Quantity and Distribution of Indonesia's Health Workforce

Are we doing enough?

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Indonesia's Challenges in Distributing Healthcare Workforce

4th most **populous** country with ± 280 million (2024)

Vast Geography with **Remote Areas** and Small Islands

Decentralized migration of health workers

Production with **Unequitable Distribution**

Significant discrepancy between urban and rural

Shortage of **HWs**

- These challenges **hinders effective healthcare services**
- **National-level** analyses remain **limited**, leaving **gaps** in understanding the country's **overall** health workforce distribution.

Aim: provide an in-depth analysis of the **current state of quantity and distribution** of HWs **at the district level** in Indonesia

HW = Health Worker

Methods

Observational and cross-sectional study measuring **trend of quantity distribution** of **various health workforces** from **1990 to 2022**

Data Source

1. Ministry of Health data
2. Medical Council data
3. Medical and Midwifery Association member data
4. World Health Organization (WHO) Global Health Workforce data
5. Health profile book data

Benchmarking

The **HWs density** was compared to the **goals** made by **Indonesia's** Directorate of Health Workforce Planning's **Target Document** and **WHO** proposed **4.45 HWs threshold** to meet **80% coverage** of sustainable development goals.

Supplementary Table 1: Data source of Indonesia health workforce

Source of data	Data input	Data update	Location data	Advantages	Disadvantages
Indonesia Medical Council (KKI) registration data	All doctor that register to KKI (before 2010). And all doctor that finish UKMPPD after 2010 (STR)	No data out option	Address of correspondence	Most complete data for doctor	The number tend to overcount due to no data out. The correspondence location is not the real practise location
Indonesia Medical Association (IDI) member data	Membershup data Collected from every IDI Branch (KTA)	Every 5 years of membership extension, or every time doctor change their practice location	Location where the physician wants to practice		The data lagged to 5 years
Ministry of Health Human Resource Information System (SISDMK)	Active doctor that work will make permission to health officer (SIP)	Retirement and death data were updated every 5 years	The area where the physician actively works	The location was up to date. Count the active personnel	Not measuring non-active doctor

KKI: Indonesia medical council, IDI: Indonesia medical association, UKMPPD: National Competency Examination for Indonesian Medical Doctors, SISDMK: Indonesian Health Human Resources Information System, STR: Registration certificate, KTA: Membership card, SIP: Practice License

Table 1: Recommendation of health worker density

Health worker	National target	Others target	Source
GP	1:1000	1:1000	Kumar *et al*., 2018[40]
Specialist	0.2:1000	-	-
Dentist	0.2:1000	0.13:1000	Pandya *et al*., 2020[41]
Nurse	2.4:1000	3.3:1000	WHO
Midwifery	2:1000	-	-
All health workers	5.8:1000	4.45:1000	WHO: Global strategy on human resources for health[14]

GP: General practitioner, WHO: World Health Organization

References

[14] Kanchanachitra C, Lindelow M, Johnston T, Hanvoravongchai P, Lorenzo FM, Huong NL, et al. Human resources for health in Southeast Asia: Shortages, distributional challenges, and international trade in health services. Lancet 2011;377:769–81

[40] Kumar R, Pal R. India achieves WHO recommended doctor population ratio: A call for paradigm shift in public health discourse!. J Family Med Prim Care 2018;7:841

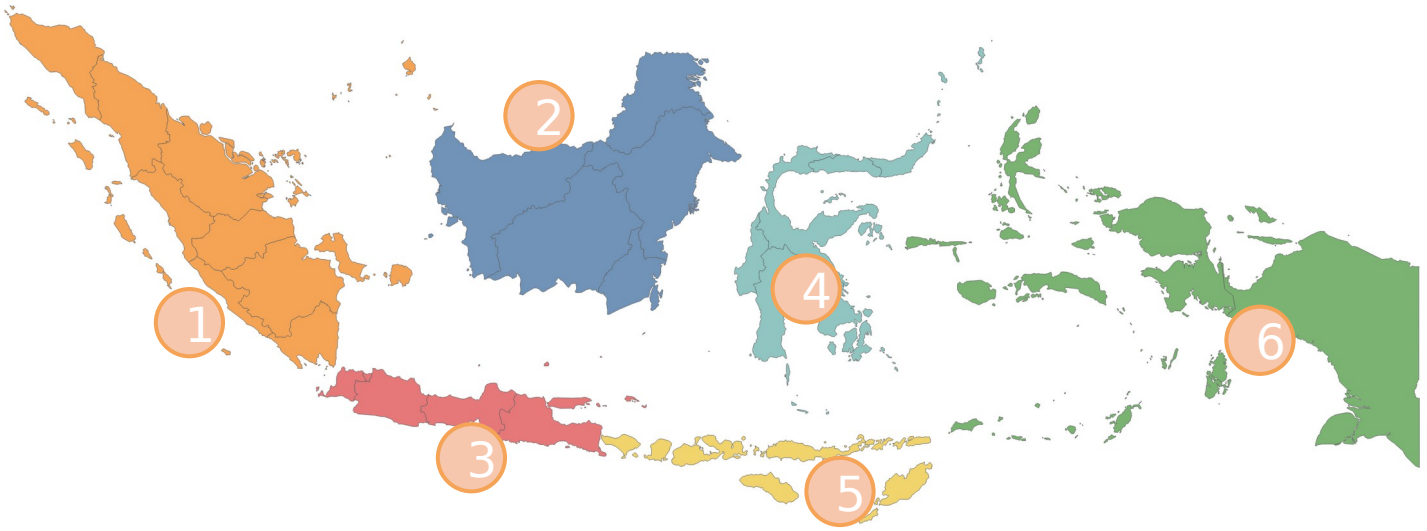
[41] Pandya VS, Sampath N, Yadav R, Mahuli AV, Kapadiya JD. Dental Manpower in India: changing trends up to 2020.

Method: Health Coverage Beyond Administrative Boundaries

By the end of **2022**, Indonesia **administrative divisions** consisted of **34 provinces** and **514 districts** (416 regencies and 98 cities).

Aggregated HW Regions

1. Sumatra
2. Kalimantan
3. Java
4. Sulawesi
5. Bali-Nusa
6. Maluku-Papua

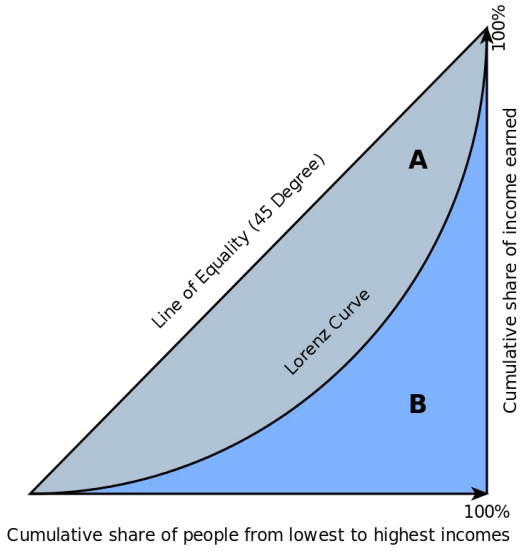


This study, however, also approach **aggregated HW into six major** islands considering:

- **Health seeking** and **service utilization** could extend **beyond district and provincial lines**
- Administrative boundaries **can obscure disparities**, especially in border areas where populations may be underserved if only local facilities are counted

Method: Statistical Analysis

1 Gini Index



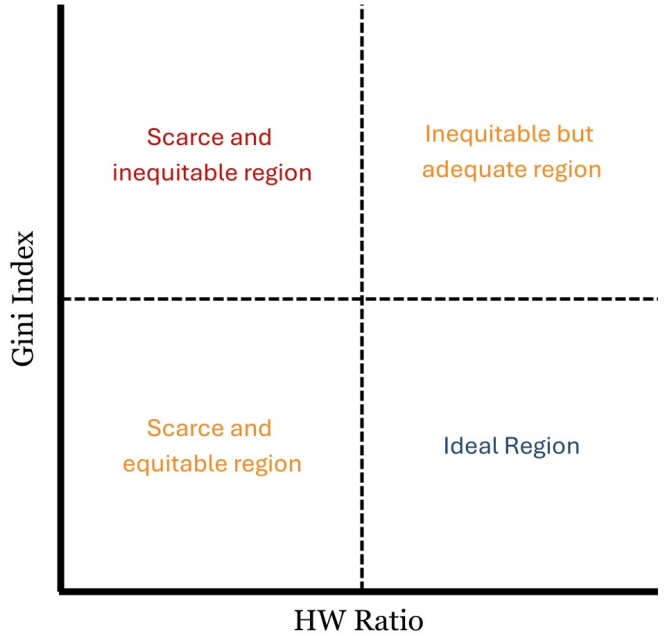
Source: Analyttica Datalab

- As **recommended by WHO**, Gini Index is utilized in **measuring HW equality.**
- Obtained from the **Lorenz Curve**, measuring **level of inequality** in a distribution.
  - Value **0 (perfect equality)** and **1 (perfect inequality)**
- **Interprovincial** and **interdisctrict** Gini Index were analyzed.

Analyses were conducted using **R** version 4.02

2 Quadrant Analysis

- Evaluating **quantity** and **distribution** of each **HWs**
- Two axes: **Gini Index**



Notable Rural-Urban Disparities in Every HW Except Midwives

- Per 2022, **Indonesia** has **3.84 HWs** per 1,000 population
- **GP ratio** of **0.38** per 1,000

1

- **Rural and urban disparity** displayed by **most HW category**
- The **only** relatively **similar distribution** was found in **Midwives** category

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- Distribution was **right-skewed** indicating **most areas** having **low ratios** and a **few** with significantly **higher** ones.

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Table 2: Descriptive statistics of health workers density per 1000 population in Indonesia

	Mean (minimum-maximum)	Median (IQR)	Skewness	Kurtosis
National (*n*=514)				
Population (million)	1.28 (0.025–5.385)	1.06 (0.43–1.87)	2.73	10.41
Physician ratio	0.53 (0.02–5.42)	0.31 (0.22–0.63)	4.28	26.7
Specialist ratio	0.15 (0–1.86)	0.08 (0.05–0.16)	4.37	28.97
Dentist ratio	0.1 (0–1.52)	0.05 (0.03–0.1)	6.42	63.73
Midwife ratio	1.1 (0.07–5.16)	0.86 (0.67–1.36)	1.04	1.3
Nurse ratio	1.95 (0.22–12.03)	1.44 (1.07–2.54)	1.63	4.53
Health worker ratio	3.84 (0.31–19.08)	3.09 (2.21–4.97)	1.45	3.91
Rural (regencies) (*n*=426)				
Population (million)	1.23 (0.025–5.385)	1.02 (0.42–1.68)	2.98	13.47
Physician ratio	0.31 (0.02–2.27)	0.27 (0.21–0.35)	3.6	22.57
Specialist ratio	0.08 (0–0.57)	0.06 (0.05–0.1)	2.86	15.22
Dentist ratio	0.05 (0–0.52)	0.05 (0.03–0.06)	3.98	28.01
Midwife ratio	1.13 (0.07–5.16)	0.87 (0.68–1.45)	0.99	1.16
Nurse ratio	1.5 (0.22–7.16)	1.26 (0.98–1.8)	1.18	1.79
Health worker ratio	3.08 (0.31–12.48)	2.6 (2.04–3.68)	0.9	0.94
Urban (cities) (*n*=88)				
Population (million)	1.47 (0.034–3.275)	1.27 (0.53–2.47)	1.94	2.97
Physician ratio	1.34 (0.21–5.42)	1.1 (0.82–1.58)	2.61	8.41
Specialist ratio	0.42 (0.02–1.86)	0.35 (0.25–0.51)	2.52	9.04
Dentist ratio	0.27 (0.02–1.52)	0.2 (0.13–0.35)	3.98	20.64
Midwife ratio	1 (0.51–3.75)	0.86 (0.61–1.1)	1.14	1.17
Nurse ratio	3.61 (1.55–12.03)	3.18 (2.54–4.16)	1.46	3.01
Health worker ratio	6.64 (3.1–19.08)	5.94 (4.97–7.62)	1.53	2.88

IQR: Interquartile range

Masked Interdistrict Inequalities

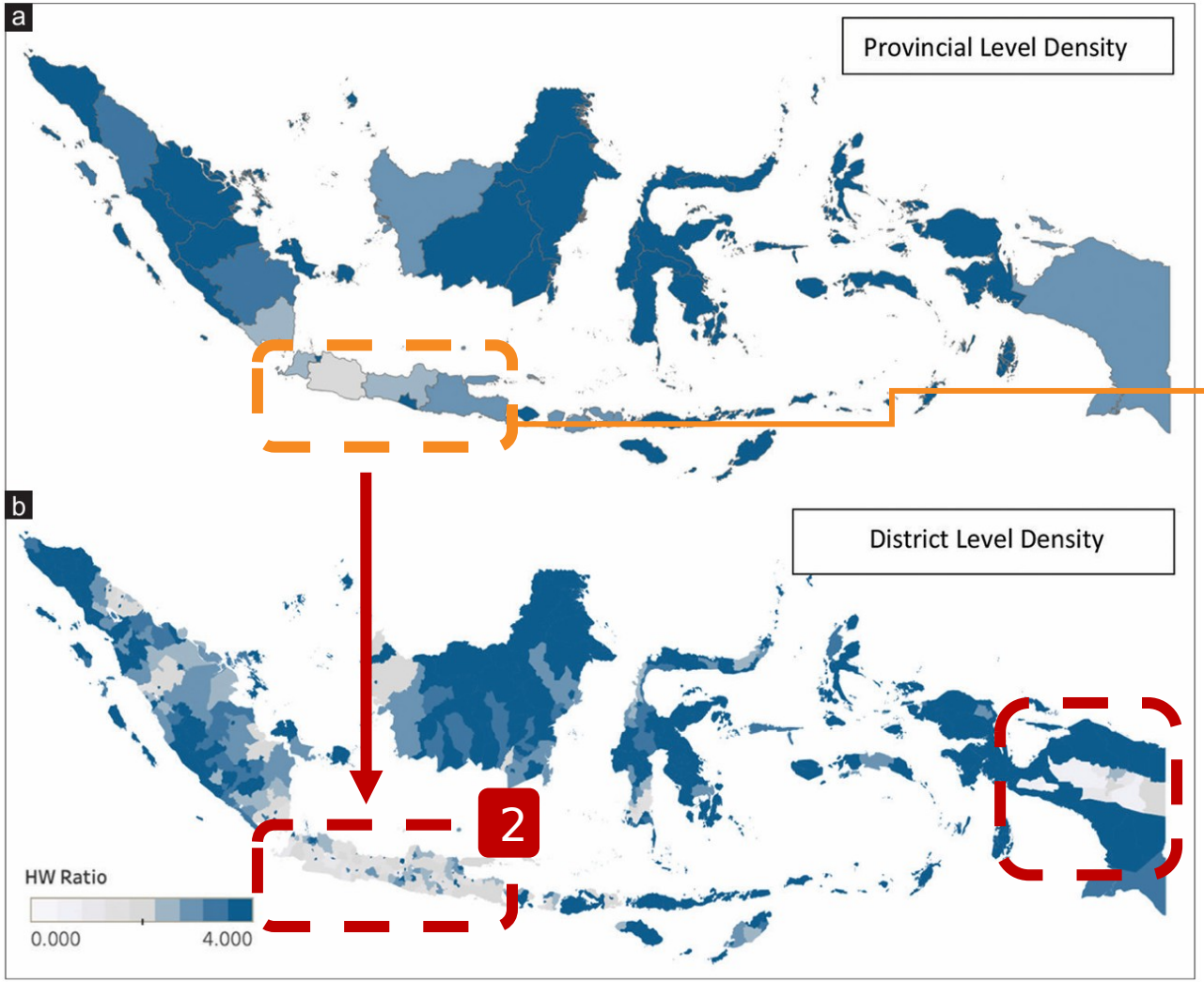

Figure 2. Geographic distribution of health worker ratios in Indonesia

Provincial Level

- **Aceh** and **Jakarta** recorded the **highest HW ratios**, at 7.68 and 6.23, respectively.
- The **lowest** ratio was reported by **West Java (2.44), Banten (2.69), and Central Java (2.83)**
- Despite **Java** having the **largest number** of **healthcare workers**, most districts **fell below** **national and WHO recommendation**

District Level

2 **Significant disparities** emerges when HW ratios were examined at the **district level**

- **Extreme** cases could be seen in **Java** and **Papua districts**

Severe Outliers in Papua Remote Districts

Province	30 lowest district	Doctor ratio
Papua	Deiyai	0.02
Papua	Dogiyai	0.03
Papua	Nduga	0.03
Papua	Lanny Jaya	0.03
Papua	Intan Jaya	0.05
Papua	Yahukimo	0.05
Papua	Tolikara	0.10
Papua	Puncak	0.10
Papua	Puncak Jaya	0.10
Jawa Barat	Tasikmalaya	0.11
Sumatera Utara	Nias Selatan	0.11
Papua	Yalimo	0.12
Sumatera Selatan	Ogan Komering Ilir	0.12
Banten	Pandeglang	0.13
Papua Barat	Maybrat	0.13

Papuan districts exhibited **severe deficiency** of HWs, including GPs

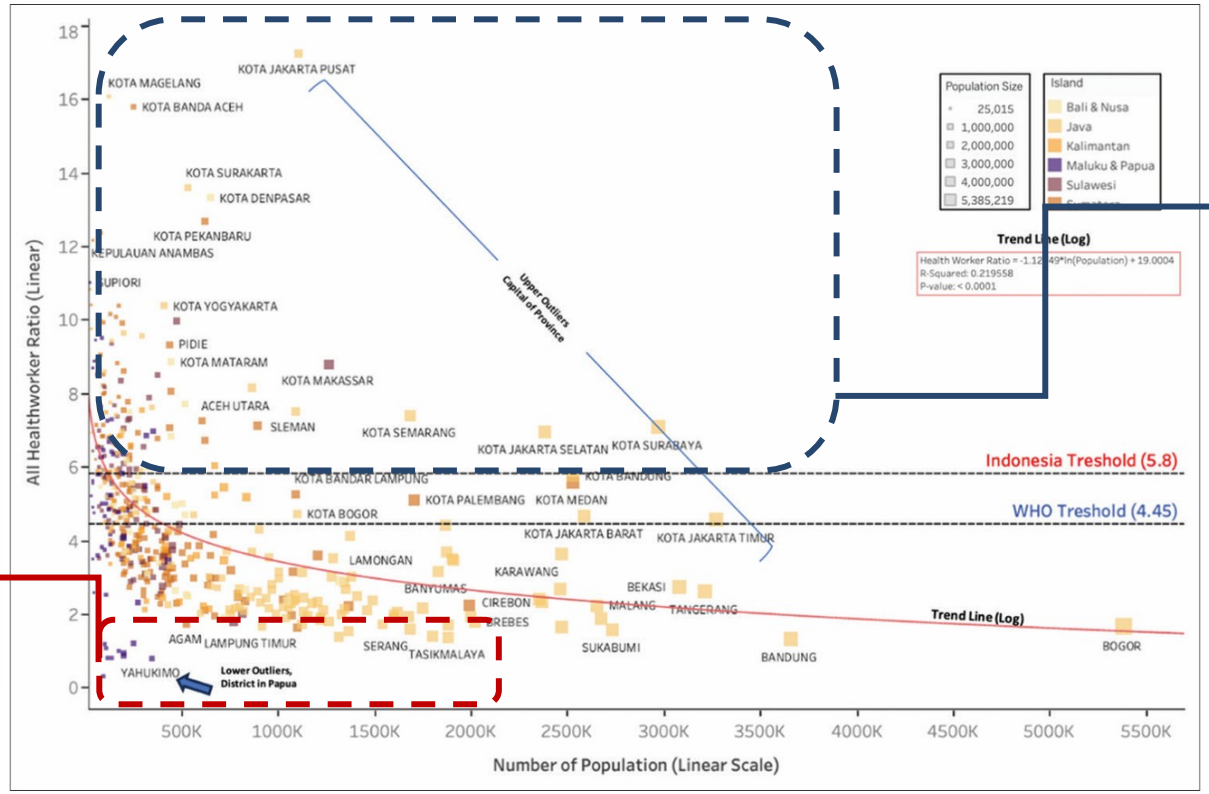

Figure 3. Population versus **health worker ratio** across Indonesian regions

Province	30 highest district	Doctor ratio
Dki Jakarta	Jakarta Pusat	6.94
Bali	Kota Denpasar	4.95
Aceh	Kota Banda Aceh	4.17
Riau	Kota Pekanbaru	3.62
Jawa Tengah	Kota Surakarta	3.53
Sulawesi Utara	Kota Manado	2.96
DI Yogyakarta	Sleman	2.79
Jawa Timur	Kota Malang	2.72
Dki Jakarta	Jakarta Selatan	2.52
Jawa Tengah	Kota Magelang	2.44
Sulawesi Selatan	Kota Makassar	2.43
Jawa Timur	Kota Surabaya	2.42
DI Yogyakarta	Kota Yogyakarta	2.40
Jawa Timur	Kota Kediri	2.27
Bali	Badung	2.21

Those **above** the **national threshold** consisted of **capitals of provinces** as shown in the scatter plot and the interdistrict doctor ratio

Logarithmic trend line indicates that **districts** with **larger populations tend** to have **proportionately fewer HWs**

(ratio = −1.274 × ln (Population) +19.0, R^2=0.215)

Fluctuations of HW Distribution from 1992-2022

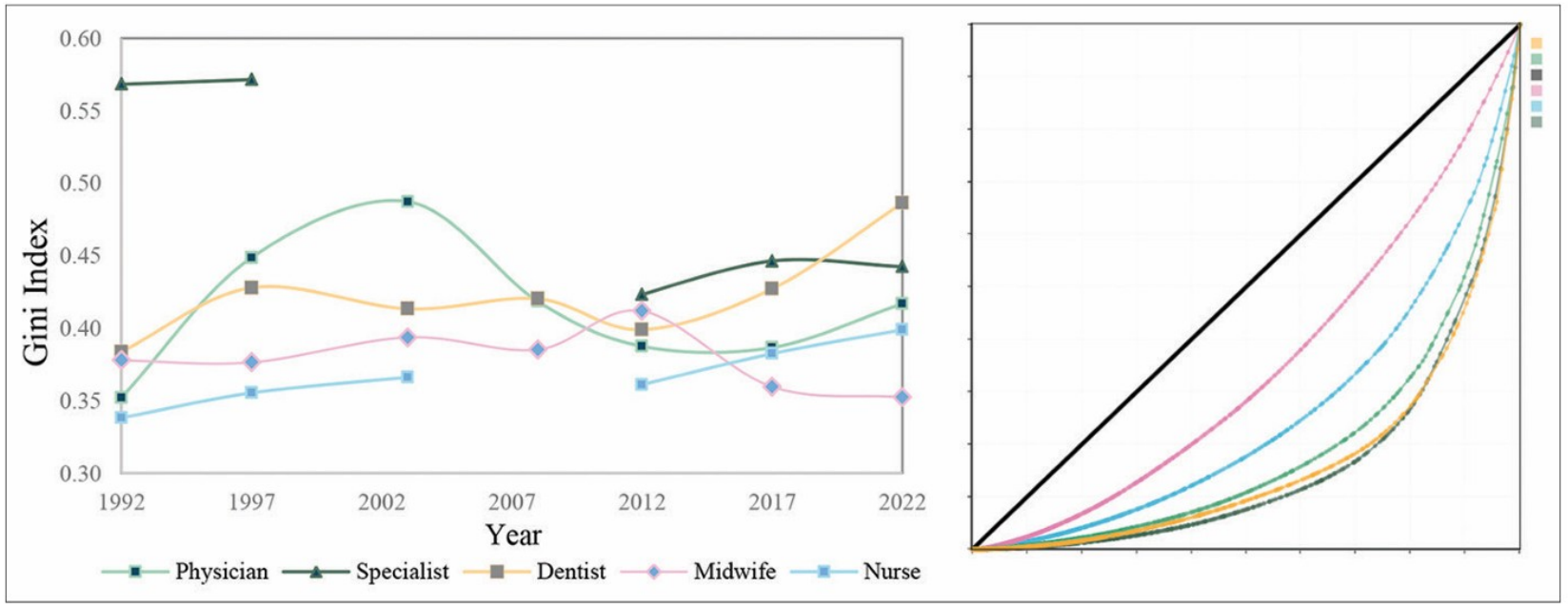

Figure 4. Trends and **disparities** in health worker distribution: **Gini Index** over time and **Lorenz Curve** analysis

Table 4: Provincial and district-level inequality in health worker distribution: Gini index from 1992 to 2022

Health worker	Between province Gini index							Between district Gini index 2022
	1992	1997	2003	2008	2012	2017	2022	
GP	0.35	0.45	0.49	0.42	0.39	0.39	0.42	0.46
Specialist	0.57	0.57	NA	NA	0.42	0.45	0.44	0.53
Dentist	0.38	0.43	0.41	0.42	0.40	0.43	0.49	0.52
Nurse	0.34	0.36	0.37	NA	0.36	0.38	0.40	0.33
Midwife	0.38	0.38	0.39	0.39	0.41	0.36	0.35	0.31

The Gini index scores for different health worker categories, measuring the inequality in their distribution across provinces from 1992 to 2022 and at the district level in 2022. Data unavailability is marked as NA. NA: Not available, GP: General practitioner

- The **inequality** as shown by the Gini Index of **GP**, **nurse**, **specialist**, **and dentist** **increased** in **2022** compared to 1992.
- **Only midwives** experienced **improvement** in **equality**, with their **Gini Index declining** from 0.38 in 1992 to 0.35 in 2022.
- **Lorenz** curves indicate that the **bottom percentage** of **districts** had significantly **fewer HWs than expected** in an equal distribution.
- **Disparities** at the **district level** were more **pronounced** compared to province level.
- **Nurses** and

General Scarcity of HWs

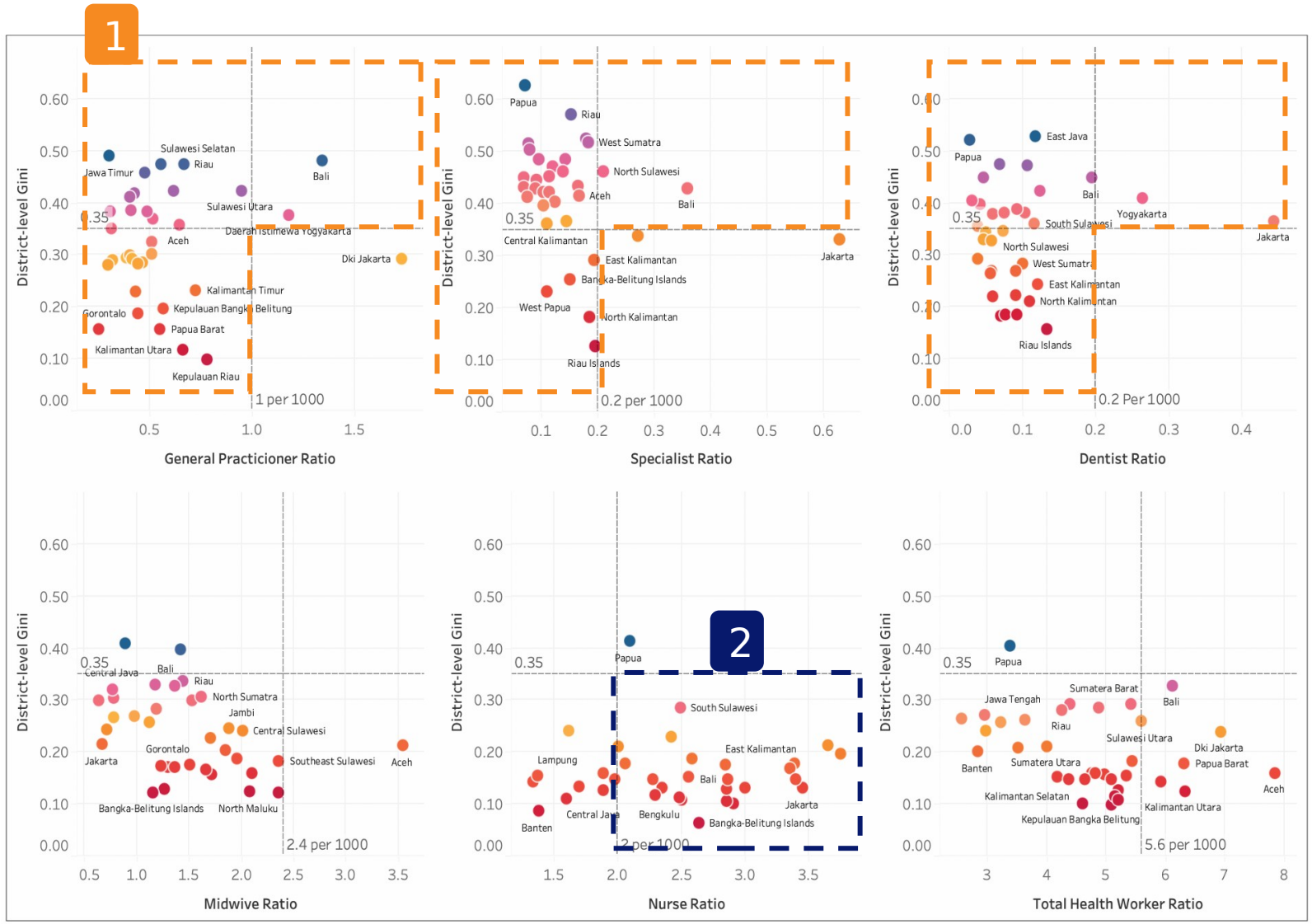

Figure 5. Scatter plot of **health worker** distribution across **provinces**, **Gini Index vs HW Ratio**
Dashed line for Gini referenced 0.35 Gini ratio, the target for distribution.
Dashed line for ratio referenced to national target for each health worker.

1. **GPs, specialists, and dentists** show a similar pattern, with **most provinces failing to meet minimum HW targets** (except Jakarta, Yogyakarta, and Bali).
   - **Specialists** are predominantly located in the **upper-left quadrant**, indicating concentration in more **developed** areas.
2. **Nurses** show the **most widespread distribution** across provinces, with a noticeable **lean towards lower ratios**, indicating a **general scarcity of HWs** in many areas.

Deficit of 166,000 HWs to Achieve 80% Coverage Threshold

Physician Shortage

National target ratio:
- GP 1:1000
- Specialist 0.2:1000

Per 2022 ratio:
- GP 0.53:1000
- Specialist 0.15:1000

Physican ratio comparison:
- India 0.73:1000
- China **2.4:1000**
- Singapore **2.29:1000**
- Philippines 0.6:1000
- Malaysia **1.54:1000**

Java with Saturated HW but Lowest Density

- **Java** face shortage of **nurse** and **midwives**, **despite** high **sum** of **doctors**.
- Tackling this imbalance of distribution calls for **aggressive policy and measures**, as demonstrated by **China** in their experience in **quadrupling** their **nurse** per **population ratio.**

Significant Gap between Urban and Rural

Indonesian cities possessed:

~50% National Amount of **GPs**

20% of Total **Population**

Higher mean **ratios** across **all HW.**

Similar pattern in **other LMICs**, e.g. **India**:
- **77.4%** of **all HWs**concentrated in **urban** areas.
- **Cities** constituted **31%** population.

Inequity Indicator

- Every **HW categories**, **aside** from **midwives**, face **high level of inequality.**
- This discrepancy is highlighted by **Gini Index differences** between **provincial** and **district** levels.
- Measuring **only province** Gini Index **mask interdistrict disparities**
- Contrasting to China and India, **Indonesia** possessed **higher Gini Inde**x of **GPs** and **specialists** than **nurses.**

Midwives Landscape in Indonesia

In 2022, midwives make up to ≈ **300.000** of Indonesia's HWs (**1.10 per 1000**)

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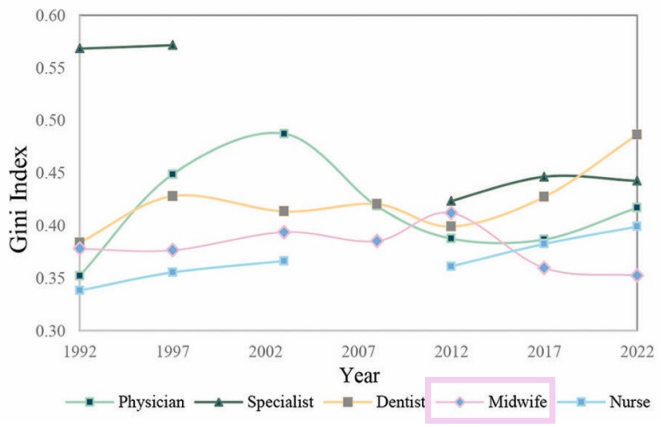

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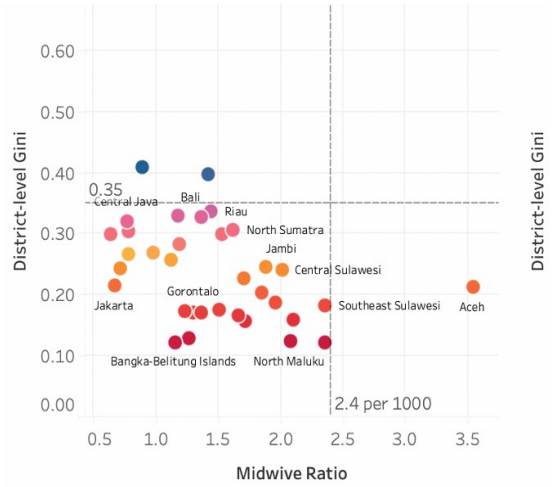

- Most **equitably distributed** than other HWs categories **across provinces and districts**
- **Improvement in equality**: Gini Index declining from 0.38 in 1992 to 0.35 in 2022
- **Only Aceh (3,55:1000) exceeds** the national quantity **threshold**
- **Jakarta** has a **low ratio** of **midwives**, contrasting trends with other HW categories

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Regional group	Population	Midwife	
		n	Ratio
Bali Nusa	15,028,974	22,769	1.52
Bali	4,287,193	5835	1.36
West nusa tenggara	5,359,579	6393	1.19
East nusa tenggara	5,382,202	10,541	1.96
Java	153,344,799	110,580	0.72
Banten	12,142,696	8719	0.72
D.I. Yogyakarta	3,677,522	2890	0.79
D.K.I. Jakarta	11,249,585	7582	0.67
West Java	48,623,371	30,922	0.64
Central Java	37,323,519	28,892	0.77
East Java	40,328,106	31,575	0.78
Kalimantan	16,779,243	21,984	1.31
West Kalimantan	5,482,046	6160	1.12
South Kalimantan	4,069,123	5292	1.30
Central Kalimantan	2,672,790	4435	1.66
East Kalimantan	3,847,792	4882	1.27
North Kalimantan	707,492	1215	1.72
Maluku and Papua	8,634,347	11,254	1.30
Maluku	1,886,735	2575	1.36
North Maluku	1,317,333	2740	2.08
Papua	4,272,108	3798	0.89
West Papua	1,158,171	2141	1.85
Sulawesi	19,989,579	33,924	1.70
Gorontalo	1,203,921	1815	1.51
West Sulawesi	1,441,712	3401	2.36
South Sulawesi	8,980,741	13,716	1.53
Central Sulawesi	3,074,958	6195	2.01
South-East Sulawesi	2,625,494	6195	2.36
North Sulawesi	2,662,753	2602	0.98
Sumatera	58,458,372	100,245	1.71
Aceh	5,356,965	19,017	3.55
Bengkulu	2,041,265	4294	2.10
Jambi	3,600,625	6763	1.88
Bangka Belitung Isl.	1,464,663	1696	1.16
Riau Island	2,072,922	2567	1.24
Lampung	8,866,673	10,458	1.18
Riau	6,032,801	8736	1.45
West Sumatera	5,481,484	7800	1.42
South Sumatera	8,489,000	14,512	1.71
North Sumatera	15,051,94	24,402	1.62

GP: General practitioner

- The **quantity**, however, are still **below the national target** (2:1000)
- **Java** being the most populous island has the **lowest density** of midwives

Two Sides of the Problem: Inequity and Sc

Scarcity

- Several provinces **struggled in redistribution** as their **amount of HWs is lower than needed.**
- This scarcity is **further strained** particularly in the **COVID-19** pandemic.
- **Effective care delivery** in Indonesia is therefore **hindered** manifesting as persistently **high maternal mortality rate** and **increased** of undiagnosed **hypertension**.

Inequity

- Regions in the upper-right quadrant such as Bali possessed **high HW ratio** yet **distributed unequally**.
- **Aggregated national** data can **hide critical disparities.**
- **District-level** reporting offers **crucial** detail of **HW availability** at the subregional level, as emphasized by the WHO.

Policy Approach

1) **Boost healthcare workforce number**
   - **Training** and **recruitment**
   - Aligning with plans by the newly elected President of Indonesia in **opening new medical schools**, although may **require** further **assessment** and **planning**
2) **Ensuring retention in rural areas**
   - Increase benefits, working condition, and other incentives
   - Previous effort including the "Dokter Internship" program which places newly graduates in regions
3) **Attribute-based surveillance system**
   - Better planning and resource allocation

Conclusion

- **Human resources for health** in Indonesia are both **inadequate**, in terms of **quantity**, and **unevenly** distributed.
- Inter-**province** and inter-**district disparities** must be considered to construct policies (production and distribution) to tackle each region's **unique problems**.

Central government contributes on enhancing **production** and **distribution.**

Local government plays a role in HW retention, **tailoring** strategies to **local context**.

Limitation

- Notable discrepancies between the numbers and distribution of General Physicians and Specialists as reported by the medical association, medical council, and Ministry of Health.
- We decided to use the data from the Ministry of Health, acknowledging its limitation that some doctors may not have re-registered or may not be practicing and thus might not be recorded.

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