

Bridging Data Gaps in Pakistan: District-Level Life Expectancy at Birth through Machine Learning-Based Small-Area Estimation

Background

In Pakistan, official statistics on life expectancy are available only at the national and provincial level, masking sharp differences between districts. Some communities enjoy longer, healthier lives, while others face much shorter lifespans. Without district-level evidence, resources cannot be directed where they are most needed.

Using PSLM survey data and a globally trained model, we estimated district-wise life expectancy at birth in Pakistan. The findings reveal disparities across districts, identifying which districts are ahead, which lag behind, and how wide the gaps remain. This evidence enables policymakers to target resources more effectively and track progress in reducing health inequalities.

Table 2: Ranking of District Level Life Expectancy in Pakistan (2019)

District (Top)	Life Expectancy	District (Bottom)	Life Expectancy
Chitral	73	Jaffarabad	60
Khanewal	72	Nasirabad	60
Khushab	72	Harnai	61
Jhelum	71	Upper Dir	61
Sialkot	71	Kashmore	61
Jhang	71	North Waziristan	61
Faisalabad	71	Kohistan	61
Islamabad	71	Pishin	61

Figure 1: District Level Pakistan Life Expectancy (2019)

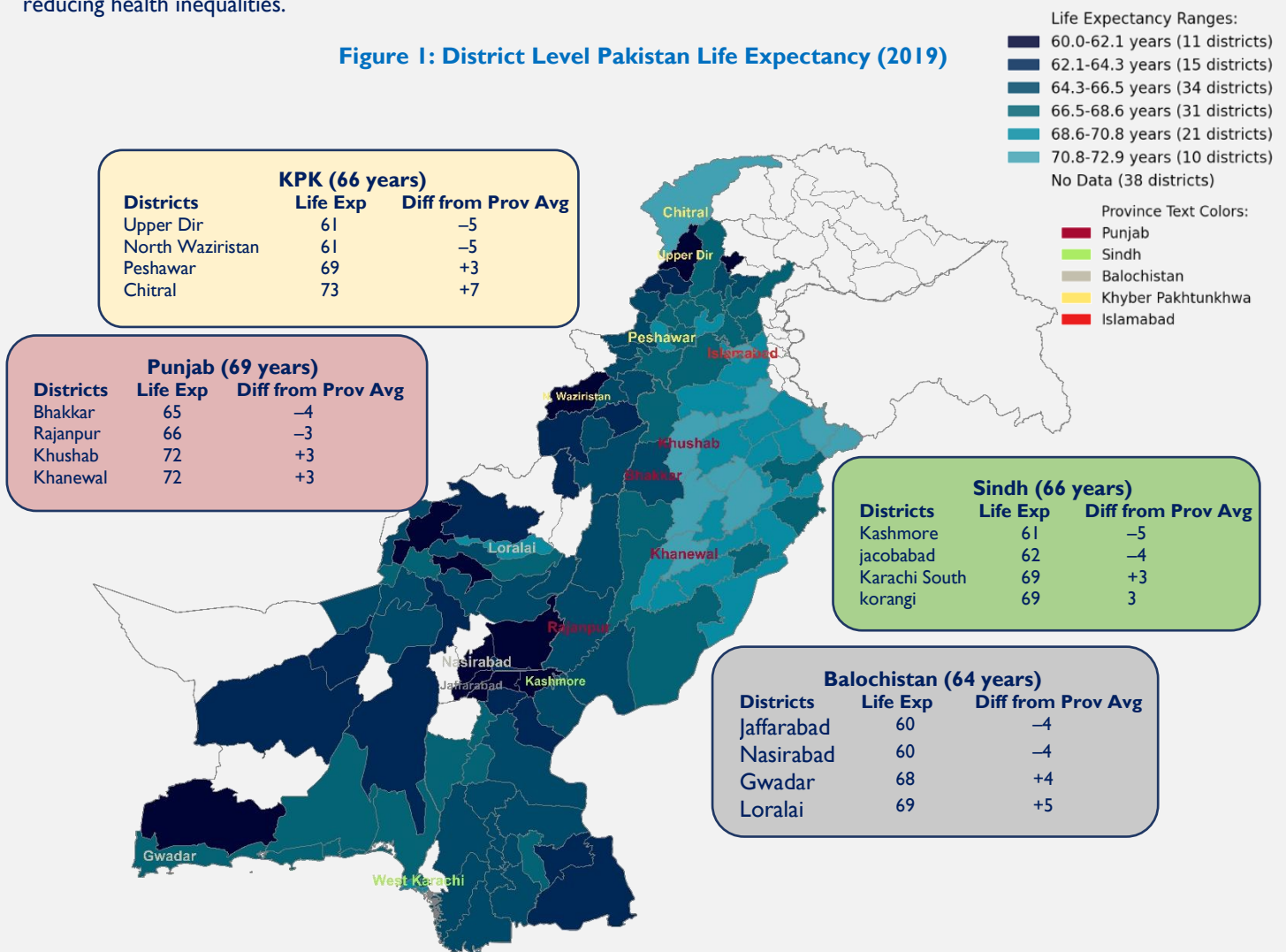
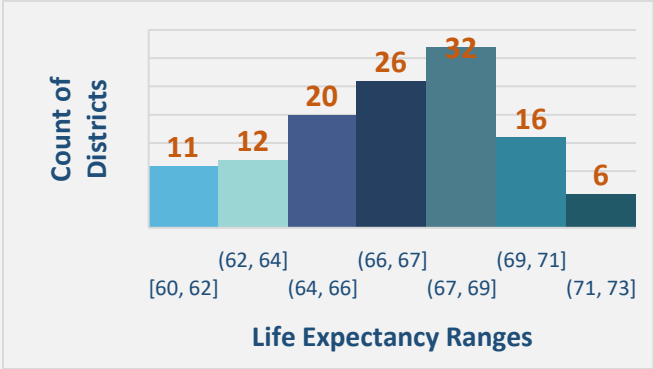


Figure 2 shows that Most districts fall between **64 and 70 years**, but important gaps remain. At one end, **11 districts** have life expectancy between **60 and 62 years**, while at the other, only **2 districts** exceed **72 years**. This uneven distribution underscores sharp inequalities: while some communities are approaching global averages, many others lag far behind. Such disparities highlight the need for targeted investments and tailored health policies to ensure that everyone has the opportunity to live longer and healthier lives.

Data and Methodology

Life expectancy at birth for every district of Pakistan was estimated by applying a gradient-boosting model trained on the 1990-2022 WDI² country-year panel, missing values in training data are handled via constrained random imputation, the trained model was then applied to district-level aggregates from PSLM 2019-20¹. For sensitivity analysis, we compared predicted and actual life-expectancy-at-birth values across multiple countries.

Figure 2: Distribution of Pakistan Districts by Life Expectancy Ranges



Policy Recommendation

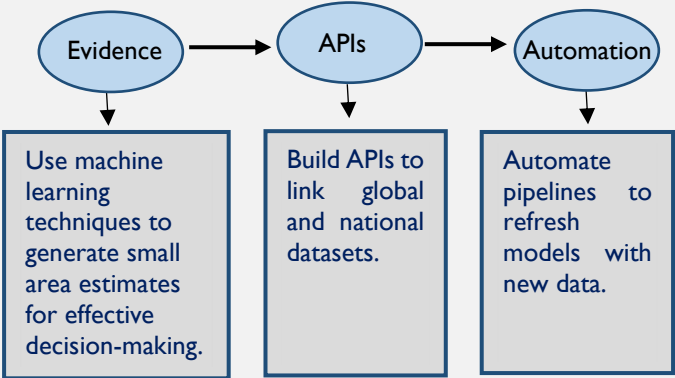
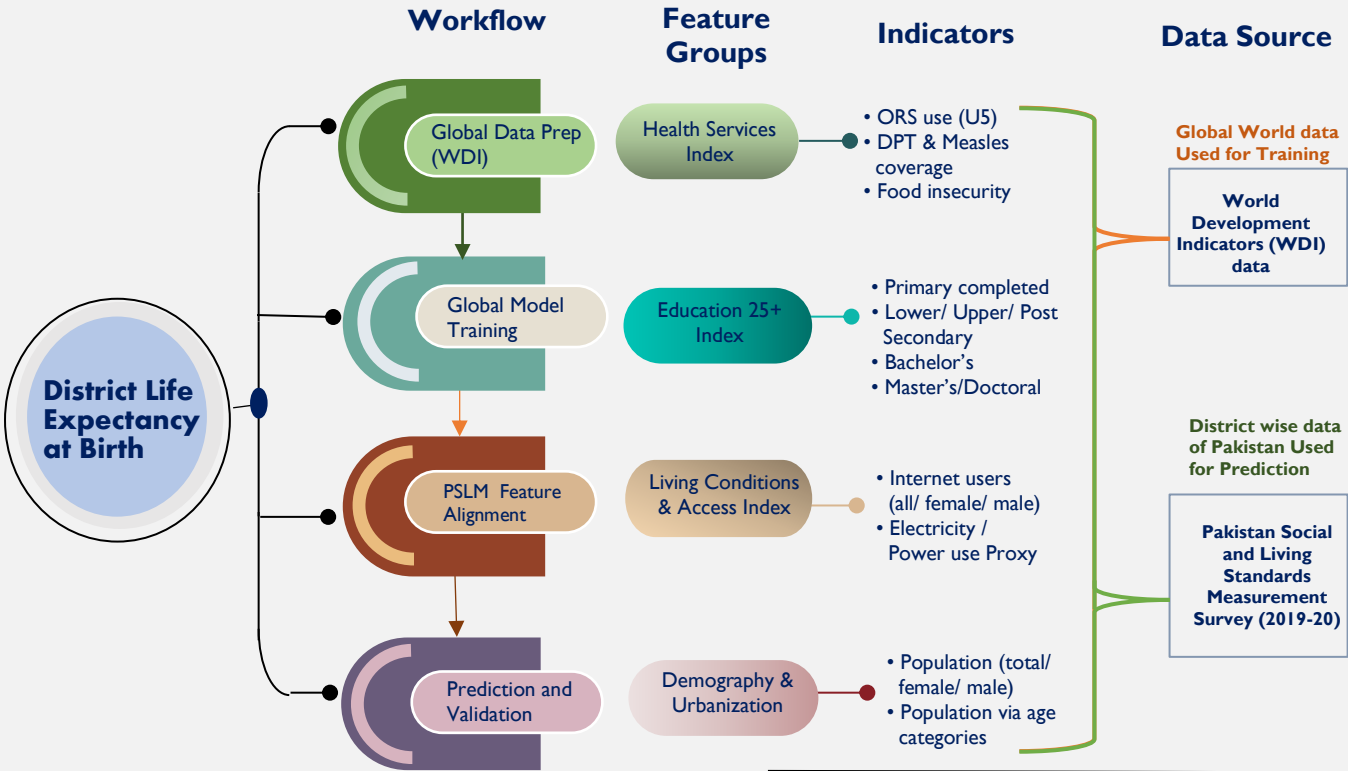


Figure 3: Methodology of Pakistan Districts Level Life Expectancy



1* Pakistan Bureau of Statistics (2021) Pakistan Social and Living Standards Measurement Survey (PSLM) 2019–20: National/Provincial/District. Islamabad: Government of Pakistan, Statistics Division.
2* World Bank (2025) *World Development Indicators*. Washington, DC: World Bank.

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