where support is most needed.

At a local level, HDI scores reveal disparities in development, enabling governments to direct resources effectively toward areas most in need. This is particularly important in countries with significant regional inequalities, such as Pakistan, where the gap between urban and rural areas or among provinces can be pronounced[2]. Post-18th Amendment, which devolved significant responsibilities in health and education to provincial governments, HDI tracking at the local level becomes even more critical[3]. The amendment gave provinces greater autonomy over these sectors, and HDI provides an actionable framework to assess and address disparities. For instance, if a region has a low HDI due to healthcare deficiencies, provincial governments can prioritize health sector improvements in that area, allowing for more tailored, region-specific interventions.

Moreover, regular updates to HDI at the local level offer a way to assess policy impact over time, promoting accountability and transparency in governance. Local HDI monitoring aligns with global frameworks like the Sustainable Development Goals (SDGs)[4], supporting national goals by focusing on subnational progress. It also empowers communities by providing a transparent measure to track their locality's development and advocate for improvements if necessary. By fostering data-driven decision-making and enhancing accountability, HDI at the local level plays a vital role in creating an equitable and resilient society where development is inclusive and sustainable across all regions.

Traditional domains in HDI are education, health, and living standards. Latest National Human Development Report by UNDP Pakistan uses the 2019-20 Pakistan Social and Living Standards Measurement Survey to compute HDI up to district level.

[1] For details see https://hdr.undp.org/system/files/documents/hdr1990encompletenostats.pdf
[2] For details see https://mpra.ub.uni-muenchen.de/83444/1/
[3] For details see https://ipc.gov.pk/SiteImage/Misc/files/Year%20Books/Final%20Report%20of%20Implementation%20Commission.pdf
[4] For details see https://unpartnerships.un.org/sites/default/files/publications/2024-01/SDG%20Briefing%20Book_2023.pdf

By using updated data sources like the Population Census 2023, Annual School Census, Provincial Development Statistics, we construct a Reference Index (RIX)[5] which is highly correlated with the conventional HDI. The RIX is also composed of the same domains i.e. education, health, and living standards. It relies on variables for which we have both old and fresh data sources. Reliance of fresh data allows a realistic identification of lagging regions and implement targeted interventions effectively, enabling a proactive approach toward addressing inequalities and achieving equitable development across Pakistan. Thus, the RIX provides a current assessment of district level development performance. We apply the rate of change in the RIX during 2019-2023 period to the conventional HDI to get the Derived HDI for 2023 i.e. DHDI 2023. This approach avoids unrealistic assumptions and linear extrapolations of actual HDI. To summarize, we capture the change in education, health and living standards through actual reported data instead of simulating the earlier HDI through unjustifiable assumptions.

1.1 Rationale of Provincial Development Monitor

PDM serves as a valuable tool for tracking development in provinces by directly measuring improvements in key areas viz. education, health and standard of living. By tracking the HDI over time, provincial governments can assess whether their fiscal policies and development strategies are yielding tangible improvements in these areas, thus providing accountability for the use of devolved funds.

Additionally, the DHDI that we construct for this PDM can help evaluate whether the distribution of resources under the NFC Award[6] is effectively addressing regional disparities. One of the key objectives of the award is to ensure equitable development across provinces. By monitoring DHDI scores, policymakers can identify provinces that are lagging in development and implement targeted interventions accordingly. This tracking mechanism also allows for benchmarking progress between provinces, encouraging competitive governance and fostering a focus on sustainable, inclusive growth that meets the long-term objectives of the NFC Award.

Earlier version of HDI (National Human Development Report, 2024) is based on the data from Pakistan Social and Living Standards Measurement Survey (PSLM) 2019-20. Such pre-Covid and pre-flood data does not account for the disruptive effects of these shocks on the essential building blocks of human development. COVID-19 overwhelmed the healthcare systems, limiting access to essential medical services. Additionally, widespread economic disruptions caused by the pandemic, including significant job losses and business closures, sharply reduced household incomes,

[5] Details of the Reference Index are provided in Annexure 1.
[6] For details see https://www.finance.gov.pk/nfc/presidential_order_5_2010.pdf

undermining the economic dimension of human development. Education, too, suffered heavily due to prolonged school closures, causing setbacks in learning and higher dropout rates.

Crucially, the 2023–24 data used in this study represents a comprehensive measure of human development prior to the expected 2025 Floods. This establishes the current study's findings as an essential pre-crisis baseline. By comparing these established development statistics with data from fresh rounds of the PSLM or other subsequent official surveys, researchers and policymakers can accurately quantify the socio-economic cost of the 2025 Floods and other subsequent disasters on education, health, and living standards at the district level.

1.2 What is Derived Human Development Index?

The Derived Human Development Index (DHDI) is an updated measure of human development at the district level, calculated by applying the 2019-2023 rate of change in education, health, and living standards indices (from the Reference Index, RIX) to the respective components of the 2019 Human Development Index (HDI) reported in UNDP Pakistan's NHDR-24. It incorporates real historical data instead of relying on linear extrapolation, ensuring that the DHDI reflects actual trends and socio-economic changes. The DHDI is computed using the geometric mean of three derived indices: the Derived Education Index (DEI), Derived Health Index (DHI), and Derived Living Standards Index (DLSI). This approach improves accuracy, adapts to regional variations, and minimizes errors, providing a more realistic assessment of development over time.

The DHDI capitalizes on RIX constructed from indicators for which both old and fresh data sources are available. The fresh data sources include Population Census 2023, Annual School Census and Provincial Development Statistics to capture the recent development status at the sub-national level. Since we are using the latest data sources, the indicators within each domain of RIX are chosen in a way that they are close proxies of those used in earlier HDI literature. In Section 2.1, we discuss the strong correlation of RIX and HDI.

1.3 Limitations

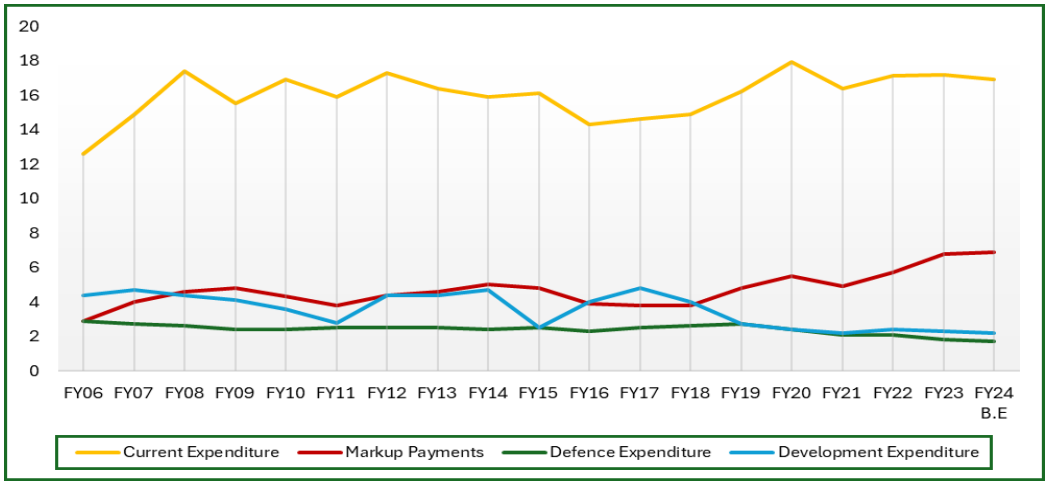
The Derived HDI (DHDI) approach estimates human development changes using a Reference Index (RIX), which is based on variables for which both historical and new data exist. This method allows for updating HDI without making unrealistic extrapolations, but it does not fully replace conventional HDI. Consequently, living standards, education, and health indices are measured with some degree of approximation, to assess the development costs of certain socio-economic shocks such

as COVID-19, inflationary pressures, and climate-induced disasters. Additionally, it primarily tracks provincial and district-level trends but does not provide granular insights at the household or individual level. Lastly, it does not include income inequality, environmental sustainability and governance factors due to data limitations.

1.4 Development Responsibilities of National and Sub-National Governments

The real spirit of 7th NFC Award - which got constitutional cover from the 18th Amendment – was to give the provinces autonomy (and responsibility) of executing their development agenda. The development of mega infrastructure and energy projects is still carried out by the Federal government – a key priority of the successive governments, who heavily invested - mainly through internal/external borrowing - in such mega projects assuming that provinces would develop the human capital capable to sustain a growth trajectory that generates the revenue streams and net foreign receipts required to meet the debt obligations and enhance public investment in high growth sectors. However, over the years, the markup payments have increased at the cost of development and defence expenditures.

Figure 1: Major Budgetary Expenditures as % of GDP



Data Source: Pakistan Economic Survey - Budget Wing, Finance Division and EA Wing's Calculations

Lower development expenditure can have a direct and detrimental impact on human development, as it limits the central and provincial governments' ability to invest in key areas like education, healthcare, and basic infrastructure core components of human development. When development funds are insufficient, provinces struggle to improve essential services that contribute to human capital development. This can result in poor education outcomes, inadequate healthcare access, and lower standards of living, all of which are reflected in the regional disparities in development scores

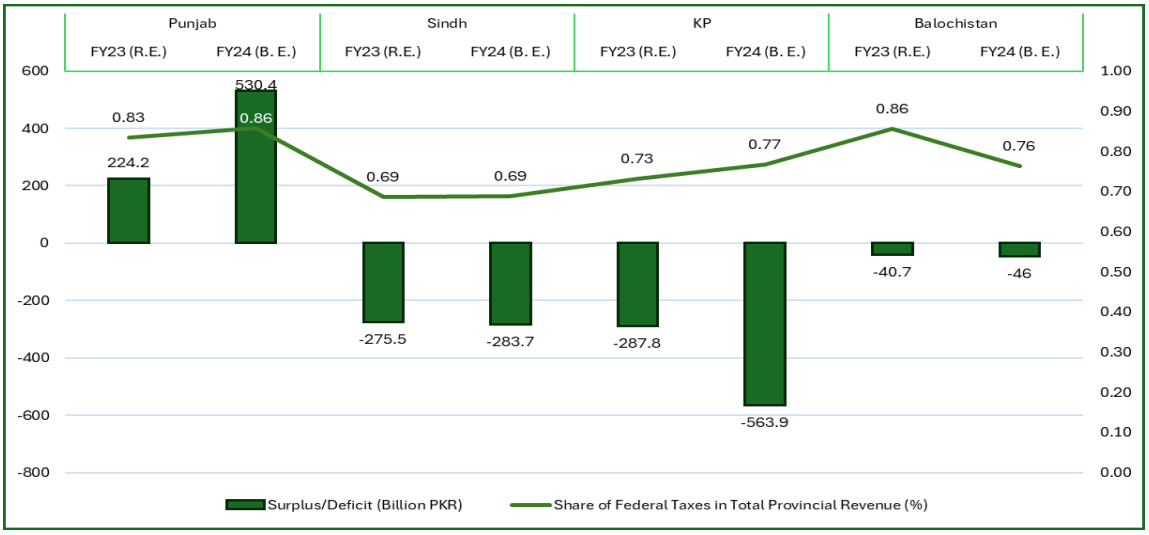
measured through different indices like Human Development Index (HDI), Gender Development Index (GDI) and Multidimensional Poverty Index (MPI).

1.5 Heterogenous Public Finance Management by Provinces

Provincial governments run their current and development budget through a pool of revenues which comprises their own tax revenue, tax revenue receipts from federation and non-tax revenue. A large share of the provincial revenues comes from the Federal Divisible Pool (57.5% of the Federal Tax Revenue). Sindh has the lowest contribution of federal tax receipts in its total revenue and Punjab has the highest. In the last two fiscal years, Punjab had a budget surplus while other provinces were running deficits.

Provincial share in the Federal Public Sector Development Programme is 72.7%. This mainly covers the infrastructure development projects. Provinces also make their own Annual Development Plans which target multiple sectors. For FY25, Balochistan, Khyber Pakhtunkhwa, Punjab and Sindh allocated PKR 321 billion, 120 billion, 842 billion and 959 billion respectively for their Annual Development Plan[7].

Figure 2: Provincial Budget Surplus/Deficit and Share of Federal Taxes in Total Provincial Revenue



Data Source: Pakistan Economic Survey - Provincial Finance Wing, Finance Division

The qualitative and quantitative heterogeneity of public investment management amongst the provinces is both cause and symptom of differences in their socio-economic and developmental performance. As a province's development performance enhances, it can improve its fiscal base by attracting investment, increasing productivity, and enhancing tax revenues. Conversely, regions that lag in development remain fiscally weaker and continue to depend on federal transfers,

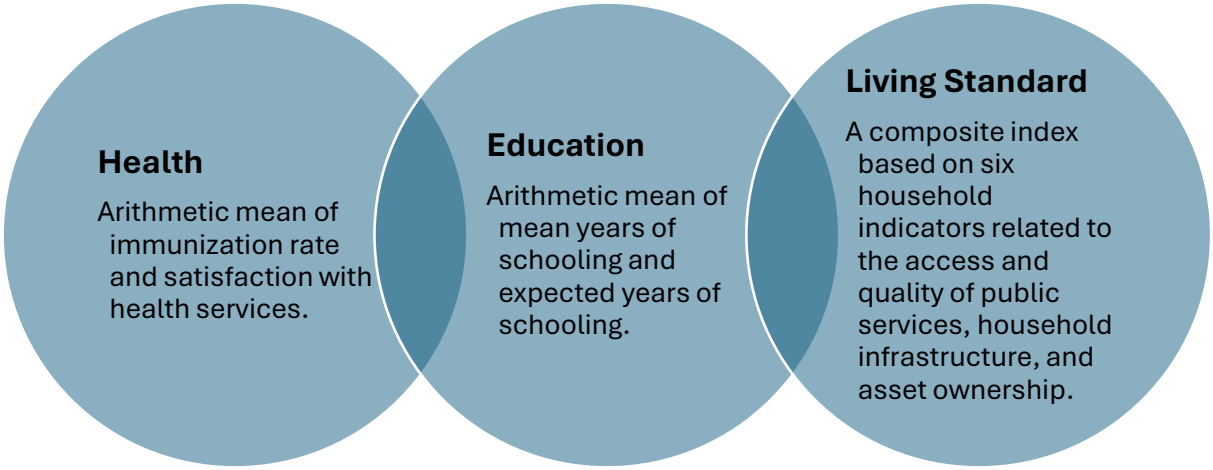
[7] For details see https://www.finance.gov.pk/budget/Budget_2024_25/Budget_in_Brief.pdf

creating a cycle where resource limitations reinforce poor developmental outcomes. This loop perpetuates a heterogeneous landscape where development discrepancies mirror differences in public investment management.

2 Methodology for Derived HDI (Domains, Indicators, and Computation):

2.1 Conceptual Framework, Domains, and Indicators

Human Development Index (HDI) is a composite index measuring average achievement in three basic dimensions of human development - a long and healthy life, knowledge and a decent standard of living. As originally proposed by Anand and Sen (1994[8]), it included the country level measure of life expectancy, youth literacy, and adjusted income. Over the years, HDI has evolved. It's now reported at sub-national levels and covers more comprehensive set of indicators. In the latest National Human Development Report (NHDR-24)[9] by UNDP Pakistan, the three component indices for computing HDI were:



NHDR-24 used PSLM 2019-20 microdata. Microdata usually allows one to opt comprehensive set of indicators listed above. Since we don't have microdata after 2019-20, the derived HDI (DHDI) is constructed through applying the 2019-23 rate of change in component indices of Reference Index (RIX) for each district to the respective components of HDI at the district level reported in UNDP's NHDR-24. Thus, we capture the change in education, health and living standards through actual reported data instead of simulating the earlier HDI through linear extrapolation.

2.2 Computation of the Derived HDI (DHDI)

For each district, the Derived HDI (DHDI) for 2023 applies the 2019–2023 rate of change in the component indices from a Reference Index (RIX) to the corresponding

[8] Anand, S., & Sen, A. (1994). Human Development Index: Methodology and Measurement. Available at: https://ora.ox.ac.uk/objects/uuid:98d15918-dca9-4df1-8653-60df6d0289dd/files/mf20dce7650c4a977d50841adc14bfad3

[9] Pakistan National Human Development Report (NHDR) 2023-2024 "Doing Digital for Development: Access, Adopt, Anticipate, Accelerate. Available at: https://undppknhdr2024.com/wp-content/uploads/2024/05/NATIONAL-HUMAN-DEVELOPMENT-REPORT-2024.pdf

2019 district-level HDI component values reported in NHDR-24. These captures observed changes in education, health, and living standards using actual data trends rather than linear extrapolation.

Mathematically,

$$Derived\ HDI\ 2023 = \sqrt[3]{DEI_{2023} \times DLSI_{2023} \times DHI_{2023}}$$

Where,

$$DEI_{2023} = Derived\ Education\ Index\ 2023$$
$$= \Delta RIX^{2019-23}_{EducationIndex} \times HDI^{2019}_{EducationIndex}$$

$$DHI_{2023} = Derived\ Health\ Index\ 2023$$

$$= \Delta RIX^{2019-23}_{HealthIndex} \times HDI^{2019}_{HealthIndex}$$

$$DLSI_{2023} = Derived\ Living\ Standards\ Index\ 2023$$

$$= \Delta RIX^{2019-23}_{LivingStandardsIndex} \times HDI^{2019}_{LivingStandardsIndex}$$

Our approach, which involves using the district-level rates of change in component indices of RIX rather than linearly extrapolating linearly, is advantageous for several reasons:

i. Accuracy and Relevance:

Extrapolating assumes a constant rate of growth or decline, which may not reflect actual trends and variations in recent years, especially given socio-economic shifts or shocks (e.g., COVID-19, 2022 Flood). Our method uses real historical data to inform changes, ensuring the HDI better represents the actual evolution in education, health, and living standards at the district level.

ii. Comprehensive and Specific Data:

By using PSLM 2019-20 microdata, NHDR-24 leverages a detailed and comprehensive set of indicators that represent more than basic metrics. Extrapolation would rely on limited indicators and ignore the depth provided by microdata, which can capture nuanced variations in living standards, health, and education.

iii. Reduced Error Margins:

Linear extrapolation can introduce inaccuracies, as it applies to a straightforward trendline that may diverge from real patterns. Our approach minimizes these errors by basing estimates on actual historical data points, yielding more robust and credible projections.

iv. Adaptability to Regional Variations:

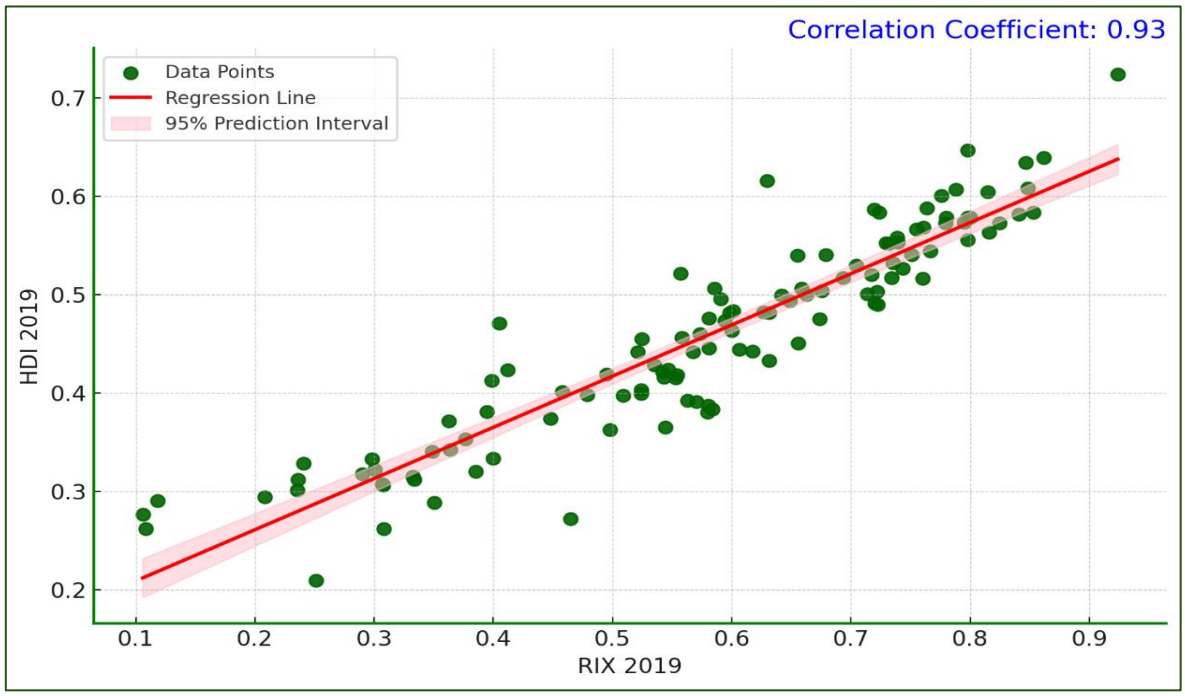
Economic and social changes vary widely across districts. This approach allows each district's development index to reflect region-specific changes rather than a generalized trend, making the DHDI figures more reflective of local realities.

In summary, by applying real rates of change derived from historical data, our approach ensures the district-level DHDI aligns more closely with recent trends and socio-economic realities, producing a more accurate and meaningful picture of development than linear extrapolation would allow.

2.3 Relation Between RIX 2019 and HDI 2019:

The scatterplot (Figure 3) shows a strong positive association between RIX 2019 (x-axis) and HDI 2019 (y-axis), indicating that as RIX 2019 increases, HDI 2019 tends to rise in a fairly linear pattern. The scatterplot reveals a strong positive association between RIX 2019 (Reference Index) and HDI 2019 (Human Development Index). Each point on the graph represents a region, showing that as resilience (RIX) increases, so does human development (HDI). This positive trend is visually emphasized by the regression line, which captures the overall direction of the data points and indicates that regions with higher resilience metrics, as measured by the Reference Index, are generally more developed in terms of human development. The 95% confidence interval around the regression line suggests a high level of certainty in this trend, reinforcing that the observed relationship is robust across different regions.

Figure 3: Correlation Between RIX 2019 and HDI 2019

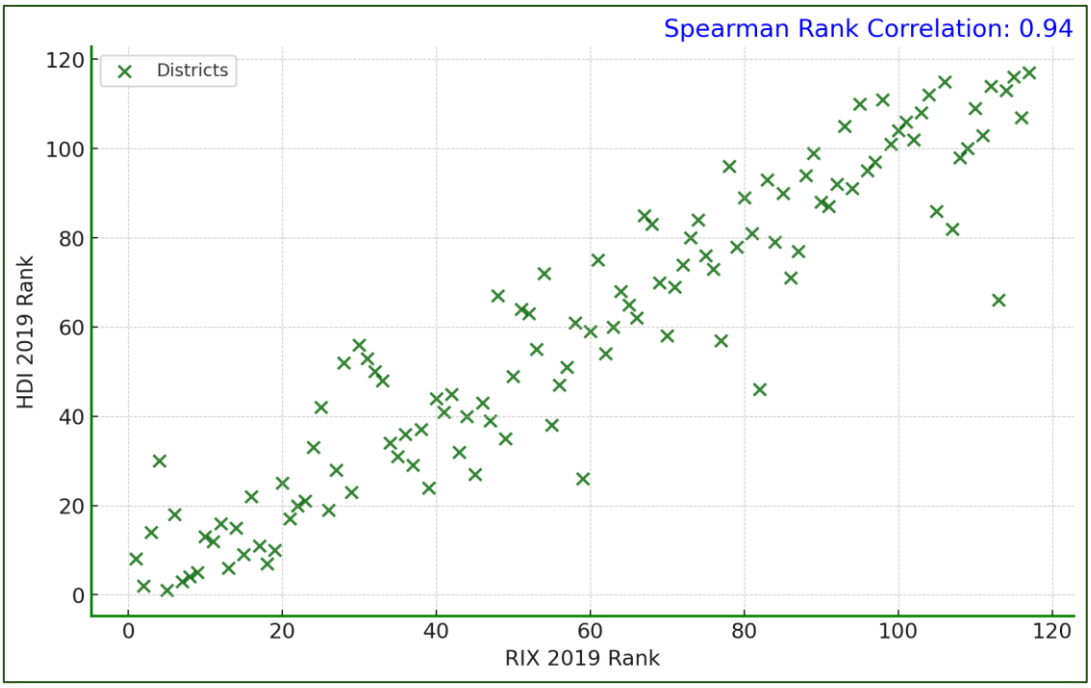


Source: Authors' Calculations

The correlation coefficient of approximately 0.93 quantifies this strong positive relationship, implying that RIX and HDI are closely aligned, with 93% variation in one index associated with the other. This close alignment suggests that as regions improve in resilience-related factors (e.g., infrastructure, social support, economic stability), they also tend to improve in human development indicators such as health, education, and income. The regression line's slope of about 0.53 indicates that for each unit increase in resilience, HDI increases by roughly half a unit, highlighting the significant impact of resilience on human development. This relationship underscores the interdependence between resilience and human development, suggesting that policy efforts focusing on enhancing resilience may have a substantial impact on overall development in these regions.

The rank correlation plot (Figure 4) shows a clear positive association between the RIX 2019 and HDI 2019 district rankings. Each data point represents a region's ranking in RIX 2019 and HDI 2019, and the close alignment of points along a diagonal indicates that regions with high resilience rankings also tend to have high human development rankings. This pattern reflects consistency in how resilience factors are associated with human development levels across regions.

Figure 4: Rank Correlation



Source: Authors' Calculations

The Spearman rank correlation coefficient of approximately 0.94 reinforces this strong positive relationship, indicating that 95% of the variation in the ranks of HDI can be explained by the ranks of RIX. This near-perfect correlation suggests that regions that are more resilient, as measured by RIX, are very likely to also perform well in terms of human development, hinting at underlying shared determinants or interlinked socioeconomic factors. This robust rank association underscores the value of resilience initiatives for improving human development outcomes.

3 Key Findings

The analysis of Human Development Index (HDI) trends from 2019 to 2023 shows that Pakistan's overall HDI saw a slight decline of 1.14%, indicating minor regressions across education, health, and living standards, regional disparities underscore deeper challenges. Islamabad stands out as the only region with a positive HDI trend, showing resilience and slight improvements, particularly in healthcare. In contrast, Balochistan faces significant hurdles, with decreases across all indices, reflecting persistent socio-economic and health inequalities.

Punjab and Sindh demonstrate similar HDI patterns, with both regions experiencing notable declines in health indicators. The Education Index showed declines in every region, hinting at nationwide educational challenges, while the Living Standards Index dropped across most areas, highlighting economic difficulties. Overall, the findings point to a general decline in human development across Pakistan's regions, with particular challenges in the education and health sectors, despite isolated areas of improvement.

Table 1: National and Provincial HDI

Province	EI 2019	DEI 2023	HI 2019	DHI 2023	LSI 2019	DLSI 2023	HDI 2019	DHDI 2023
Pakistan	0.539	0.548	0.789	0.779	0.802	0.772	0.699	0.691
Islamabad Capital Territory	0.883	0.853	0.901	0.976	0.990	0.971	0.924	0.931
Balochistan	0.387	0.353	0.550	0.456	0.410	0.386	0.444	0.396
Khyber Pakhtunkhwa	0.486	0.474	0.750	0.703	0.752	0.726	0.650	0.623
Punjab	0.588	0.600	0.838	0.719	0.899	0.887	0.762	0.726
Sindh	0.500	0.504	0.755	0.809	0.712	0.652	0.645	0.643

EI=Education Index; DEI= Derived Education Index; HI=Health Index; DHI=Derived Health Index; LSI=Living Standards Index; DLSI=Derived Living Standards Index; HDI=Human Development Index; DHDI= Derived Human Development Index

The analysis presented in the Table 2 highlights significant spatial disparities in human development outcomes across Pakistan's provinces, reflected through composite indices of education, healthcare, and living standards.

Islamabad Capital Territory (ICT) consistently demonstrates superior socio-economic performance, ranking first across all baseline and derived indices as mentioned in Table 2. This consistency indicates a robust institutional and governance framework characterized by strategic public investment, particularly in education, healthcare services, and digital infrastructure. ICT's stable and leading position suggests the presence of effective policy implementation, high administrative capacity, and relatively equitable service delivery mechanisms, reinforcing theories that link institutional quality with human development.

Punjab maintains its second place ranking in most indices, with a notable exception in the Derived Health Index (DHI), where it falls to third place. This decline points to emerging or persisting healthcare system inefficiencies, potentially driven by uneven health infrastructure distribution, disparities between rural and urban healthcare access, and challenges in service quality. Despite Punjab's diversified economy and urbanization advantages, the province's moderate digital and health performance signals the need for targeted interventions aimed at closing service delivery gaps and advancing technological adoption to sustain human development gains.

Sindh presents a mixed picture. An upward shift from third to second in the DHI indicates progress in healthcare outcomes, possibly resulting from targeted investments or reforms in health services. However, stagnation in educational and living standards indices suggest systemic bottlenecks in educational quality, access to basic services, and socio-economic inclusiveness. This points to the need for integrated policy interventions focusing not only on healthcare but also on broad-based human capital development and infrastructural modernization, especially in peri-urban and rural areas.

Khyber Pakhtunkhwa (KP) maintains a consistent rank (fourth) across most indices, except in Living Standards where it slightly outperforms Sindh. Despite benefitting from a relatively young population and ongoing infrastructure development, KP's performance suggests that demographic dividends have not yet translated into significant human development improvements. Investments aimed at enhancing education quality, healthcare access, and digital connectivity could enable KP to leverage its potential more effectively.

Balochistan persistently ranks lowest across all indices, highlighting profound structural barriers including weak governance, limited institutional capacity, infrastructural deficits, and socio-political instability. These findings align with

broader literature emphasizing that peripheral and conflict-affected regions face chronic underinvestment in human development sectors. Comprehensive, multi-sectoral strategies emphasizing state capacity building, equitable resource distribution, and social protection mechanisms are essential to break the cycle of underdevelopment.

Table 2: National and Provincial HDI Rank wise

Province	EI 2019	DEI 2023	HI 2019	DHI 2023	LSI 2019	DLSI 2023	HDI 2019	DHDI 2023
Islamabad Capital Territory	1	1	1	1	1	1	1	1
Punjab	2	2	2	3	2	2	2	2
Sindh	3	3	3	2	4	4	4	3
Khyber Pakhtunkhwa	4	4	4	4	3	3	3	4
Balochistan	5	5	5	5	5	5	5	5

EI=Education Index; DEI= Derived Education Index; HI=Health Index; DHI=Derived Health Index; LSI=Living Standards Index; DLSI=Derived Living Standards Index; HDI=Human Development Index; DHDI= Derived Human Development Index

The overall findings reveal embedded regional disparities despite some provinces registering isolated improvements. The evolving provincial dynamics point towards the critical role of governance quality, infrastructure development, healthcare accessibility, educational attainment, and digitalization in shaping human development trajectories. A differentiated, region-specific approach focusing on capacity enhancement, service delivery reforms, and inclusive economic policies is imperative to achieve balanced and sustainable development across Pakistan.

The provincial rankings from 2019 to 2023 show that while ICT and Punjab have maintained relative stability, provinces like Sindh and KP exhibit shifts that underscore sector-specific vulnerabilities and opportunities. Balochistan's consistently low performance emphasizes the urgency of redressing historical marginalization through proactive developmental planning.

3.1 Overall HDI Comparison (2019 vs. 2023)

Pakistan (Overall)	•The HDI has decreased slightly from 0.699 in 2019 to 0.691 in 2023. This decline reflects minor regressions across several indices, although relatively stable overall.
Balochistan	•This province saw a decrease from 0.444 in 2019 to 0.396 in 2023, indicating a significant drop in HDI. The largest declines were observed in the Education and Health indices, suggesting that both education access and health outcomes may have worsened here.
Khyber Pakhtunkhwa	•The HDI dropped from 0.650 in 2019 to 0.623 in 2023. Here, Health and Living Standards have slightly decreased, pointing toward economic and healthcare challenges.
Punjab	•The HDI decreased from 0.762 in 2019 to 0.726 in 2023. The decline is largely influenced by a drop in the Health Index, while the Living Standards and Education indices are relatively stable.
Sindh	•HDI declined from 0.645 in 2019 to 0.643 in 2023. However, Sindh showed an improvement in the Health Index, which partially offset declines in other areas.
Islamabad	•Despite minor decreases in Education and Living Standards, Islamabad saw a marginal increase in HDI from 0.924 in 2019 to 0.931 in 2023, indicating relatively high resilience and overall development progress.

3.2 Detailed Index Trends

- *Education Index (EI):*
    - All regions saw a decline in their Education Index from 2019 to 2023. This may indicate nationwide challenges in educational access or quality.

- Punjab and Islamabad retained the highest values but still experienced declines, while Balochistan showed the lowest values, reflecting significant educational challenges.

- ***Living Standards Index:***
  - Declines were observed across most regions, with Islamabad remaining the highest.
  - Punjab and Sindh saw moderate declines, while Balochistan had the lowest Living Standards Index in both 2019 and 2023, indicating ongoing economic challenges.

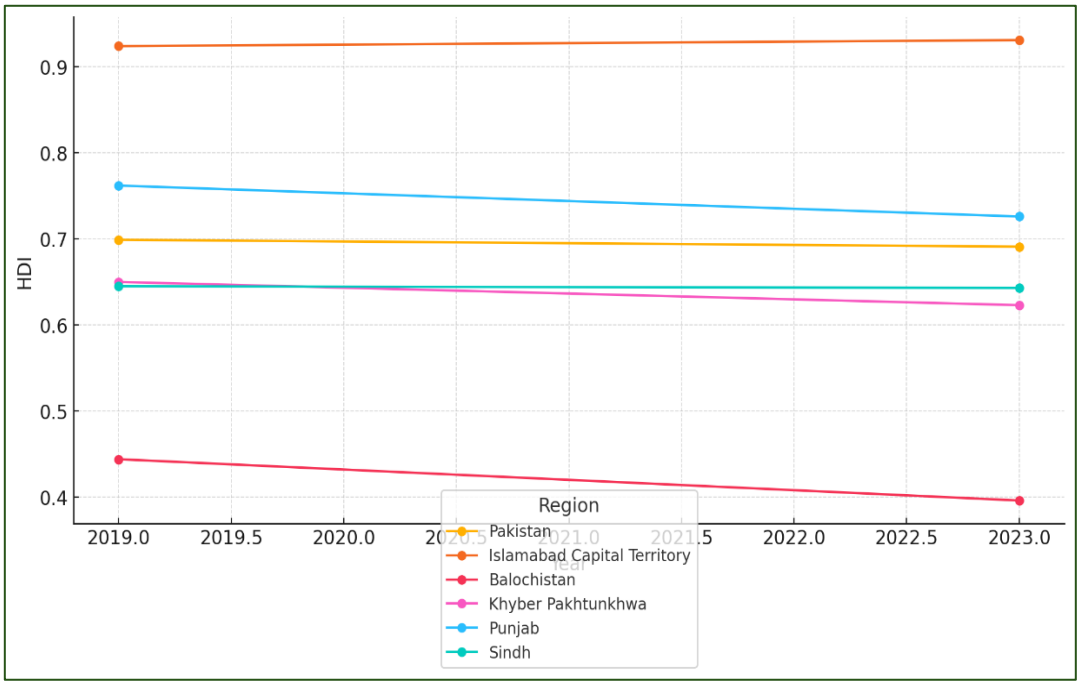
- ***Health Index:***
  - Sindh saw an improvement in its Health Index, suggesting a possible focus on healthcare improvements.
  - Balochistan and Khyber Pakhtunkhwa saw declines, with Balochistan's Health Index being particularly low, which may reflect challenges in healthcare access or outcomes.

3.3 Regional Highlights

- Balochistan faces significant challenges, with drops in all indices. Its low scores suggest persistent socio-economic and health inequalities.
- Punjab and Sindh show similar HDI scores, with declines in health indicators playing a major role in both regions' overall HDI drop.
- Islamabad stands out as the only region with a positive HDI trend, albeit minor, indicating a relatively better socio-economic environment.

The overall trend shows a slight decline in HDI across most regions, with particular challenges in education and health sectors. Islamabad demonstrates resilience and improvement, while Balochistan shows significant development challenges in nearly all areas.

Figure 5: Changes in HDI Trends Across Regions



Source: Authors' Calculations

The component-wise HDI trends for each region from 2019 to 2023 reveal several insights:

1. Pakistan:

- The Education Index improved slightly from 0.539 in 2019 to 0.548 in 2023.
- The Living Standards Index decreased marginally from 0.802 to 0.772.
- The Health Index experienced a slight decline from 0.789 to 0.779.
- Overall, the HDI decreased from 0.699 in 2019 to 0.691 in 2023, indicating minor regression in development indicators nationally.

2. Balochistan:

- The Education Index declined from 0.387 to 0.353, suggesting setbacks in educational development.
- The Living Standards Index decreased from 0.410 to 0.386, indicating limited progress in economic well-being.
- The Health Index fell from 0.550 to 0.456, signaling a decline in health outcomes.

- The overall HDI dropped significantly from 0.444 in 2019 to 0.396 in 2023, underscoring persistent developmental challenges in Balochistan.

3. Islamabad Capital Territory (ICT):

- The Education Index decreased slightly from 0.883 in 2019 to 0.853 in 2023.
- The Living Standards Index showed a minor reduction from 0.990 to 0.971, though still reflecting high standards.
- The Health Index improved slightly from 0.901 to 0.976, indicating gains in healthcare access and quality.
- ICT's overall HDI increased from 0.924 to 0.931, highlighting its position as the region with the highest human development level in Pakistan.

4. Khyber Pakhtunkhwa:

- The Education Index saw a decrease from 0.486 to 0.474.
- The Living Standards Index dropped slightly from 0.752 to 0.726.
- The Health Index also declined from 0.750 to 0.703, reflecting reduced health outcomes.
- Khyber Pakhtunkhwa's overall HDI decreased from 0.650 to 0.623, suggesting a moderate regression in human development.

5. Punjab:

- The Education Index increased slightly from 0.588 to 0.600, indicating steady educational improvements.
- The Living Standards Index remained relatively stable, decreasing slightly from 0.899 to 0.887.
- The Health Index experienced a more noticeable decline from 0.838 to 0.719.
- Punjab's overall HDI decreased from 0.762 to 0.726, indicating a minor decline in overall development.

6. Sindh:

- The Education Index showed a slight increase from 0.500 to 0.504.

- The Living Standards Index declined from 0.712 to 0.652.
- The Health Index improved from 0.755 to 0.809, indicating better health conditions.
- Sindh's HDI remained almost stable, with a slight decrease from 0.645 to 0.643.

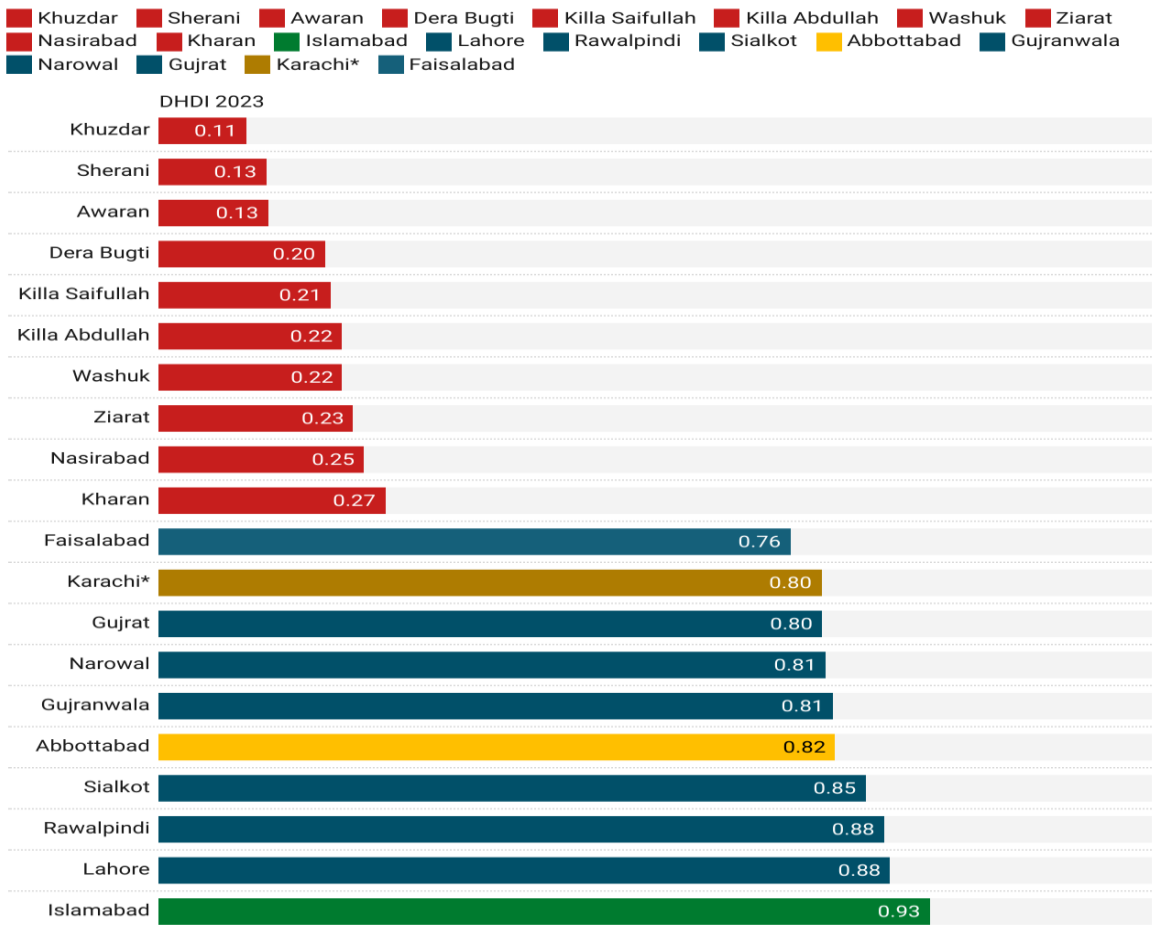
These trends show that while ICT has achieved substantial progress, especially in health, other regions like Balochistan and Khyber Pakhtunkhwa face declining HDI components, indicating challenges in maintaining educational, economic, and health standards. Punjab and Sindh show stability with slight declines, while Pakistan's national average mirrors a minor overall decrease, pointing towards a need for balanced, region-focused interventions.

3.4 District Level Trends

The bar chart in Figure 6 illustrates the Derived Human Development Index (DHDI) for 2023 across various districts in Pakistan. The top 10 districts, showcasing the highest DHDI values, reflect a diverse representation from multiple provinces. Islamabad, as the federal capital, leads with the highest score, while Punjab dominates this category with seven districts, including Lahore, Rawalpindi, Gujrat, Gujranwala, Narowal, Sialkot, and Faisalabad. Sindh also has a strong presence with Karachi, and KP is represented by Abbottabad. This distribution highlights a relatively balanced development among provinces in the higher-ranking districts, indicating progress in education, health, and living standards across these areas.

In contrast, the bottom 10 districts with the lowest DHDI values are exclusively clustered in Balochistan, including Khuzdar, Sherani, Awaran, Dera Bugti, Killa Saifullah, Killa Abdullah, Washuk, Ziarat, Nasirabad, Kharan. This stark regional disparity underscores the development challenges faced by Balochistan, where indicators for education, healthcare, and basic living conditions remain critically low. The concentration of underdeveloped districts in Balochistan highlights the urgent need for targeted policy measures and investments to address the province's structural inequalities and improve its socio-economic outcomes.

Figure 6: Bottom 10 and Top 10 Districts in Pakistan



Source: Authors' Calculations

In the coming sub-sections, we examine the top 5 and bottom 5 districts within each province which provides a more nuanced understanding of intra-provincial disparities, highlighting both areas of progress and those needing targeted interventions. This approach captures the range of human development levels within a province, showing how evenly resources and opportunities are distributed. While a province may have a high overall HDI, significant disparities across districts can reveal areas where development is uneven, potentially impacting social cohesion and economic stability. By identifying the highest-performing districts, policymakers can learn from successful strategies, while the lower-performing districts highlight where urgent, focused interventions are needed.

This analysis also aids in setting benchmarks, monitoring progress, and supporting equitable development goals. The top districts serve as benchmarks, allowing others to set realistic goals and track progress relative to what is achievable within the province. Understanding the unique drivers of both high and low HDI performance provides insights into the root causes of disparities, enabling tailored solutions for

each district's specific needs. This targeted approach not only improves policy efficiency but aligns with an inclusive development agenda, ensuring that development initiatives uplift all districts, not just the well-performing ones, thus promoting balanced and equitable progress across the province.

3.4.1 Balochistan:

Among the top-performing districts in Balochistan, Gwadar records the highest Derived Human Development Index (DHDI) in 2023 at 0.617, reflecting a 1.7 percent increase since 2019. Quetta follows with a DHDI of 0.597, but exhibits a 5.5 percent contraction relative to 2019. Pishin ranks third with 0.527 and a 8.9 percent decline, while Kohlu and Mastung register 0.516 and 0.503, corresponding to declines of 3.6 percent and 7.8 percent, respectively. Across the top five, deterioration in the education dimension is pervasive, as the Education Index values in 2023 are uniformly lower than in 2019. Health and living standards show mixed trajectories: Gwadar and Kohlu demonstrate substantive improvements in health, whereas Quetta and Pishin experience health reversals. Living standards improve in Quetta but weaken markedly in Kohlu and Pishin, indicating structural heterogeneity in the drivers of human development across districts.

Table 3: Balochistan Top 5 and Bottom 5 Districts

District	EI 2019	DEI 2023	HI 2019	DHI 2023	LSI 2019	DLSI 2023	HDI 2019	DHDI 2023	% Change (DHDI2023 - HDI2019)
Top 5									
Gwadar	0.506	0.449	0.721	0.874	0.611	0.598	0.606	0.617	1.705
Quetta	0.533	0.459	0.591	0.532	0.793	0.870	0.630	0.597	-5.531
Pishin	0.479	0.432	0.590	0.568	0.666	0.596	0.573	0.527	-8.855
Kohlu	0.521	0.457	0.349	0.610	0.842	0.494	0.535	0.516	-3.623
Mastung	0.485	0.375	0.898	0.899	0.365	0.377	0.542	0.503	-7.817
Bottom 5									
Killa Saifullah	0.364	0.289	0.391	0.322	0.098	0.096	0.241	0.208	-16.070

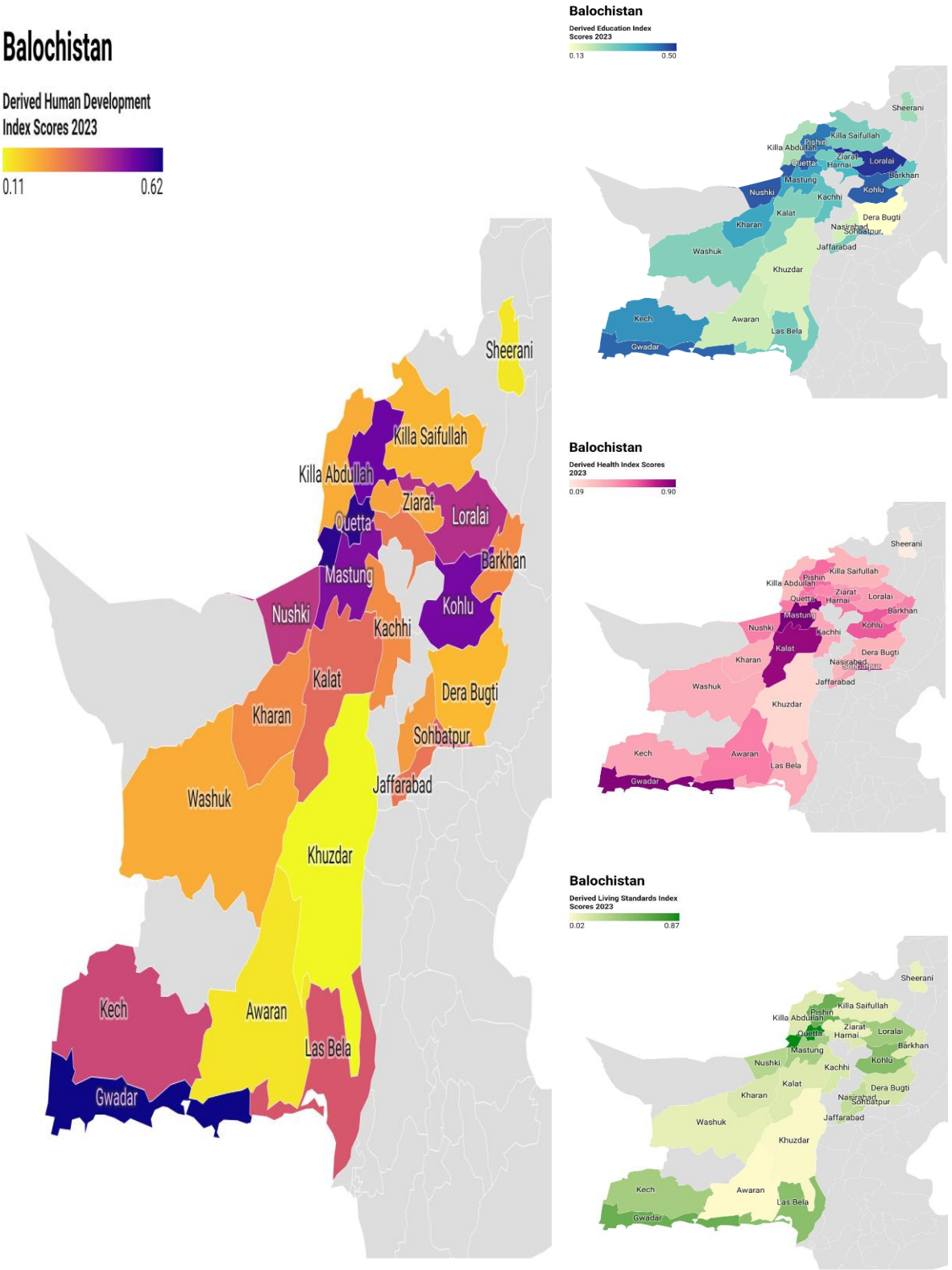
Dera Bugti	0.142	0.134	0.406	0.321	0.228	0.186	0.236	0.200	-17.776
Awaran	0.207	0.199	0.378	0.516	0.021	0.022	0.118	0.131	10.019
Sherani	0.236	0.249	0.111	0.091	0.049	0.095	0.108	0.129	15.865
Khuzdar	0.174	0.183	0.247	0.176	0.028	0.036	0.106	0.105	-0.685

EI=Education Index; DEI= Derived Education Index; HI=Health Index; DHI=Derived Health Index; LSI=Living Standards Index; DLSI=Derived Living Standards Index; HDI=Human Development Index; DHDI= Derived Human Development Index

The bottom five districts continue to face pronounced socio-economic constraints. Dera Bugti and Killa Saifullah register DHDI values of 0.200 and 0.208, with declines of 17.8 percent and 16.1 percent, driven by concurrent reductions in education, health, and living standards. Khuzdar records the lowest DHDI at 0.105, with negligible overall change (0.7 percent decline), underscoring persistent deprivation. In contrast, Awaran and Sherani post measurable gains in DHDI 10.0 percent and 15.9 percent, respectively largely attributable to improvements in specific subindices: Awaran exhibits a strong rise in health, whereas Sherani's gains are concentrated in education and living standards. Notwithstanding these localized improvements, living standards remain critically low across much of the bottom cohort, and education shortfalls remain the most consistent headwind to human development.

Overall, Balochistan exhibits widening intra-provincial disparities. Policy responses should prioritize: reversing the province-wide erosion in education outcomes; stabilizing health gains where they are emerging while addressing reversals in districts such as Quetta and Pishin; and designing place-specific interventions to bolster living standards, particularly in Kohlu, Pishin, and the lowest-ranked districts. Targeted, district-differentiated strategies are essential to sustain progress and promote equitable human development across the province.

Figure 7: DHDI Scores in Balochistan



Source: Authors' Calculations

3.4.2 Khyber Pakhtunkhwa:

Khyber Pakhtunkhwa is led by Abbottabad, which records DHDI 2023 at 0.817, up from 0.800 in 2019, reflecting an increase of 2.07 percent. Within the remaining top five, Peshawar declines from 0.764 to 0.728 a reduction of 4.84 percent, Malakand from 0.751 to 0.720 a reduction of 4.21 percent, Mardan from 0.735 to 0.710 a reduction of 3.53 percent, and Mansehra from 0.734 to 0.705 a reduction of 4.12 percent. These trajectories are consistent with mixed movements across components, where education shows modest improvement in Abbottabad from 0.687 to 0.734 and in Malakand from 0.579 to 0.596, near stagnation in Mansehra at 0.555 to 0.556, and contractions in Peshawar at 0.584 to 0.561 and Mardan at 0.548 to 0.528.

Table 4: Khyber Pakhtunkhwa Top 5 and Bottom 5 Districts

District	EI 2019	DEI 2023	HI 2019	DHI 2023	LSI 2019	DLSI 2023	HDI 2019	DHDI 2023	% Change (DHDI2023 - HDI2019)
Top 5									
Abbottabad	0.687	0.734	0.793	0.803	0.940	0.924	0.800	0.817	2.070764
Peshawar	0.584	0.561	0.834	0.784	0.914	0.879	0.764	0.728	-4.83924
Malakand	0.579	0.596	0.819	0.752	0.892	0.834	0.751	0.720	-4.21413
Mardan	0.548	0.528	0.828	0.789	0.875	0.858	0.735	0.710	-3.52946
Mansehra	0.555	0.556	0.779	0.712	0.915	0.885	0.734	0.705	-4.12088
Bottom 5									
Batagram	0.361	0.344	0.519	0.392	0.771	0.676	0.524	0.450	-16.5379
Orakzai	0.376	0.374	0.807	0.608	0.317	0.298	0.458	0.408	-12.3111
Mohmand	0.257	0.262	0.721	0.688	0.261	0.268	0.364	0.364	-0.06953
South Waziristan	0.338	0.327	0.642	0.432	0.284	0.278	0.395	0.340	-16.1437
Bajaur	0.257	0.259	0.577	0.495	0.286	0.295	0.349	0.336	-3.87093

EI=Education Index; DEI= Derived Education Index; HI=Health Index; DHI=Derived Health Index; LSI=Living Standards Index; DLSI=Derived Living Standards Index; HDI=Human Development Index; DHDI= Derived Human Development Index

Health and living standards remain comparatively higher in absolute terms for the top five, yet several districts exhibit softening over time, for example Peshawar health from 0.834 to 0.784 and living standards from 0.914 to 0.879.

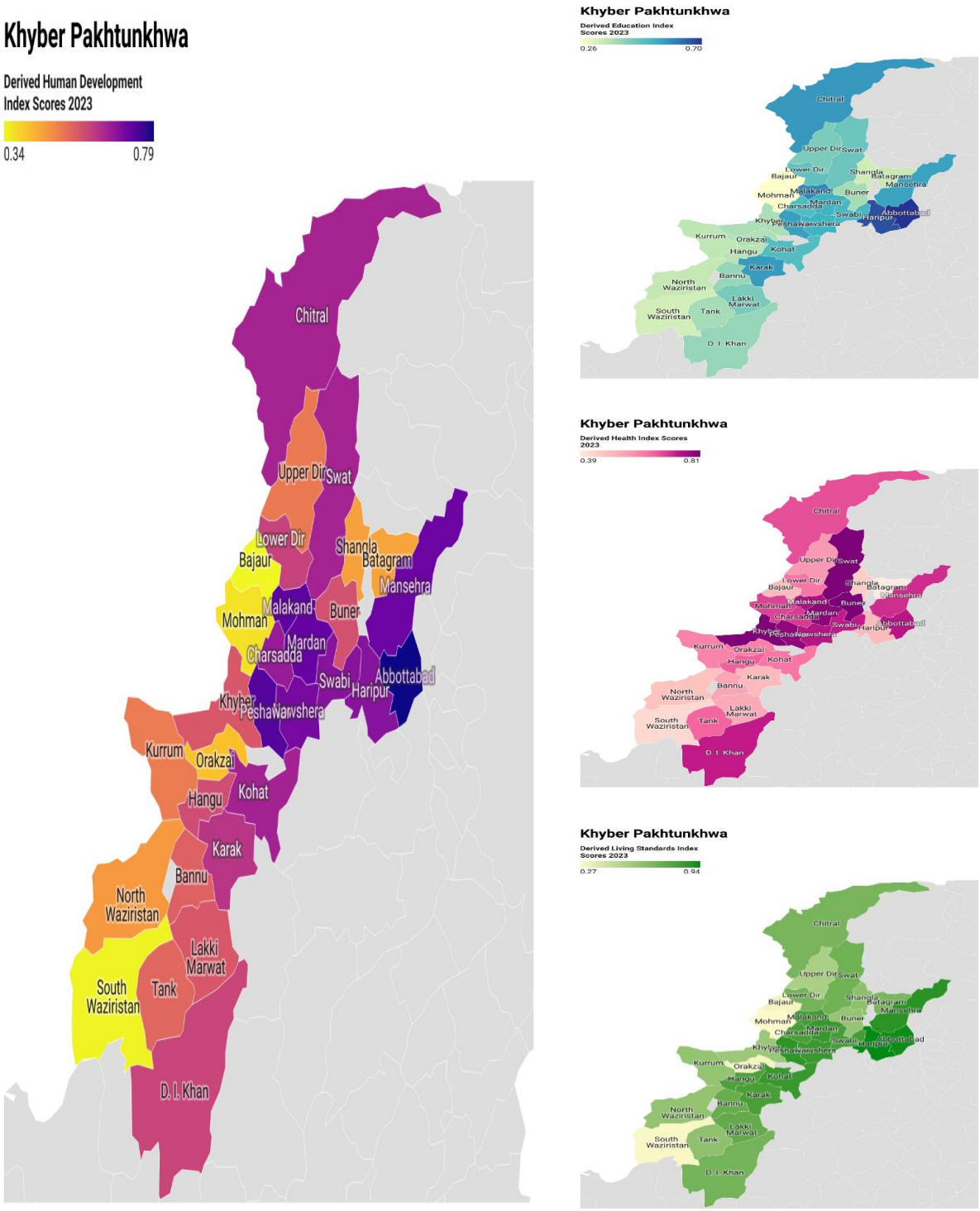
At the lower end, Batagram, Orakzai, Mohmand, South Waziristan, and Bajaur report substantially lower outcomes. Batagram experiences the largest contraction, with HDI 2019 at 0.524 and DHDI 2023 at 0.450, a reduction of 16.54 percent; this pattern aligns with declines in health from 0.519 to 0.392 and living standards from 0.771 to 0.676. South Waziristan records a reduction of 16.14 percent, and Orakzai a reduction of 12.31 percent. Bajaur shows a reduction of 3.87 percent. Mohmand remains comparatively stable at 0.364 across both years, a marginal reduction of 0.07 percent, supported by small gains in education from 0.257 to 0.262 and living standards from 0.261 to 0.268.

Overall, the province exhibits concentration of higher composite well-being in the top tier led by Abbottabad, while the lower tier, particularly Batagram, Orakzai, and South Waziristan, requires targeted policy responses focused on health and living standards alongside sustained improvements in education to reduce spatial disparities within Khyber Pakhtunkhwa.

3.4.3 Punjab:

According to Table 5, Lahore and Rawalpindi are the two highest ranked districts in Punjab by the Derived Human Development Index in 2023, recording DHDI values of 0.884 and 0.876. Lahore exhibits an overall improvement of 4.18 percent relative to 2019. This net gain is primarily associated with a substantial rise in the Derived Health Index from 0.829 to 0.982, offsetting marginal softening in the Derived Education Index from 0.740 to 0.723 and the Derived Living Standards Index from 0.988 to 0.971. Rawalpindi registers an increase of 1.66 percent, supported by an uplift in the Derived Education Index from 0.783 to 0.821 and a modest advance in the Derived Health Index from 0.842 to 0.849, alongside a small easing in the Derived Living Standards Index from 0.971 to 0.964.

Figure 8: District Wise DHDI Scores in Khyber Pakhtunkhwa



Source: Authors' Calculations

Sialkot ranks third with a DHDI of 0.854 and a net improvement of 0.61 percent. The data indicates a notable advance in the Derived Education Index from 0.740 to 0.828, which compensates for reductions in the Derived Health Index from 0.847 to 0.787 and the Derived Living Standards Index from 0.975 to 0.954. Gujranwala occupies the

fourth position with a DHDI of 0.815 and a contraction of 1.16 percent. Despite gains in the Derived Education Index from 0.678 to 0.707, the aggregate outcome is weighed down by declines in the Derived Health Index from 0.848 to 0.823 and in the Derived Living Standards Index from 0.974 to 0.930. Narowal ranks fifth with a DHDI of 0.806 and a reduction of 1.26 percent, reflecting an education gain from 0.701 to 0.734 that is more than offset by decreases in the Derived Health Index from 0.824 to 0.773 and in the Derived Living Standards Index from 0.940 to 0.922.

Table 5: Punjab Top 5 and Bottom 5 Districts

District	EI 2019	DEI 2023	HI 2019	DHI 2023	LSI 2019	DLSI 2023	HDI 2019	DHDI 2023	% Change (DHDI2023 - HDI2019)
Top 5									
Lahore	0.740	0.723	0.829	0.982	0.988	0.971	0.847	0.884	4.184281
Rawalpindi	0.783	0.821	0.842	0.849	0.971	0.964	0.862	0.876	1.658355
Sialkot	0.740	0.828	0.847	0.787	0.975	0.954	0.848	0.854	0.609514
Gujranwala	0.678	0.707	0.848	0.823	0.974	0.930	0.824	0.815	-1.16063
Narowal	0.701	0.734	0.824	0.773	0.940	0.922	0.816	0.806	-1.25519
Bottom 5									
Bhakkar	0.482	0.503	0.772	0.549	0.822	0.862	0.674	0.619	-8.7683
Muzaffargarh	0.362	0.384	0.779	0.679	0.767	0.780	0.600	0.588	-2.00926
Dera Ghazi Khan	0.400	0.386	0.882	0.812	0.616	0.619	0.601	0.579	-3.90102
Rahim Yar Khan	0.419	0.382	0.751	0.587	0.839	0.862	0.642	0.578	-11.0106
Rajanpur	0.341	0.309	0.922	0.845	0.548	0.500	0.557	0.507	-9.78441

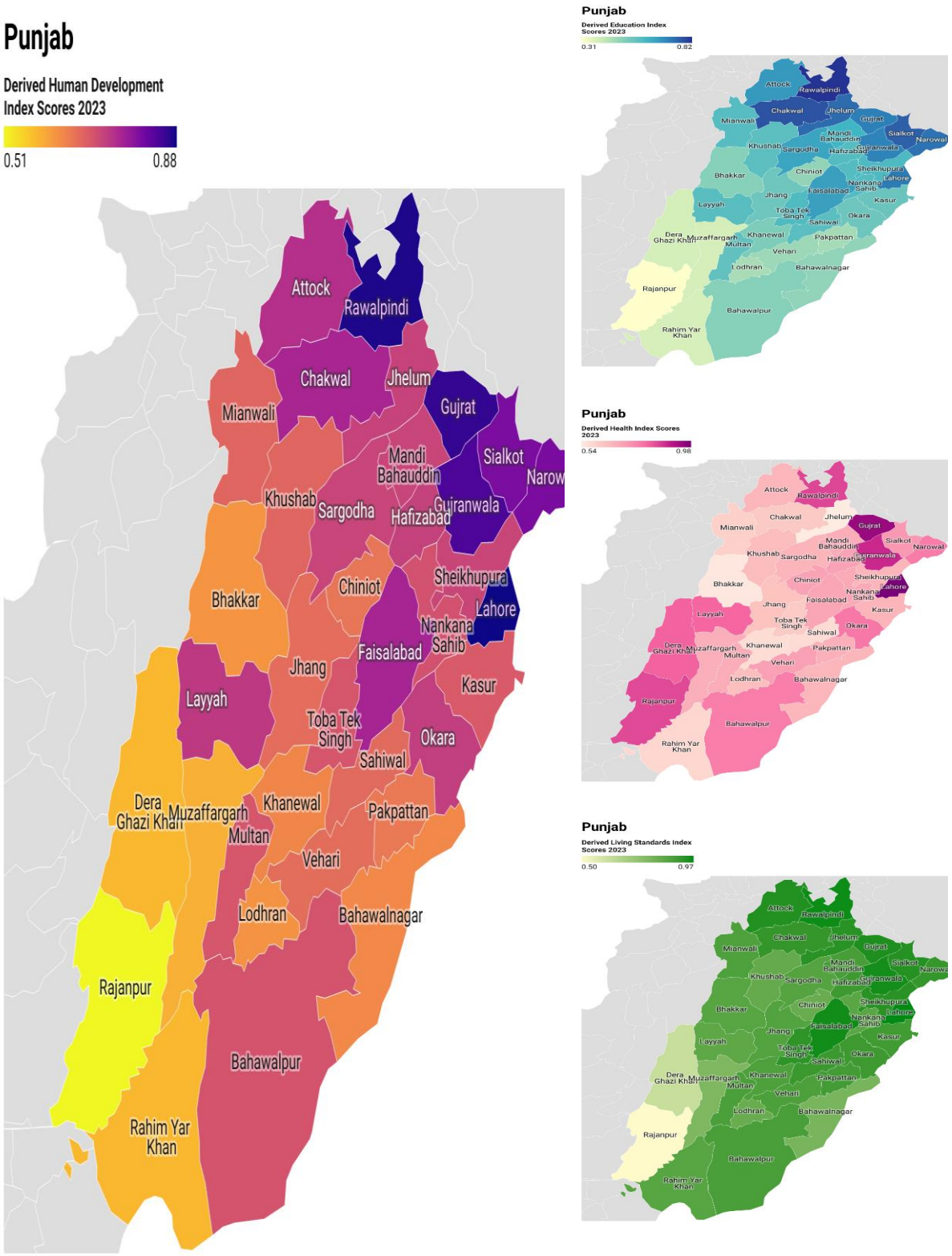
EI=Education Index; DEI= Derived Education Index; HI=Health Index; DHI=Derived Health Index; LSI=Living Standards Index; DLSI=Derived Living Standards Index; HDI=Human Development Index; DHDI= Derived Human Development Index

The bottom five districts present a contrasting trajectory. Rajanpur records the lowest DHDI at 0.507 with a decline of 9.78 percent, as all three components weaken between

2019 and 2023. The Derived Education Index falls from 0.341 to 0.309, the Derived Health Index moderates from 0.922 to 0.845, and the Derived Living Standards Index decreases from 0.548 to 0.500. Rahim Yar Khan posts a DHDI of 0.578 with a decline of 11.01 percent. Although the Derived Living Standards Index improves from 0.839 to 0.862, the deterioration in the Derived Health Index from 0.751 to 0.587 and in the Derived Education Index from 0.419 to 0.382 drives the overall setback. Dera Ghazi Khan registers a DHDI of 0.579 and a decline of 3.90 percent, shaped by a fall in the Derived Health Index from 0.882 to 0.812 and in the Derived Education Index from 0.400 to 0.386, with only a marginal improvement in the Derived Living Standards Index from 0.616 to 0.619. Muzaffargarh records a DHDI of 0.588 with a decline of 2.01 percent. Gains in the Derived Education Index from 0.362 to 0.384 and in the Derived Living Standards Index from 0.767 to 0.780 are outweighed by a decrease in the Derived Health Index from 0.779 to 0.679. Bhakkar shows a DHDI of 0.619 with a decline of 8.77 percent, where increases in the Derived Education Index from 0.482 to 0.503 and in the Derived Living Standards Index from 0.822 to 0.862 are eclipsed by a pronounced reduction in the Derived Health Index from 0.772 to 0.549.

Overall, Punjab exhibits heterogeneity in human development outcomes in 2023. The highest ranked districts Lahore, Rawalpindi, and Sialkot sustain relatively elevated development levels, frequently underpinned by strong performance in education or health. By contrast, the bottom ranked districts Rajanpur, Rahim Yar Khan, Dera Ghazi Khan, Muzaffargarh, and Bhakkar face persistent constraints, with declines predominantly concentrated in health outcomes and, in several cases, education. Policy priorities therefore include targeted reinforcement of primary and preventive healthcare, continuous improvements in schooling access and quality, and context specific interventions to raise living standards. Focused investment in these domains would contribute to a more inclusive and balanced development trajectory across Punjab.

Figure 9: District Wise DHDI Scores in Punjab



Source: Authors' Calculations

3.4.4 Sindh:

According to Table 6, Karachi, Hyderabad, and Naushero Feroze lead the table of districts with Derived Human Development Index values in 2023 of 0.800, 0.761, and 0.663 respectively. Karachi registers an improvement of 1.49 percent over 2019, largely supported by gains in the Health Index to 0.744, while the Derived Education Index and Derived Living Standards Index are 0.701 and 0.983.

Table 6: Sindh Top 5 and Bottom 5 Districts

District	EI 2019	DEI 2023	HI 2019	DHI 2023	LSI 2019	DLSI 2023	HDI 2019	DHDI 2023	% Change (DHDI2023 - HDI2019)
Top 5									
Karachi*	0.703	0.701	0.706	0.744	0.987	0.983	0.788	0.800	1.49402
Hyderabad	0.600	0.628	0.797	0.801	0.900	0.876	0.755	0.761	0.767246
Naushero Feroze	0.414	0.459	0.764	0.879	0.795	0.723	0.631	0.663	4.856924
Sukkur	0.450	0.507	0.862	0.802	0.728	0.679	0.656	0.651	-0.71892
Dadu	0.407	0.385	0.829	0.875	0.697	0.631	0.617	0.597	-3.45106
Bottom 5									
Tando Muhammad Khan	0.276	0.306	0.588	0.722	0.394	0.296	0.400	0.403	0.815358
Badin	0.286	0.319	0.617	0.668	0.323	0.243	0.385	0.373	-3.29011
Sujawal	0.253	0.313	0.476	0.587	0.242	0.188	0.308	0.326	5.506744
Thatta	0.211	0.232	0.508	0.546	0.345	0.264	0.333	0.322	-3.4768
Tharparkar	0.265	0.314	0.652	0.741	0.092	0.098	0.251	0.284	11.32991

** Cumulative Value for Karachi*

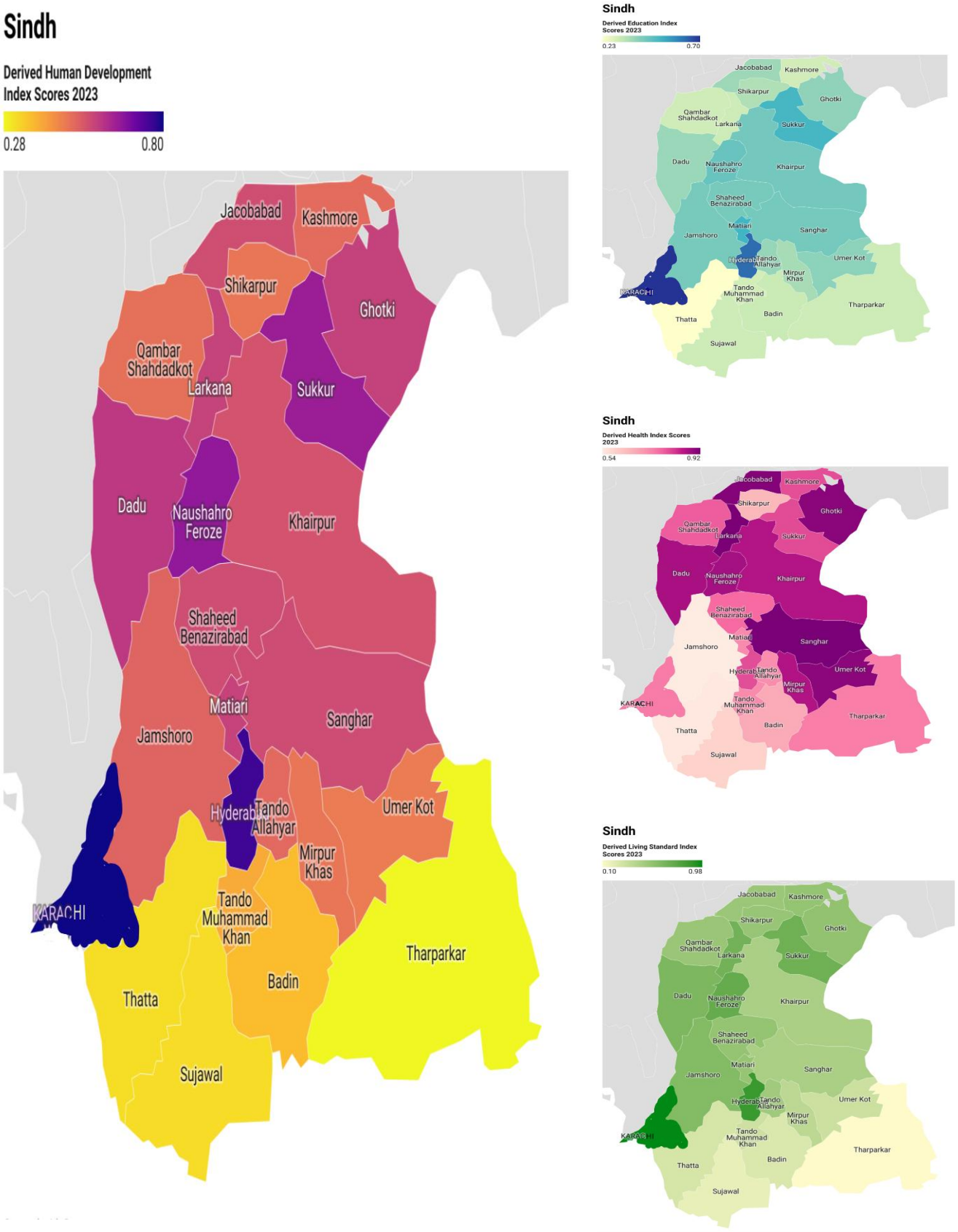
EI=Education Index; DEI= Derived Education Index; HI=Health Index; DHI=Derived Health Index; LSI=Living Standards Index; DLSI=Derived Living Standards Index; HDI=Human Development Index; DHDI= Derived Human Development Index

Hyderabad shows a measured rise of 0.77 percent, reaching a DHDI of 0.761 in 2023, with education at 0.628, health at 0.801, and living standards at 0.876. Naushero Feroze evidences the strongest upward movement among the top group with a 4.86 percent increase, attaining a DHDI of 0.663 in 2023, propelled by a marked improvement in health to 0.879, despite a lower living standards value of 0.723. Sukkur and Dadu complete the top five with DHDI values of 0.651 and 0.597 in 2023; both record contractions of 0.72 percent and 3.45 percent respectively, reflecting softening in living standards to 0.679 for Sukkur and 0.631 for Dadu, alongside mixed movements in education and health.

At the lower end, Tando Muhammad Khan, Badin, Sujawal, Thatta, and Tharparkar present heterogeneous trajectories. Tando Muhammad Khan edges up by 0.82 percent to a DHDI of 0.403 in 2023, with education at 0.306, health at 0.722, and living standards at 0.296. Badin declines by 3.29 percent to 0.373, primarily associated with living standards of 0.243, even as education rises to 0.319 and health to 0.668. Sujawal posts a notable improvement of 5.51 percent, reaching 0.326 in 2023, supported by education at 0.313 and health at 0.587, though living standards remain low at 0.188. Thatta contracts by 3.48 percent to 0.322, with education at 0.232, health at 0.546, and living standards at 0.264. Tharparkar achieves the largest percentage gain among the bottom group, rising by 11.33 percent to 0.284, underpinned by improvements in education to 0.314, health to 0.741, and a modest uplift in living standards to 0.098.

Overall, the distribution of outcomes indicates pronounced intra-regional disparities. Districts at the top maintain relatively stronger human development profiles through higher health and living standards values, while several districts at the lower end continue to be constrained by subdued living standards despite advances in education and health. Targeted investments that raise the living standards dimension, coupled with sustained improvements in education and healthcare service delivery, are likely to yield the greatest marginal gains in DHDI across these districts.

Figure 10: District Wise DHDI Scores in Sindh



Source: Authors' Calculations

4 Underlying Factors and Recommendations

The Provincial Development Monitor 2024 presents a comprehensive analysis of human development trends across Pakistan's provinces and districts, highlighting key shifts in education, health, and living standards. While national and sub-national data reveal both progress and setbacks, the overarching trend suggests uneven development, with significant regional disparities that demand targeted policy interventions.

This section delves into the specific factors driving changes in the Human Development Index (HDI) and its sub-components, identifying critical strengths and persistent gaps. The analysis is structured around three core domains education, health, and living standards, each of which plays a vital role in shaping overall development outcomes.

To bridge these gaps and promote equitable development, this section outlines actionable policy recommendations tailored to each domain. These include leveraging non-formal education for skill-building, expanding healthcare access through targeted resource allocation, and adopting sustainable infrastructure solutions to improve living conditions. By aligning policy efforts with data-driven insights, provinces can better navigate their development trajectories, ensuring that progress is both resilient and inclusive.

4.1 Education

The improvement in national education index by 1.67% comes primarily from improved enrolment ratios and better school facilities. Student teacher ratios (STRs) have risen which is an anticipated outcome of higher enrolment. The literacy rate is almost stagnant.

- National enrollment increased from 68.34% (2019) to 71.63% (2023), indicating a gradual improvement in participation.
- Punjab experienced the most significant rise in 5-16 enrollment ratio (75.96% to 81.86%), while Balochistan showed a decline from 53.24% to 44.95%, signaling challenges specific to this province. KP and Sindh showed 1 percentage point and 4.1 percentage point improvement in enrolment ratio.
- The national literacy rate increased slightly from 60.0% in 2019 to 60.7% in 2023, indicating slow progress in improving nationwide literacy. In Balochistan, the literacy rate declined significantly from 46.4% in 2019 to 42.0% in 2023, showing a worsening education situation, likely due to limited infrastructure. The literacy rate in KP dropped from 52.8% to 51.1%, reflecting a concerning downward trend, possibly linked to security challenges and access barriers in certain areas. Punjab

is the only province with a notable increase, rising from 64.5% in 2019 to 66.3% in 2023. In Sindh, literacy slightly declined from 58.0% to 57.5%.

- Despite the rise in enrollment, STR remains below the benchmark value of 40, suggesting that the education system can accommodate more students without overburdening teachers or hiring more teachers, the latter eventually leading to more salary expenditure.
- In Sindh, STR increased from 30.0 to 35.7, reflecting optimal utilization of teachers as enrollment grows.
- Balochistan, with a STR of only 22.7 (2023), highlights underutilization of teaching capacity, likely due to declining enrollment ratio and lower population density.
- Improvements in facilities (e.g., electricity, toilets, water) are observed nationally (82.6 to 85.2) and provincially. Punjab leads with 99.5%, while Balochistan lags at 53.3%, showing a need for infrastructure investment in less-developed areas.

Recommendations:

- As compared to basic facilities and student teacher ratio, there is more room for improvement on the enrolment and literacy front - particularly through non-formal and vocational education pathways. In the recent past, provinces have initiated different programs to provide transport and meal support to the students. Similarly, initiatives like Parent Teacher School Management Committees and School Councils have been introduced to improve education governance. Without any prejudice to formal education, linking Non-Formal Education (NFE) with Small and Medium Enterprises (SME) led apprenticeships should be the priority for coming years so that graduates complement basic literacy with practical skills that meet business demands. Encouraging SME-led growth requires a culture of entrepreneurship, which is the need of hour considering Pakistan's youth bulge. Linking NFE with apprenticeships can cultivate entrepreneurial skills by providing students with both practical knowledge and a deep understanding of the business landscape. Graduates of these programs can not only work within existing SMEs but also be empowered to start their own ventures, thereby contributing to the broader economic ecosystem.
- Awareness campaigns and community engagement are crucial to changing perceptions about vocational education. Many parents do not see value in schooling due to poor employment outcomes; linking education to skills and entrepreneurship can make education a tangible economic asset.
- Women-focused vocational training and NFE centers can empower female participation in SMEs, leading to inclusive economic growth. Given that 57% of NFE learners are female, tailored skill programs in digital economy, handicrafts,

and services can boost women-led enterprises. This approach is directly aligned with the Government of Pakistan's skills development agenda which highlights targeted NAVTTC initiatives to enhance women's access to technical and vocational education through specialized programs and digital skills training. These measures such as the "She Fixes" initiative and expansion of high-impact IT training are designed to increase employability, promote women's entrepreneurship in SMEs, and facilitate greater participation of women in high-growth sectors, by this means supporting inclusive and sustainable economic growth at both national and provincial levels

- Policy reforms should mandate vocational education integration within both formal and non-formal education streams, ensuring a structured pathway from basic literacy to employment. The expansion of RPL is imperative, as highlighted in the Pakistan Economic Survey 2024-25, which reports that RPL initiatives have already certified thousands of informal sector workers across provinces, significantly enhancing workforce formalization, employability, and labor mobility. Scaling up RPL will ensure that skills acquired outside the formal education system particularly among youth, women, and marginalized groups are systematically assessed, accredited, and integrated into national qualification frameworks. This will not only address skills mismatches in the labor market but also boost productivity, facilitate worker transitions to higher-value employment, and align Pakistan's workforce certification standards with international benchmarks, thereby supporting greater economic inclusion and enabling Pakistan to respond more effectively to evolving domestic and global labor market demands

4.2 Health

On national level, the health index has slightly dropped by 1.27% mainly due to higher number of patients reported although there have been improvements on facilities side, in particular post Covid-19.

- Updated district-level data on immunization, infant mortality, and food insecurity remain limited in Pakistan, making it difficult to fully assess health disparities across provinces.

- The most recent immunization trends indicate challenges in vaccine coverage, with national vaccination rates hovering around 60.6%, and significant gaps in measles, polio, and tuberculosis immunization due to weak disaster management and disruptions from COVID-19.

- Infant mortality in Pakistan remains one of the highest globally, at 56.9 deaths per 1,000 live births, surpassing regional averages. Contributing factors include unsafe deliveries, low vaccination rates, and poor maternal nutrition.

- Food insecurity is worsening, with 8.6 million people in critical food insecurity (IPC Phase 3 and 4) as of mid-2024, predominantly in Balochistan, Sindh, and KP. Although food security was expected to improve slightly by the end of 2024, the impact of high food prices, climate shocks, and economic instability remains severe.

- Given these data gaps at the district level, hospital beds per 10,000 and patient load data provided a reasonable proxy for assessing health infrastructure adequacy and disease burden.

- National health index slightly dropped by 1.27% between 2019 and 2023, mainly due to a surge in patient loads per 10,000 people (from 5,937 to 6,864), reflecting increased healthcare demand and limited-service expansion.

- Hospital beds per 10,000 increased marginally (4.5 to 4.9), yet this growth lags behind the international benchmark of 10-30 beds per 10,000 for middle-income countries and remains well below high-income country standards (30-80 beds per 10,000).

- Balochistan saw the largest surge in patient load (3,606 to 6,866), despite bed availability improving from 3.3 to 4.5 per 10,000, indicating severe healthcare access challenges.

- Sindh's patient load declined from 10,425 to 7,766, showing some improvements in healthcare access, but a decline in bed availability (4.8 to 4.6) suggests difficulties in maintaining service capacity.

- Punjab's beds per 10,000 rose from 4.2 to 4.8, but patient loads surged from 3,797 to 5,911, pointing to higher healthcare demand driven by population growth and urbanization.

- Khyber Pakhtunkhwa saw an increase in patient loads (7,675 to 9,010), with beds per 10,000 slightly declining (5.7 to 5.6), highlighting an urgent need for better resource planning.

- Post-COVID-19 investments improved health infrastructure, yet systemic disparities persist, especially in underdeveloped provinces like Balochistan and KP.

- A holistic strategy integrating healthcare, immunization, nutrition, and education is critical to improving long-term health outcomes.

Recommendations:

- Balochistan needs to strengthen rural health infrastructure by expanding mobile health units and community-based clinics to reach remote populations facing severe healthcare shortages.

- Sindh has scope for Scaling up the ongoing Universal Health Coverage (UHC) programs and integrate private sector partnerships to sustain recent improvements in healthcare access.

- Punjab must improve referral systems and strengthen secondary healthcare facilities to reduce overburdening of tertiary hospitals and manage the rising patient load more efficiently. The launch of the Prime Minister's Health Initiative (PMHI) and the National Health Support Program (NHSP) Technical Assistance (TA) Component reflect the government's strategic commitment to health system strengthening. These initiatives operationalize integrated service delivery models, enhance institutional capacity, and promote evidence-based planning serving as pivotal mechanisms for scaling universal health coverage, reducing financial barriers to care, and catalyzing sustainable health sector reform across Pakistan.

- Khyber Pakhtunkhwa needs to expand health workforce capacity in NMDs and incentivize doctors and paramedics to work in underserved districts, addressing rising patient loads and declining hospital bed ratios. The initiation of the National Health Support Programme and the Khyber Pakhtunkhwa Human Capital Investment Project marks a strategic shift towards integrated health system strengthening in KP. These initiatives provide a robust policy framework for enhancing service delivery, advancing health equity, and accelerating progress toward SDG targets particularly for vulnerable and underserved populations. With sustained investment and effective implementation, these programs have strong potential to drive transformative health sector reforms in the province.

4.3 Living Standards

Pakistan's Living Standards Index declined by 3.74% nationally, driven by setbacks in electricity access, clean cooking fuel, and sanitation. Sindh saw the largest decline (-8.43%) due to rising kacha households and worsening sanitation, while Balochistan (-5.85%) faced severe setbacks in infrastructure and housing conditions. Khyber

Pakhtunkhwa (-3.46%) experienced declines in clean cooking fuel access and housing vulnerabilities, whereas Punjab (-1.34%) maintained relative stability. Islamabad (-1.92%) showed strong urban resilience despite minor reductions in service access.

- Sindh recorded a substantial drop, driven by rising proportion of Kacha households, increased open defecation, and reduced access to clean cooking fuel. However, it was the only province where the Health Index (HI) improved (+0.054), likely due to targeted health interventions.
- Balochsitan's dip was due to deterioration in access to electricity, sanitation, and increase in the proportion of kacha HHs.
- Khyber Pakhtunkhwa (KP) saw a moderate decline in living standards, mostly due to worsening access to clean cooking fuel and an increase in kacha housing.
- Punjab had the smallest LSI decline (-0.012), maintaining relatively better living standards. Islamabad remains the best-performing region, with only a minor LSI drop (-0.019), maintaining high living standards due to superior urban infrastructure and public services.

Recommendations:

- Promote off-grid solar solutions and microgrids through public-private partnerships (PPPs) and community-led solar cooperatives. This allows households in Balochistan, Sindh, and Khyber Pakhtunkhwa to access electricity without heavy government subsidies while reducing dependence on the national grid. The current expansion of off-grid solar and microgrid solutions through PPPs is strategically aligned with the Framework Guidelines for Fast-Track Solar Initiatives 2022 and supported by a robust pipeline of renewable projects facilitated by the Private Power and Infrastructure Board (PPIB), including 143,222 solar PV system installations and a surge in distributed solar capacity exceeding 2,113 MW.
- Implement pay-for-service models for community-managed water and sanitation projects, where local cooperatives operate and maintain off-grid water filtration and bio-toilet systems. This approach can improve sanitation in rural Sindh and Balochistan without requiring additional fiscal outlays.
- Leverage carbon credit programs to fund the distribution of solar cookstoves and biogas digesters in Khyber Pakhtunkhwa and Balochistan, reducing reliance on expensive LPG and firewood while attracting international climate funding.
- Encourage low-cost, locally sourced materials for housing construction (such as compressed earth blocks) through building code reforms and small-scale financing incentives.

4.4 Resource Distribution

Public finance resources play a crucial role in determining development outcomes by influencing how governments mobilize, allocate, and spend financial resources. As mentioned in the sections 1.3 and 1.4, the Federal development expenditure (as % of GDP) has declined over the years due to rising markup costs, and the provinces will have to lead the social sector development. In this context there is a need for revisiting the National Finance Commission to create a sense of competition amongst provinces. As a start, the population weight should be reduced from 82% to 78%. Enrolment and Literacy should be given 4% weight. We are not recommending that overall education score be considered because it also contains score for school facilities and teacher availability. The idea is to encourage the provinces towards strengthening the initiatives and programs that improve enrolment and literacy by effectively utilizing the existing infrastructure and human resources.

Table 7: Comparison of NFC Awards

Pakistan 7th NFC Award 2006	India 15th NFC Award 2021-26
Population: 82%	Income Distance: 45%
Backwardness and Poverty: 10.3%	Area: 15%
Revenue Generation and Collection: 5%	Population: 15%
Inverse Population Density: 2.7%	Demographic Performance: 12.5%
	Forest and Ecology: 10%
	Tax and Fiscal Efforts: 2.5%

Similarly, Provincial Finance Commission Awards should be more responsive to the regional disparities through equitable resource distribution which prioritizes underdeveloped districts. The developed districts should leverage private sectors' role in effective public service delivery instead of relying on public resources.

5 Conclusion

The Provincial Development Monitor presents a realistic snapshot of human development across provinces (and districts) considering recent socio-economic and environmental shocks. It also offers a comprehensive foundation for targeted provincial and district-level planning, underscoring the importance of data-driven decision-making, resilience planning, and inclusive growth. As provinces grapple with developmental responsibilities post-18th Amendment, the updated HDI offers a reliable framework to prioritize resources, foster equitable development, and build resilience against future shocks.

The findings indicate a slight national decline in HDI from 0.699 in 2019 to 0.691 in 2023 (-1.14%), with significant variations at the provincial level. Balochistan, which has experienced sharp declines across all HDI domains, stands as the region most severely impacted, with an HDI drop to 0.396 in 2023. Khyber Pakhtunkhwa and Punjab also show declines, particularly in health and living standards, highlighting the need for renewed provincial strategies in these areas. Contrastingly, Islamabad's HDI has seen marginal improvement to 0.931, driven primarily by advancements in healthcare.

This report serves as a baseline for the incumbent government and will be updated when new round of PSLM data is published by the Pakistan Bureau of Statistics. Until then, policymakers can leverage the derived estimates to make strategic, data-informed decisions while remaining cognizant of existing data limitations. Moving forward, sustained efforts in strengthening provincial data collection mechanisms will be essential for ensuring that development monitoring remains dynamic, responsive, and aligned with the realities on the ground.

Table 8: Human Development Index

Province	District	EI 2019	DEI 2023	HI 2019	DHI 2023	LSI 2019	DLSI 2023	HDI 2019	DHDI 2023	Rank DHDI 2023
Pakistan	-	0.539	0.548	0.789	0.779	0.802	0.772	0.699	0.691	
ICT	-	0.883	0.853	0.901	0.976	0.990	0.971	0.924	0.931	
Punjab	-	0.588	0.600	0.838	0.719	0.899	0.887	0.762	0.726	
Sindh	-	0.500	0.504	0.755	0.809	0.712	0.652	0.645	0.643	
Khyber Pakhtunkhwa	-	0.486	0.474	0.750	0.703	0.752	0.726	0.650	0.623	
Balochistan	-	0.387	0.353	0.550	0.456	0.410	0.386	0.444	0.396	
ICT	*Islamabad*	0.883	0.853	0.901	0.976	0.990	0.971	0.924	0.931	1
Punjab	*Lahore*	0.740	0.723	0.829	0.982	0.988	0.971	0.847	0.884	2
Punjab	*Rawalpindi*	0.783	0.821	0.842	0.849	0.971	0.964	0.862	0.876	3
Punjab	*Sialkot*	0.740	0.828	0.847	0.787	0.975	0.954	0.848	0.854	4
KP	*Abbottabad*	0.687	0.734	0.793	0.803	0.940	0.924	0.800	0.817	5
Punjab	*Gujranwala*	0.678	0.707	0.848	0.823	0.974	0.930	0.824	0.815	6
Punjab	*Narowal*	0.701	0.734	0.824	0.773	0.940	0.922	0.816	0.806	7

Punjab	*Gujrat*	0.684	0.717	0.932	0.844	0.974	0.851	0.853	0.801	8
Sindh	*Karachi**	0.703	0.701	0.706	0.744	0.987	0.983	0.788	0.800	9
Punjab	*Faisalabad*	0.620	0.658	0.879	0.701	0.932	0.962	0.798	0.763	10
Punjab	*Chakwal*	0.723	0.779	0.846	0.617	0.972	0.923	0.841	0.763	11
Sindh	*Hyderabad*	0.600	0.628	0.797	0.801	0.900	0.876	0.755	0.761	12
Punjab	*Attock*	0.659	0.668	0.848	0.662	0.968	0.946	0.815	0.748	13
Punjab	*Layyah*	0.563	0.581	0.899	0.807	0.867	0.848	0.760	0.735	14
KP	*Peshawar*	0.584	0.561	0.834	0.784	0.914	0.879	0.764	0.728	15
Punjab	*Okara*	0.575	0.547	0.800	0.779	0.958	0.907	0.761	0.728	16
Punjab	*Hafizabad*	0.575	0.590	0.890	0.707	0.925	0.908	0.780	0.723	17
Punjab	*Jhelum*	0.714	0.745	0.737	0.540	0.966	0.938	0.798	0.722	18
KP	*Malakand*	0.579	0.596	0.819	0.752	0.892	0.834	0.751	0.720	19
Punjab	*Mandi Bahauddin*	0.620	0.616	0.894	0.681	0.917	0.890	0.798	0.720	20
Punjab	*Sargodha*	0.617	0.647	0.818	0.665	0.893	0.867	0.766	0.720	21
Punjab	*Sheikhupura*	0.584	0.597	0.908	0.663	0.947	0.936	0.795	0.718	22
KP	*Mardan*	0.548	0.528	0.828	0.789	0.875	0.858	0.735	0.710	23
KP	*Mansehra*	0.555	0.556	0.779	0.712	0.915	0.885	0.734	0.705	24
Punjab	*Nankana Sahib*	0.586	0.589	0.875	0.691	0.923	0.855	0.780	0.703	25

Punjab	*Bahawalpur*	0.480	0.503	0.889	0.771	0.876	0.887	0.720	0.701	26
Punjab	*Multan*	0.551	0.567	0.778	0.681	0.884	0.883	0.724	0.699	27
Punjab	*Toba Tek Singh*	0.600	0.595	0.840	0.614	0.925	0.931	0.776	0.698	28
KP	*Nowshera*	0.537	0.529	0.820	0.743	0.889	0.853	0.732	0.695	29
Punjab	*Kasur*	0.549	0.552	0.787	0.666	0.933	0.902	0.739	0.692	30
Punjab	*Khushab*	0.554	0.575	0.862	0.647	0.861	0.835	0.743	0.678	31
Punjab	*Mianwali*	0.544	0.587	0.822	0.602	0.842	0.880	0.722	0.677	32
KP	*Haripur*	0.657	0.670	0.648	0.496	0.911	0.936	0.729	0.677	33
KP	*Swabi*	0.517	0.517	0.747	0.728	0.862	0.823	0.693	0.677	34
Punjab	*Sahiwal*	0.551	0.580	0.770	0.574	0.949	0.911	0.739	0.672	35
Punjab	*Jhang*	0.540	0.544	0.803	0.633	0.866	0.871	0.722	0.669	36
Punjab	*Vehari*	0.465	0.474	0.937	0.713	0.835	0.882	0.714	0.668	37
Sindh	*Naushero Feroze*	0.414	0.459	0.764	0.879	0.795	0.723	0.631	0.663	38
KP	*Charsadda*	0.511	0.506	0.879	0.697	0.822	0.814	0.717	0.659	39
Punjab	*Chiniot*	0.477	0.487	0.940	0.710	0.830	0.827	0.719	0.659	40
Punjab	*Pakpattan*	0.462	0.461	0.735	0.679	0.921	0.899	0.679	0.655	41
Sindh	*Sukkur*	0.450	0.507	0.862	0.802	0.728	0.679	0.656	0.651	42
KP	*Kohat*	0.483	0.502	0.723	0.622	0.834	0.858	0.663	0.645	43
KP	*Chitral*	0.554	0.574	0.736	0.674	0.701	0.685	0.659	0.642	44

KP	*Swat*	0.481	0.468	0.772	0.806	0.735	0.703	0.649	0.642	45
Punjab	*Khanewal*	0.506	0.515	0.785	0.572	0.880	0.879	0.705	0.638	46
Punjab	*Bahawalnagar*	0.461	0.489	0.696	0.662	0.784	0.793	0.632	0.635	47
Punjab	*Lodhran*	0.430	0.455	0.835	0.642	0.859	0.827	0.676	0.623	48
Punjab	*Bhakkar*	0.482	0.503	0.772	0.549	0.822	0.862	0.674	0.619	49
Blochistan	*Gwadar*	0.506	0.449	0.721	0.874	0.611	0.598	0.606	0.617	50
KP	*Karak*	0.579	0.570	0.573	0.499	0.848	0.817	0.655	0.615	51
Sindh	*Dadu*	0.407	0.385	0.829	0.875	0.697	0.631	0.617	0.597	52
Blochistan	*Quetta*	0.533	0.459	0.591	0.532	0.793	0.870	0.630	0.597	53
KP	*Lower Dir*	0.477	0.482	0.761	0.621	0.679	0.694	0.627	0.592	54
KP	*Dera Ismail Khan*	0.421	0.408	0.709	0.728	0.702	0.691	0.594	0.590	55
Punjab	*Muzaffargarh*	0.362	0.384	0.779	0.679	0.767	0.780	0.600	0.588	56
Sindh	*Ghotki*	0.350	0.398	0.899	0.906	0.632	0.541	0.584	0.580	57
Sindh	*Larkana*	0.303	0.314	0.908	0.922	0.729	0.673	0.586	0.580	58
Sindh	*Matiari*	0.416	0.514	0.743	0.720	0.576	0.526	0.563	0.579	59
Punjab	*Dera Ghazi Khan*	0.400	0.386	0.882	0.812	0.616	0.619	0.601	0.579	60
Punjab	*Rahim Yar Khan*	0.419	0.382	0.751	0.587	0.839	0.862	0.642	0.578	61

KP	*Hangu*	0.357	0.365	0.659	0.652	0.831	0.805	0.581	0.577	62
KP	*Buner*	0.377	0.389	0.841	0.810	0.618	0.589	0.581	0.570	63
Sindh	*Sanghar*	0.407	0.435	0.916	0.924	0.523	0.443	0.580	0.562	64
Sindh	*Shaheed Benazirabad*	0.382	0.433	0.783	0.766	0.570	0.534	0.554	0.561	65
KP	*Lakki Marwat*	0.489	0.443	0.588	0.535	0.745	0.744	0.598	0.561	66
KP	*Khyber*	0.398	0.384	0.750	0.803	0.654	0.572	0.580	0.560	67
Sindh	*Jacobabad*	0.352	0.382	0.842	0.911	0.626	0.504	0.570	0.560	68
Sindh	*Khairpur*	0.405	0.438	0.807	0.864	0.489	0.442	0.543	0.551	69
KP	*Bannu*	0.461	0.408	0.589	0.545	0.760	0.731	0.591	0.546	70
KP	*Tank*	0.442	0.391	0.686	0.646	0.603	0.616	0.568	0.538	71
Blochistan	*Pishin*	0.479	0.432	0.590	0.568	0.666	0.596	0.573	0.527	72
Sindh	*Jamshoro*	0.418	0.433	0.659	0.539	0.593	0.603	0.547	0.520	73
Blochistan	*Kohlu*	0.521	0.457	0.349	0.610	0.842	0.494	0.535	0.516	74
Sindh	*Tando Allahyar*	0.384	0.391	0.650	0.718	0.575	0.480	0.524	0.513	75
KP	*Upper Dir*	0.421	0.440	0.679	0.568	0.608	0.530	0.558	0.510	76
Sindh	*Kashmore*	0.286	0.308	0.780	0.799	0.721	0.532	0.544	0.508	77
Punjab	*Rajanpur*	0.341	0.309	0.922	0.845	0.548	0.500	0.557	0.507	78

KP	*Kurram*	0.366	0.358	0.739	0.604	0.624	0.597	0.553	0.506	79
Blochistan	*Mastung*	0.485	0.375	0.898	0.899	0.365	0.377	0.542	0.503	80
Sindh	*Kamber Shahdadkot*	0.301	0.311	0.762	0.783	0.626	0.511	0.524	0.500	81
Sindh	*Mirpur Khas*	0.373	0.368	0.787	0.866	0.420	0.372	0.498	0.491	82
Sindh	*Shikarpur*	0.327	0.356	0.610	0.640	0.550	0.518	0.479	0.491	83
Sindh	*Umerkot*	0.354	0.402	0.832	0.905	0.340	0.305	0.464	0.481	84
KP	*North Waziristan*	0.358	0.350	0.432	0.480	0.581	0.599	0.448	0.465	85
KP	*Shangla*	0.347	0.333	0.573	0.456	0.710	0.618	0.521	0.455	86
KP	*Batagram*	0.361	0.344	0.519	0.392	0.771	0.676	0.524	0.450	87
Blochistan	*Loralai*	0.467	0.499	0.562	0.417	0.461	0.384	0.495	0.431	88
Blochistan	*Nushki*	0.505	0.462	0.462	0.507	0.271	0.310	0.398	0.417	89
KP	*Orakzai*	0.376	0.374	0.807	0.608	0.317	0.298	0.458	0.408	90
Sindh	*Tando Muhammad Khan*	0.276	0.306	0.588	0.722	0.394	0.296	0.400	0.403	91
Blochistan	*Kech*	0.398	0.400	0.820	0.394	0.403	0.374	0.509	0.389	92
Sindh	*Badin*	0.286	0.319	0.617	0.668	0.323	0.243	0.385	0.373	93

Blochistan	*Lasbela*	0.369	0.290	0.384	0.352	0.494	0.473	0.412	0.364	94
KP	*Mohmand*	0.257	0.262	0.721	0.688	0.261	0.268	0.364	0.364	95
Blochistan	*Sohbatpur*	0.417	0.399	0.726	0.735	0.143	0.134	0.351	0.340	96
KP	*South Waziristan*	0.338	0.327	0.642	0.432	0.284	0.278	0.395	0.340	97
KP	*Bajaur*	0.257	0.259	0.577	0.495	0.286	0.295	0.349	0.336	98
Blochistan	*Kalat*	0.269	0.276	0.821	0.836	0.166	0.154	0.333	0.329	99
Sindh	*Sujawal*	0.253	0.313	0.476	0.587	0.242	0.188	0.308	0.326	100
Sindh	*Thatta*	0.211	0.232	0.508	0.546	0.345	0.264	0.333	0.322	101
Blochistan	*Jaffarabad*	0.329	0.288	0.507	0.403	0.321	0.255	0.377	0.309	102
Blochistan	*Harnai*	0.282	0.343	0.592	0.529	0.174	0.151	0.307	0.302	103
Sindh	*Tharparkar*	0.265	0.314	0.652	0.741	0.092	0.098	0.251	0.284	104
Blochistan	*Barkhan*	0.293	0.316	0.822	0.494	0.198	0.134	0.363	0.276	105
Blochistan	*Kachhi*	0.354	0.320	0.541	0.372	0.152	0.171	0.307	0.273	106
Blochistan	*Kharan*	0.419	0.372	0.469	0.343	0.135	0.159	0.298	0.273	107
Blochistan	*Nasirabad*	0.240	0.190	0.400	0.313	0.283	0.253	0.300	0.247	108

Blochistan	*Ziarat*	0.306	0.294	0.409	0.487	0.072	0.091	0.208	0.235	109
Blochistan	*Washuk*	0.401	0.274	0.436	0.349	0.140	0.114	0.290	0.222	110
Blochistan	*Killa Abdullah*	0.272	0.235	0.386	0.297	0.125	0.154	0.236	0.221	111
Blochistan	*Killa Saifullah*	0.364	0.289	0.391	0.322	0.098	0.096	0.241	0.208	112
Blochistan	*Dera Bugti*	0.142	0.134	0.406	0.321	0.228	0.186	0.236	0.200	113
Blochistan	*Awaran*	0.207	0.199	0.378	0.516	0.021	0.022	0.118	0.131	114
Blochistan	*Sherani*	0.236	0.249	0.111	0.091	0.049	0.095	0.108	0.129	115
Blochistan	*Khuzdar*	0.174	0.183	0.247	0.176	0.028	0.036	0.106	0.105	116

Annexure 1: Explanatory Note on Reference Index (RIX)

The indicators under three domains (education, standard of living, and health) are listed in Table A.1. Relevance of the indicators within the RIX lies in their ability to capture critical aspects of human development and living conditions across regions, providing a nuanced view of sub-national disparities and progress.

1. Education Domain

This domain evaluates literacy, enrolment rates, teacher-student ratios, and school facilities, collectively representing the region's ability to provide quality educational opportunities. High literacy and enrolment rates are associated with stronger human capital, while favorable teacher-student ratios and basic facilities reflect educational quality. Together, these indicators highlight educational outreach, inclusivity, and quality, which are essential for workforce productivity and civic engagement.

1.1. Literacy Rate (10 Years and Above): As a primary indicator of educational achievement, literacy reflects foundational skills that drive workforce productivity, civic participation, and quality of life. Sourced from the 2023 Census, this metric offers a clear view of regional educational disparities and trends over time.

Interpretation: A higher literacy rate generally signifies better educational outcomes and contributes positively to human capital development.

Relationship: Positive; higher literacy enhances the Education Index and overall RIX.

1.2. School Level Enrolment Rates: This indicator reflects access to education and schooling availability, important for understanding regions' success in educational outreach and inclusivity, especially at younger ages.

Interpretation: Higher enrolment rates reflect better access to education, indicating an inclusive educational system.

Relationship: Positive; higher enrolment improves the Education Index and overall RIX.

1.3. School Level Teacher-Student Ratio: Sourced from the Annual School Census, this ratio sheds light on education quality and resource allocation, crucial for maintaining effective learning environments.

Interpretation: A lower ratio (fewer students per teacher) typically reflects better education quality, though a very low ratio may indicate underutilization of resources.

Relationship: Generally positive; a balanced teacher-student ratio enhances the Education Index and overall RIX.

1.4. **Basic Facilities at School**: Tracking access to essentials like clean water, electricity, and sanitation in schools highlights gaps in infrastructure that impact students' educational experiences and outcomes.

Interpretation: Schools with adequate facilities (sanitation, electricity, drinking water) are better positioned to support effective learning environments.

Relationship: Positive; access to basic facilities improves the Education Index and overall RIX.

2. Housing and Living Conditions Domain

This domain measures the quality of housing, access to utilities like electricity, cooking fuel, and clean water, as well as sanitation standards. These indicators reflect economic stability, health risks, and the region's overall living conditions. Quality housing and access to utilities are crucial for standard of living, while sanitation and clean water access directly impact health and well-being.

2.1. **Type of Housing (Pakka, Semi-Pakka, Kacha)**: This indicator from the Census reflects the quality of housing and construction, linked to economic stability and resilience in various regions.

Interpretation: A higher prevalence of "pakka" (permanent) housing suggests greater economic stability and improved living standards.

Relationship: Positive; more pakka housing boosts the Living Conditions Index and overall RIX.

2.2. **Access to Electricity**: Access to electricity is essential for modern living standards, impacting everything from economic productivity to educational opportunities within households.

Interpretation: Widespread electricity access is essential for modern living standards, affecting economic productivity and quality of life.

Relationship: Positive; greater electricity access improves the Living Conditions Index and overall RIX.

2.3. **Cooking Fuel**: The type of cooking fuel used reflects both economic capacity and health impacts, as traditional fuels can contribute to poor air quality and health risks.

Interpretation: Use of clean cooking fuels (e.g., natural gas, electricity) indicates better economic standing and reduced health risks from indoor pollution.

Relationship: Positive; clean cooking fuel usage improves the Living Conditions Index and overall RIX.

2.4. **Improved Drinking Water and Sanitation**: Access to clean water and sanitation are fundamental to health and quality of life, directly impacting disease prevention and social equity.

Interpretation: Access to safe drinking water is crucial for health and is associated with lower disease rates. Sanitation access prevents disease spread and reflects on regional development standards.

Relationship: Positive effect of safe drinking water; access to improved water sources enhances the Living Conditions Index and overall RIX. Positive effect of improved sanitation; improved sanitation raises the Living Conditions Index and overall RIX.

2.5. **Open Defecation (No Toilet)**: This metric highlights areas lacking basic sanitation facilities, an important health determinant that influences water quality, disease rates, and environmental conditions.

Interpretation: High rates of open defecation indicate poor sanitation infrastructure and health risks.

Relationship: Negative; high open defecation rates lower the Living Conditions Index and overall RIX.

3. Health Domain

The health domain focuses on infrastructure indicators like hospital beds, healthcare demand, and disease prevalence, illustrating the region's capacity to manage healthcare needs. Adequate healthcare facilities and low disease burdens signal a region's ability to support population health, while high disease prevalence may

indicate gaps in healthcare access or environmental and socioeconomic challenges affecting health outcomes.

3.1. Number of Hospital Beds 10,000 Population: Hospital bed capacity is critical during health crises and routine care, indicating the infrastructure's ability to handle patient loads.

Interpretation: More hospital beds per capita signify better healthcare infrastructure, critical during health crises.

Relationship: Positive; more beds per million improve the Health Index and overall RIX.

3.2. Patients Treated per Hospital (Indoor & Outdoor) Per 10,000 Population: This statistic offers insight into healthcare demand and system strain, identifying regions where facilities may be overburdened or under-resourced.

Interpretation: The interpretation for this indicator is a bit tricky. One may assume that higher number of patients treated indicates that the healthcare system is very efficient. The regression results indicate a positive relationship between Patients Treated per 10000 Population and Frequently Reported Cases of Diseases per 10000 Population. Specifically, the coefficient for Patients Treated per 10000 Population is positive (0.0463) and statistically significant (p-value = 0.006). This suggests that an increase in treated patients correlates with an increase in reported disease cases, which may indicate a high disease burden rather than purely effective health services.

Relationship: Negative, as it indicates strain on resources; lower strain is preferred for a positive impact on the Health Index and overall RIX.

3.3. Frequently Reported Cases of Diseases Per 10,000 Population: These cases serve as indicators of healthcare infrastructure, such as the prevalence and management of diseases across provinces. Such data can help identify regions with high disease burdens, indicating potential gaps in healthcare access, environmental issues, or socioeconomic conditions that exacerbate health risks.

Interpretation: Frequent disease reports indicate poor health outcomes and infrastructure.

Relationship: Negative; high disease rates decrease the Health Index and overall RIX.

Table A.1: List of Indicators

Domain	Indicator	Latest source	Old Source
Education Index	Literacy rate 10 Years and Above	Census 2023	PSLM 2019-20
	Enrolment rates	Census 2023	PSLM 2019-20
	Teacher Student Ratio	Annual School Census/ Education Statistics 2024	Annual School Census/ Education Statistics 2019
	Basic Facilities at School	Annual School Census/ Education Statistics 2024	Annual School Census/ Education Statistics 2019
Housing and Living Conditions	Type of housing (Pakka, Semi Pakka, Kacha)	Census 2023	PSLM 2019-20
	Access to Electricity	Census 2023	PSLM 2019-20
	Cooking fuel	Census 2023	PSLM 2019-20
	Improved source of drinking water	Census 2023	PSLM 2019-20
	Improved source of sanitation	Census 2023	PSLM 2019-20
	Open defecation (no toilet)	Census 2023	PSLM 2019-20

Health	Number of beds per 10,000	Provincial Development Statistics 2024	Provincial Development Statistics 2019
	Patients Treated (Indoor & Outdoor) per 10,000	Provincial Development Statistics 2024	Provincial Development Statistics 2019

By integrating these indicators, the RIX provides a comprehensive assessment of regional disparities in human development and essential services, equipping policymakers with targeted insights to drive equitable growth and welfare improvements across Pakistan.

It must be noted that data for diseases is not publicly available for Punjab. Therefore, the overall district rankings don't include diseases in health index computation. When we report province specific rankings, the diseases are included in the health index computation.

4. RIX Computation

After normalizing (making values between 0 and 1) the data by determining minimum and maximum values, the indicators contributions are calculated as follows:

$$Indicator\ Contribution = \frac{Actual\ Value - Minimum\ Value}{Maximum\ Value - Minimum\ Value}$$

The domain indices are then computed as arithmetic mean of corresponding sub-indicators' contributions. The RIX is computed as a geometric mean of the three domain indices.

$$RIX = \sqrt[3]{Education\ Index \times Health\ Index \times Standards\ of\ Living\ Index}$$