
Association for Socially Applicable Research



SWETA DUBEY, M.D.
**ASSOCIATION FOR SOCIALLY
APPLICABLE RESEARCH, INDIA**

**TARGETED SCALE-UP AND INTERVENTIONS TO
IMPROVE AVAILABILITY, ACCESSIBILITY,
ACCEPTABILITY AND QUALITY OF HUMAN
RESOURCES FOR HEALTH IN INDIA**

INTRODUCTION



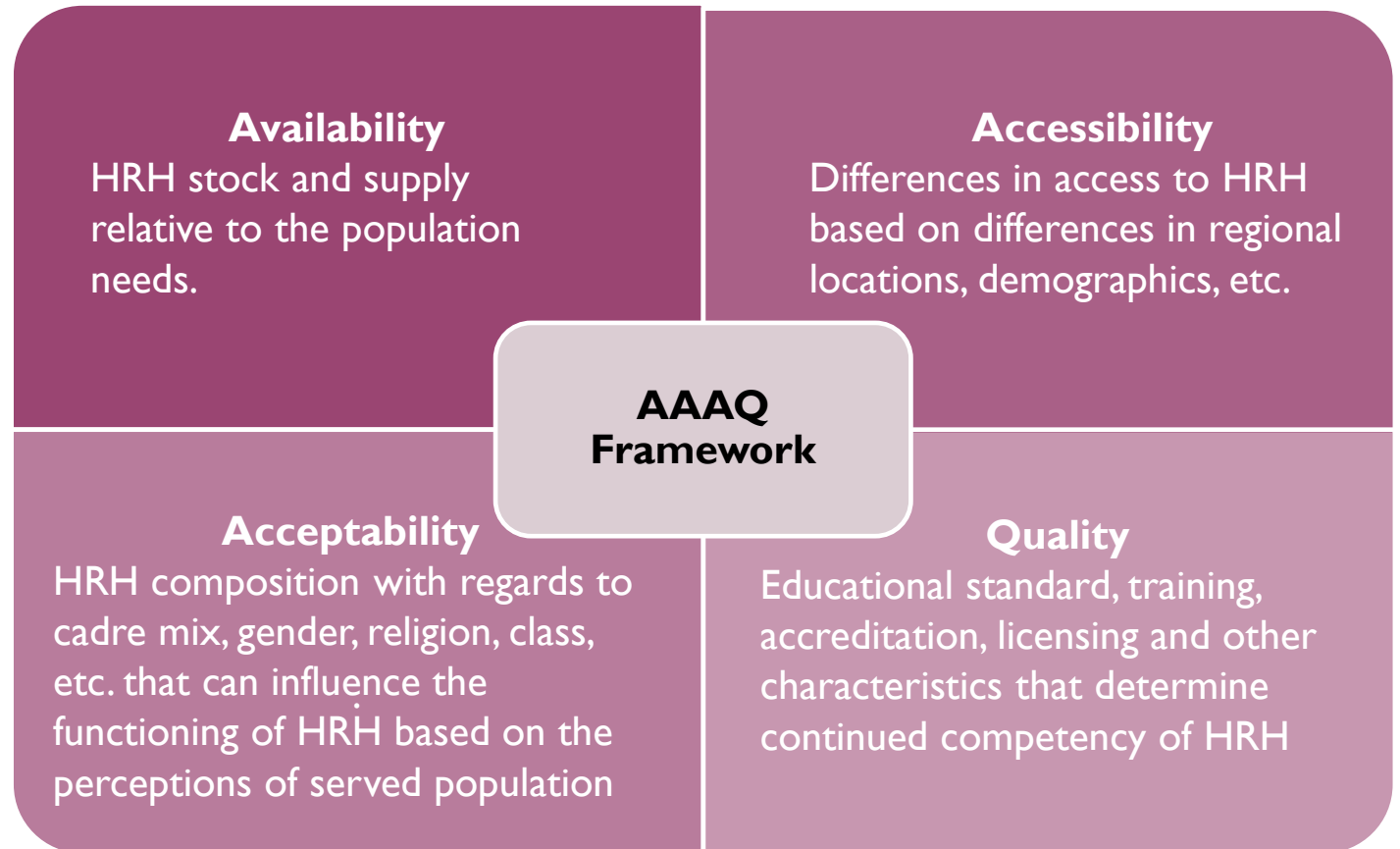
- Human resources for health (HRH) are arguably the most important component of the health systems for realizing universal health coverage (UHC).
- During the millennium development goals (MDGs) era, the World Health Organization (WHO) recognized India to be one of the fifty-six countries facing a critical shortage of HRH, particularly those involved in skilled birth attendance, i.e., doctors, nurses, and midwives.
- Owing to low investment in healthcare, limited scale up of health education infrastructure, changes in demographics and continued emigration of HRH, this shortage has continued in the sustainable development goals (SDGs) era.
- However, such assessment of shortage leaves out aspects critical to UHC achievement that go beyond HRH availability.
- Campbell & colleagues proposed a comprehensive UHC framework in the context of HRH that was later adopted by the WHO in its collaborative report with the Global Health Workforce Alliance (GHWA). They suggested multidimensional framework looking at availability, accessibility, acceptability and quality (AAAQ) of HRH.

AAAQ FRAMEWORK



Adequately available HRH with high quality of training who are accessible and acceptable to all people can improve the chances of UHC achievement for the country.

Improvements across these dimensions are thought to holistically enhance HRH and strengthen the health system.



DATA SOURCES AND METHODS



Data sources



7 HRH cadre groups: doctors, nurses, ANMs, pharmacists, dentists, AYUSH, SHPs

Years: 1981, 1991, 2001, 2011, 2021, 2031

$$\text{HRH density} = \frac{\text{HRH population}}{\text{population}} \times 100000$$

Cadre-wise personnel counts	Total, rural, urban, male, female	Qualified
1981	Census 1981	38 th NSS - 1983
1991	Census 1991	50 th NSS (1993-94)
2001	Census 2001	55 th NSS (1999-00)
2011	Census 2011	68 th NSS (2011-12)
2021	Extrapolation Census 2001 and 2011	Extrapolation NSS 55 th and 68 th
2031	Extrapolation Census 2001 and 2011	Extrapolation NSS 55 th and 68 th

Population counts: Census of India



EXTRAPOLATION EQUATION

$$HRH\ Personnel_{i,j,k,l} = HRH\ Personnel_{i-10,j,k,l} + \left(\frac{HRH\ Personnel_{i-10,j,k,l} - HRH\ Personnel_{i-20,j,k,l}}{HRH\ Personnel_{i-20,j,k,l}} \right)$$

where,

- i = year = 2021, 2031
- j = cadre = doctor, nurse, ANM, pharmacist, dentist, AYUSH, SHP, nursing cadre, supporting cadre
- k = region = India, 28 states, and 7 union territories
- l = demographic category = rural, urban, male, female, qualified, total

$$HRH\ Personnel_{2021,doctor,India,rural} = HRH\ Personnel_{2011,doctor,India,rural} + \left(\frac{HRH\ Personnel_{2011,doctor,India,rural} - HRH\ Personnel_{2001,doctor,India,rural}}{HRH\ Personnel_{2001,doctor,India,rural}} \right)$$

NORM DENSITY



Norm values are recommended number of cadre-wise HRH personnel needed

We extracted normal values from several sources including nationally relevant sources like HLEG report, Bhore Committee report, and IPHS and internationally relevant sources like SDG, MDG, and IHME

Norm density = Norm value/population x 100000

Cadres	HLEG	Bhore	IHME UHC80	IHME UHC90	IPHS	SDG	MDG
doctor	33.5	121.78	207	354	27.25		
Pharmacist	22.5	43.97	94	158	16.29		
ANM	73.72	60			56.25		
Nurse	112.26	355.91			135.36		
AYUSH	6.45				3.42		
Dentist	6.73	20	82	145	7.20		
nursing cadres*	185.98	415.91	706	1145	191.61		
supporting cadres**	208.48	459.88	800	1303	207.90		
SHPs	219.48	537.69	913	1499	218.85	445	228
all cadres	255.16	601.66	1089	1802	245.76		



AVAILABILITY DEFICIT (AVD) EQUATION

$$AvD_{i,j,k} = 1 - \frac{HRH\ Density_{i,j,k}}{Norm\ Density_j}$$

where,

i = year = 1981, 1991, 2001, 2011, 2021, 2031

j = cadre = doctor, nurse, ANM, pharmacist, dentist, AYUSH, SHP

k = region = India, 28 states, 7 UTs

Availability Deficit (AvD) investigates present HRH density per 100000 people relative to a normative (requirement) threshold

Theoretically, AvD values can range from $-\infty$ to $+\infty$ with positive (or negative) values denoting deficit (or excess) relative to the decided norm.



ACCESSIBILITY DEFICIT (ASD) EQUATION

$$AsD_{i,j,k} = 1 - \frac{\frac{HRH\ Density(Rural)_{i,j,k}}{Norm\ Density\ (Rural)_j}}{\frac{HRH\ Density\ (Urban)_{i,jk}}{Norm\ Density\ (Urban)_j}} = 1 - \frac{HRH\ Density(Rural)_{i,j,k}}{HRH\ Density\ (Urban)_{i,jk}}$$

As Norm Density (Rural)_j = Norm Density (Urban)_j

where,

i = year = 1981, 1991, 2001, 2011, 2021, 2031

j = cadre = doctor, nurse, ANM, pharmacist, dentist, AYUSH, SHP

k = region = India, 28 states, 7 UTs

Accessibility Deficit (AsD) measures the imbalance of HRH availability in rural vs. urban areas

AsD can range from $-\infty$ to $+\infty$. Positive values show that HRH are skewed toward urban areas, negative values depict a rural skew, and zero value depicts equitable rural and urban HRH distribution.



ACCEPTABILITY DEFICIT (APD): CADRE-MIX EQUATION

$$ApD (cadre - mix)_{i,j,k} = 1 - \frac{\frac{Auxiliary\ HRH\ Density_{i,j,k}}{Norm\ Density_j}}{\frac{Doctor\ Density_{i,k}}{Norm\ Density_{doctor}}}$$

where,

i = year = 1981, 1991, 2001, 2011, 2021, 2031

j = cadre = nursing cadre, supporting cadre

k = region = India, 28 states, 7 UTs

ApD cadre-mix measures the relative lack of nursing and supporting cadres in relation to doctors. Such norms ensure that communities have access to intermediary professionals such as nurses, medical assistants, etc. which have a better acceptability among patients.

ApD cadre-mix can range from $-\infty$ to $+\infty$. When ApD cadre-mix is zero, it depicts the relative values of doctors and supporting and nursing cadres are equal, having optimal values for cadre composition. Whereas a positive or negative value depicts an inadequate cadre composition.



ACCEPTABILITY DEFICIT (APD): SEX-MIX EQUATION

$$ApD(\text{sex} - \text{mix})_{i,j,k} = 1 - \frac{\frac{HRH \text{ Density}(\text{Female})_{i,j,k}}{Norm \text{ Density}(\text{Female})_j}}{\frac{HRH \text{ Density}(\text{Male})_{i,j,k}}{Norm \text{ Density}(\text{Male})_j}} = 1 - \frac{HRH \text{ Density}(\text{Female})_{i,j,k}}{HRH \text{ Density}(\text{Male})_{i,j,k}}$$

As Norm Density (Female)_j = Norm Density (Male)_j

where,

i = year = 1981, 1991, 2001, 2011, 2021, 2031

j = cadre = doctor, nurse, pharmacist, dentist, AYUSH, SHP
k = region = India, 28 states, 7 UTs

ApD sex-mix measures the disparity of female HRH to male HRH. Such index ensure that there is balance between the sex of personnel in each cadre making it acceptable to patients of different sexes.

ApD sex-mix can range from $-\infty$ to $+\infty$ with positive values depicting a lack of female HRH in comparison to males and negative values depicting an excess of female HRH. Zero value shows an equitable distribution of both.

QUALITY DEFICIT EQUATION



$$QD_{i,j,k} = 1 - \frac{\frac{HRH\ Density\ (Qualified)_{i,j,k}}{Norm\ Density\ (Qualified)_j}}{\frac{HRH\ Density\ (Total)_{i,jk}}{Norm\ Density\ (Total)_j}} = 1 - \frac{HRH\ Density\ (Qualified)_{i,j,k}}{HRH\ Density\ (Total)_{i,jk}}$$

As Norm Density (Qualified)_j = Norm Density (Qualified)_j

where,

i = year = 1981, 1991, 2001, 2011, 2021, 2031

j = cadre = doctor, nurse, ANM, pharmacist, dentist, AYUSH, SHP

k = region = India, 28 states, 7 UTs

QD measures the lack of qualified HRH in contrast to unqualified HRH i.e., QD measures the deficit in HRH having a license to practice medicine to professionals who don't. Such norms ensure quality care to all communities.

Theoretically, QD can range from 0 to 1. QD becomes zero when all professionals have a license to practice medicine whereas, on the other end, QD becomes 1 when none of the practicing professionals have a license.

PREVIOUS WORK

Dubey et al. *Hum Resour Health* (2021) 19:139
<https://doi.org/10.1186/s12960-021-00681-1>


Human Resources for Health

RESEARCH

Open Access

Do health policies address the availability, accessibility, acceptability, and quality of human resources for health? Analysis over three decades of National Health Policy of India



Sweta Dubey^{1,2}, Jeel Vasa^{1,3} and Siddhesh Zadey^{1,4,5*} 

RESULTS: TOTAL VALUES OBTAINED



CADRES



YEARS



NORMS



REGIONS

Availability Deficit (AvD)

6048

Accessibility Deficit (AsD)

1512

Acceptability Deficit (ApD) sex-mix

1296

Acceptability Deficit (ApD) cadre-mix

2160

Quality Deficit (QD)

1512

Total

12528

ADDITIONAL HRH NEEDED IN 2031 EQUATIONS



$$\text{Additional HRH Personnel (Total)}_{2031,j,k} = \frac{\text{Population}_{2031}}{100000} * \text{Norm Density}_j * \text{AvD}_{2031,j,k}$$

$$\begin{aligned} & \text{Additional HRH Personnel (Rural)}_{2031,j,k} \\ = & \frac{\text{Rural Population}_{2031}}{100000} * \text{Norm Density}_j * [(\text{AsD}_{2031,j,k} + \text{AvD(urban)}_{2031,j,k}) - (\text{AsD}_{2031,j,k} * \text{AvD(urban)}_{2031,j,k})] \end{aligned}$$



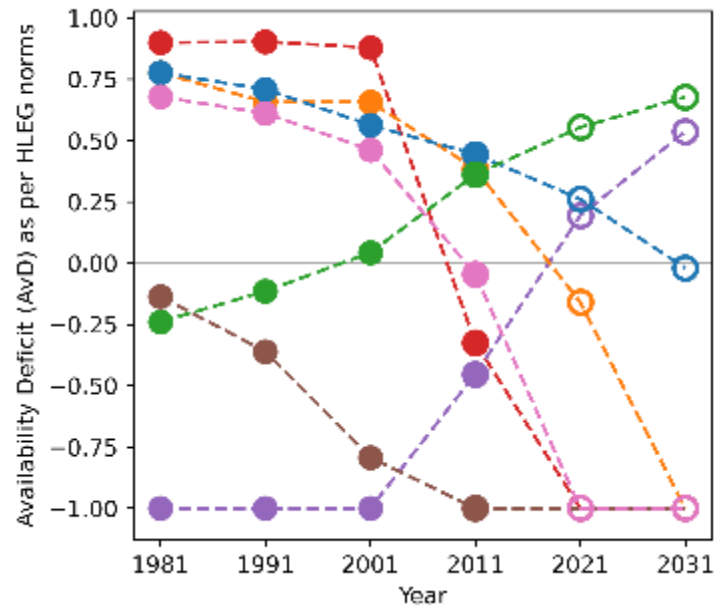
ADDITIONAL HRH NEEDED IN 2031 EQUATIONS

*Additional HRH Personnel (Female)*_{2031,j,k}

$$= \frac{\text{Female Population}_{2031}}{100000} * \text{Norm Density}_j * [(ApD(\text{sex} - \text{mix})_{2031,j,k} + AvD(\text{male})_{2031,j,k}) - (ApD(\text{sex} - \text{mix})_{2031,j,k} * AvD(\text{male})_{2031,j,k})]$$

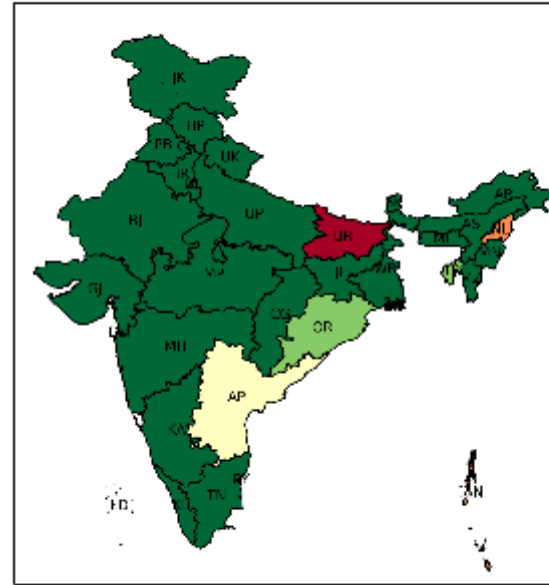
$$\text{Additional HRH Personnel (Qualified)}_{2031,j,k} = \frac{\text{Population}_{2031}}{100000} * [(QD_{2031,j,k} + AvD_{2031,j,k}) - (QD_{2031,j,k} * AvD_{2031,j,k})]$$

AVD

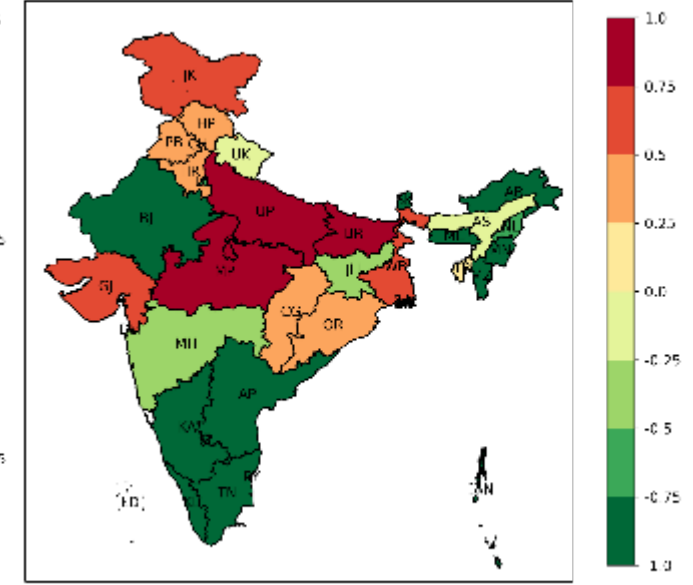


- ANM
- AYUSH
- Dentist
- Doctor
- Nurse
- Pharmacist
- Skilled Health Professionals

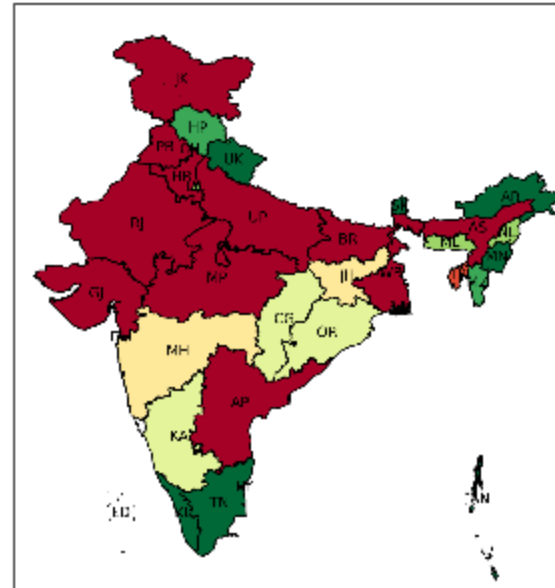
Availability Deficit (AvD) as per HLEG norms: Doctor (2031)



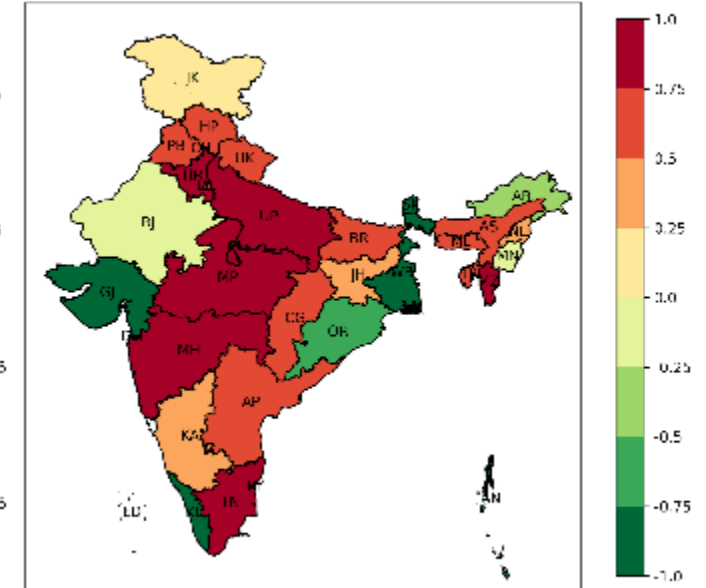
Availability Deficit (AvD) as per HLEG norms: Nurse (2031)



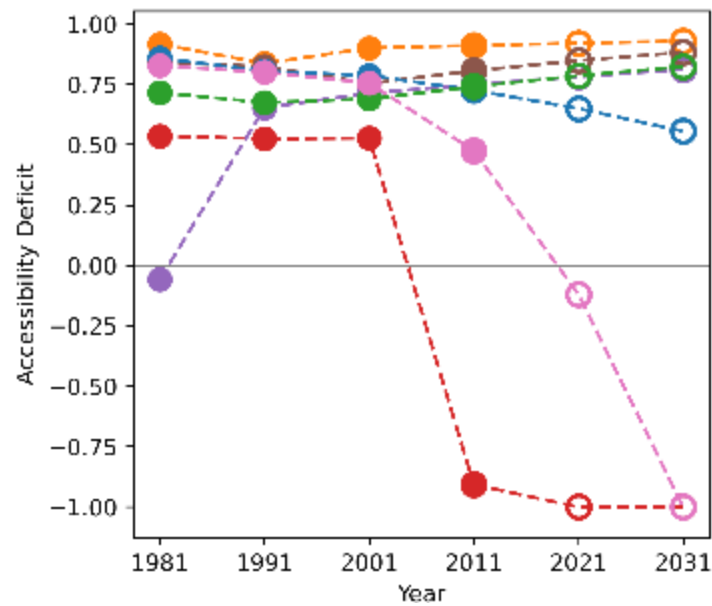
Availability Deficit (AvD) as per HLEG norms: Pharmacist (2031)



Availability Deficit (AvD) as per HLEG norms: AYUSH (2031)

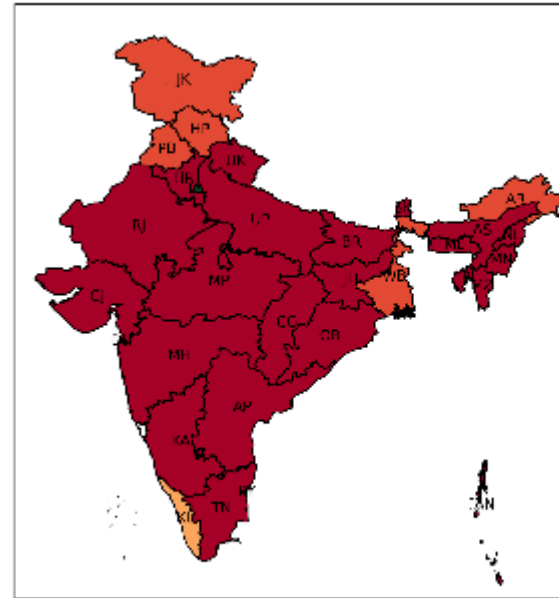


ASD

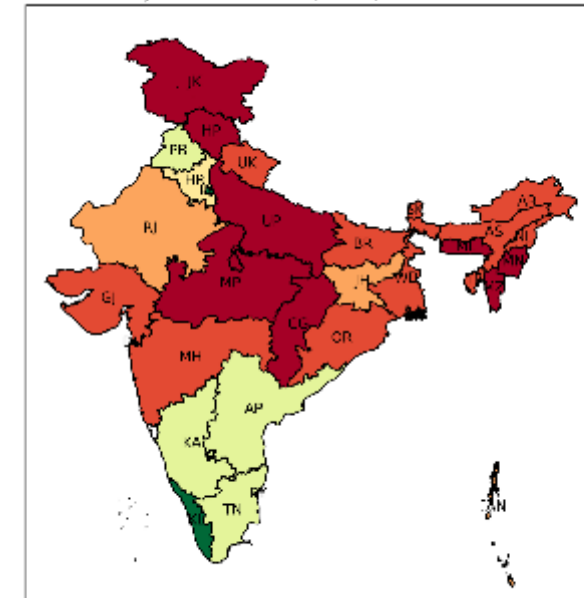


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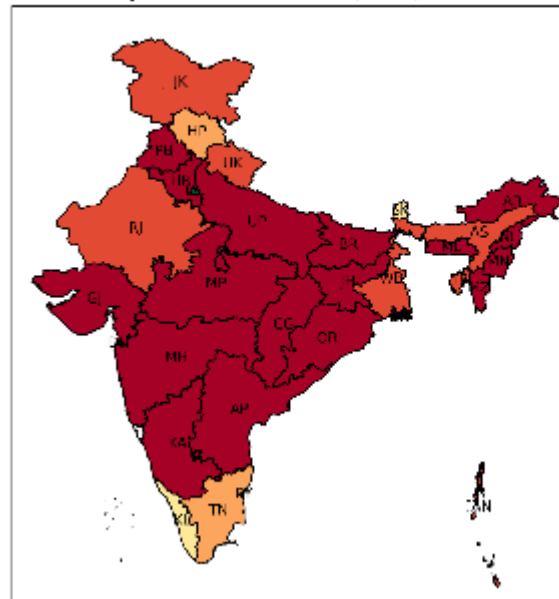
Accessibility Deficit: Doctor (2031)



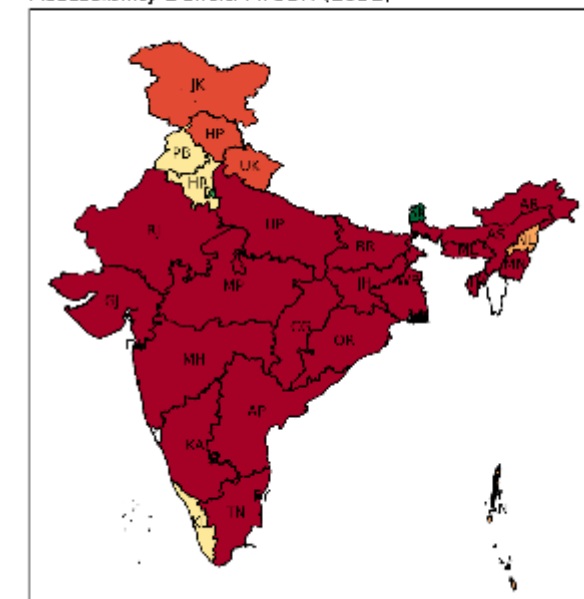
Accessibility Deficit: Nurse (2031)



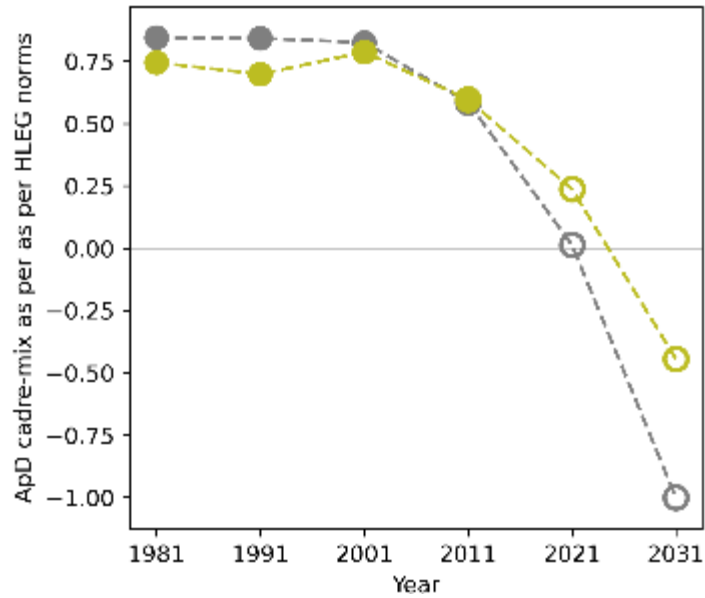
Accessibility Deficit: Pharmacist (2031)



Accessibility Deficit: AYUSH (2031)

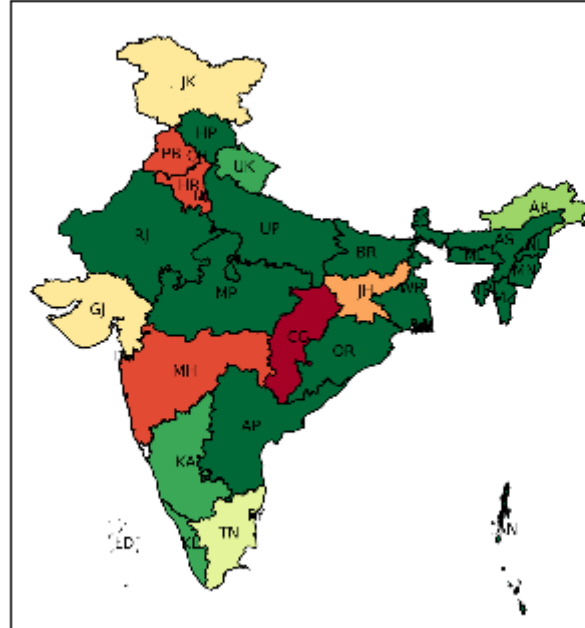


APD CADRE-MIX

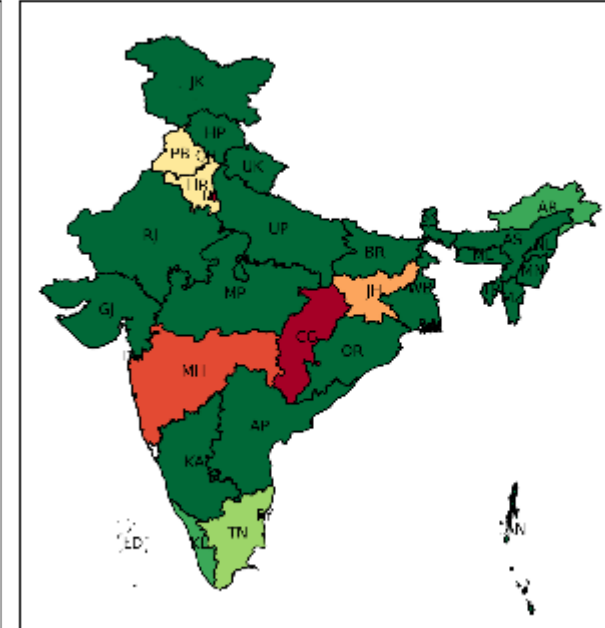


- Nursing Cadres
- Supporting Cadres

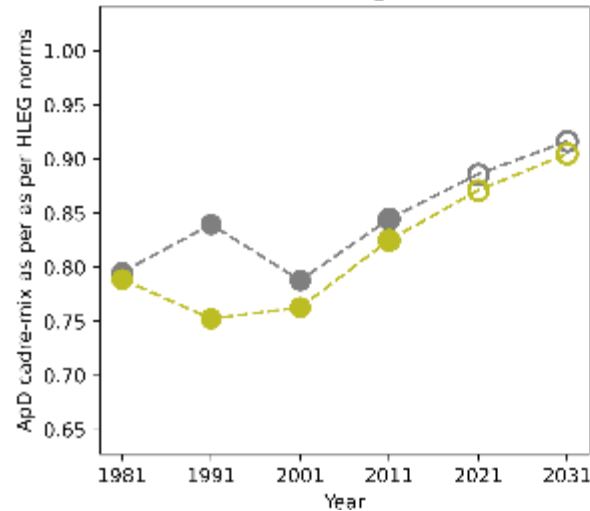
ApD cadre-mix as per as per HLEG norms:
Supporting Cadres (2031)



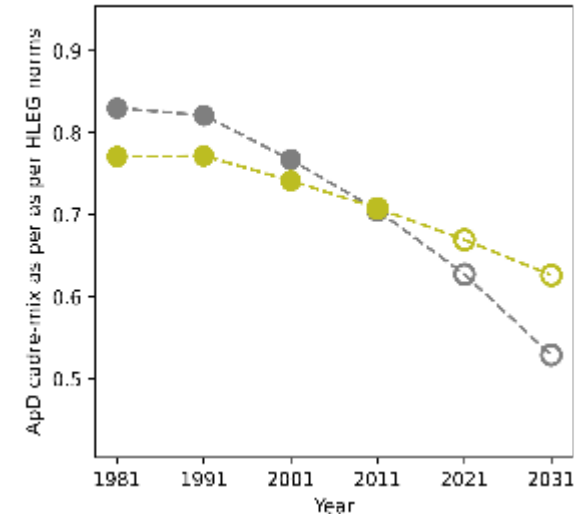
ApD cadre-mix as per as per HLEG norms:
Nursing Cadres (2031)



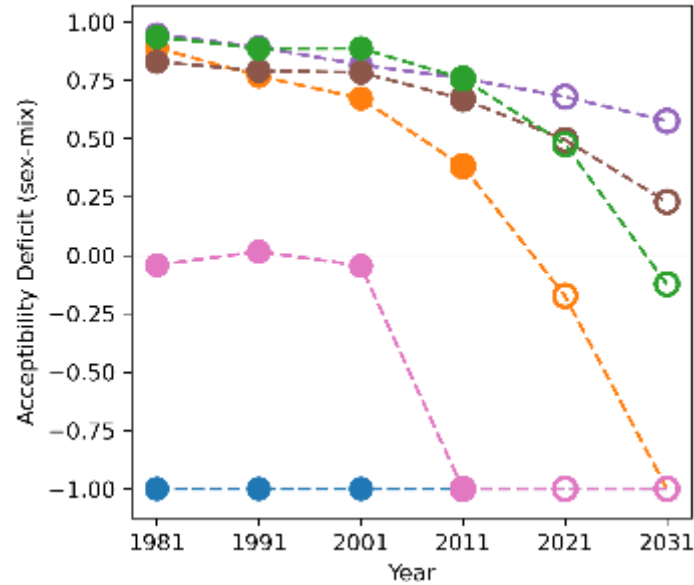
Chhattisgarh



Maharashtra

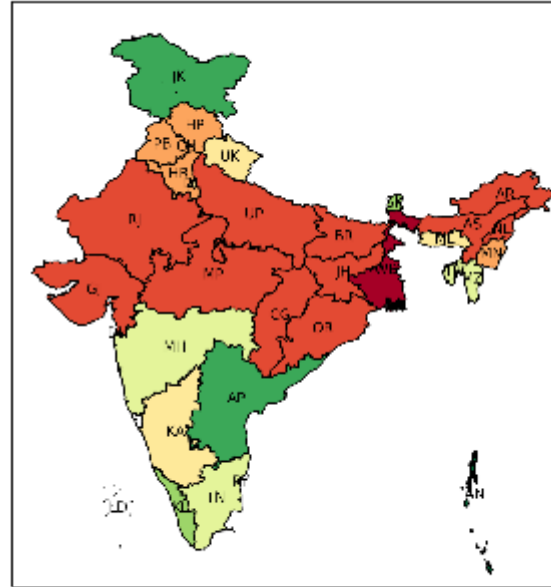


APD SEX-MIX

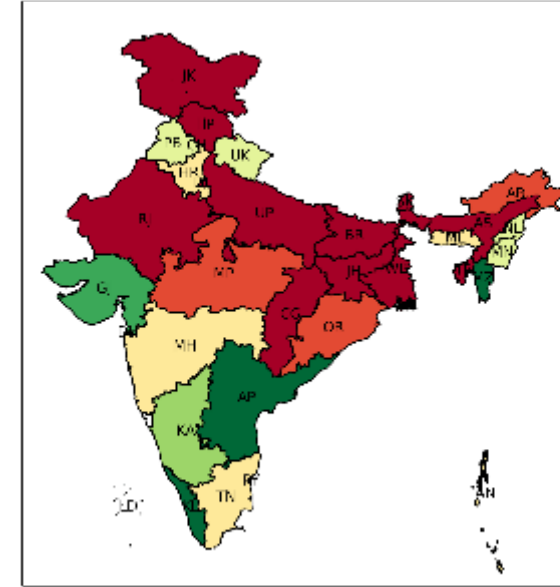


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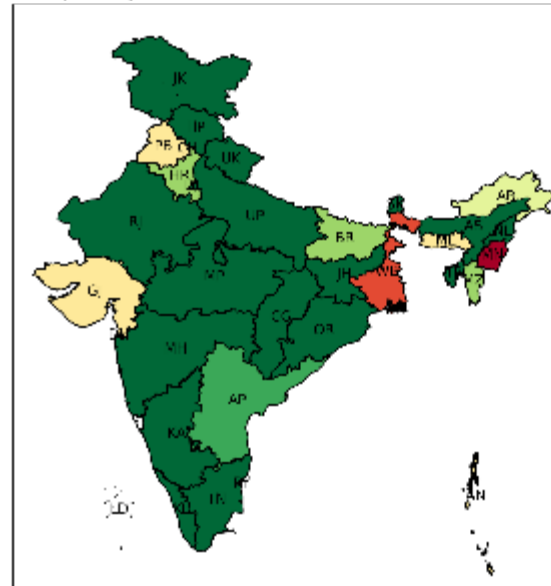
Acceptability Deficit (sex-mix): Doctor (2031)



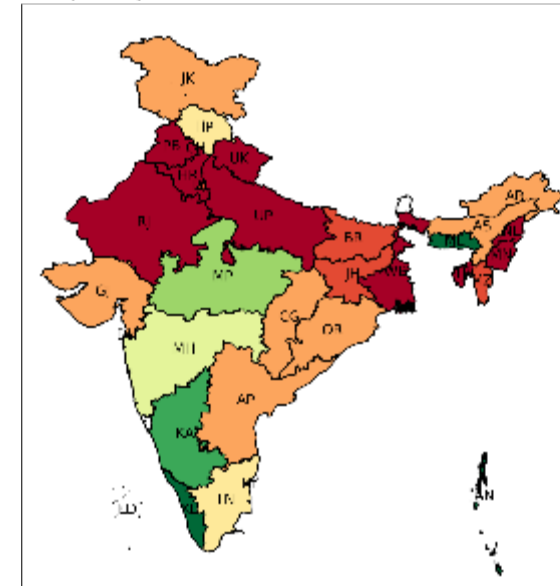
Acceptability Deficit (sex-mix): Pharmacist (2031)



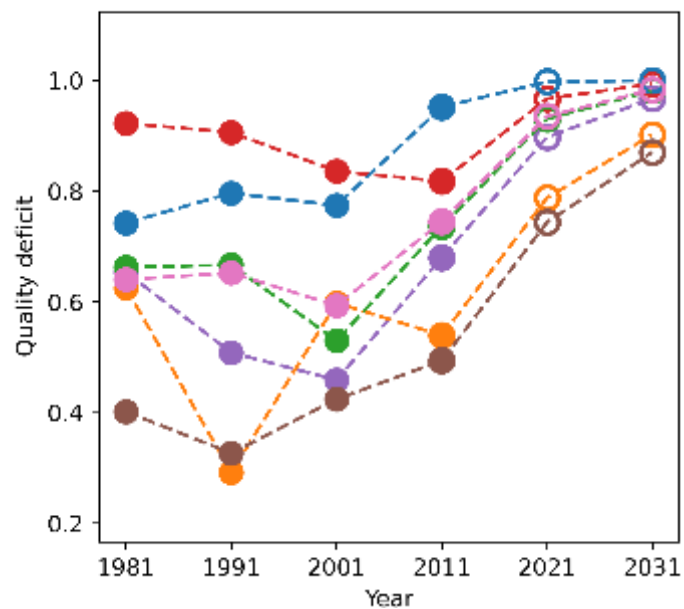
Acceptability Deficit (sex-mix): Dentist (2031)



Acceptability Deficit (sex-mix): AYUSH (2031)

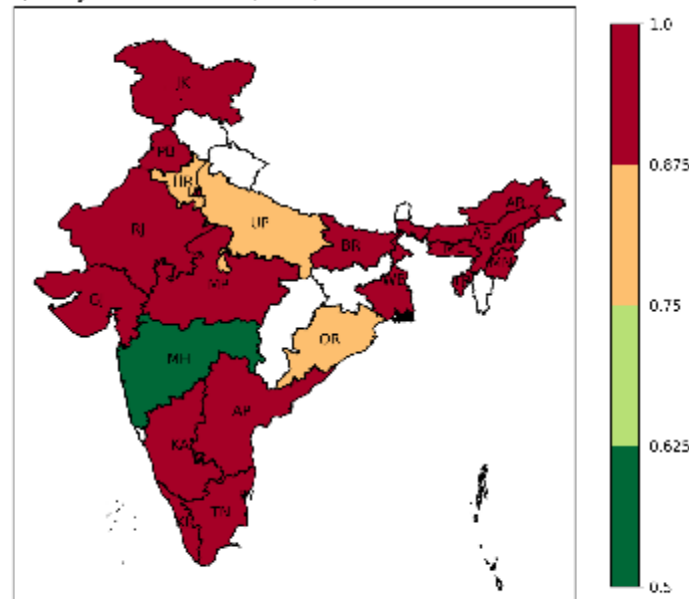


QD

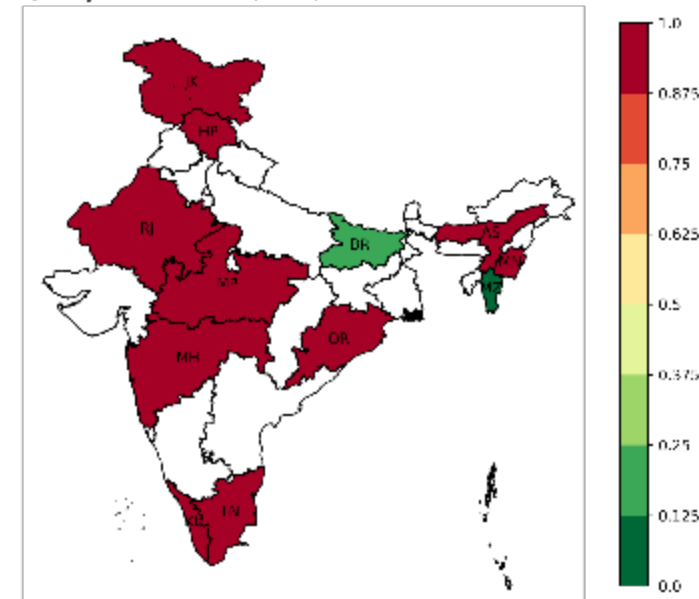


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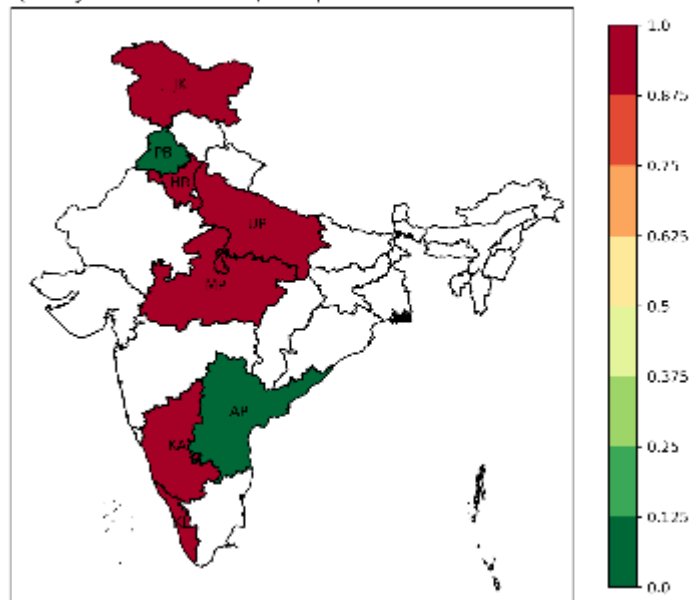
Quality deficit: Doctor (2031)



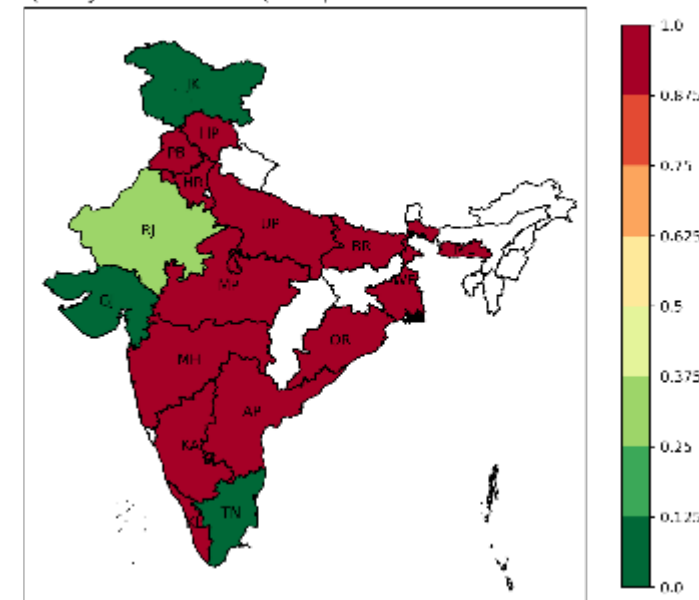
Quality deficit: Nurse (2031)



Quality deficit: Dentist (2031)



Quality deficit: AYUSH (2031)



ADDITIONAL DOCTORS NEEDED: 2031

At national level,

- Around 30000 additional doctors will be needed in rural areas and
- Around 300000 doctors will need to undergo training to be qualified

No. of states needing

- Additional doctors = 2
- Additional doctors in rural area = 16
- Additional female doctors = 3
- Additional qualified doctors = 23

States	Total	Rural	Female	Qualified
India	1,068,514	29,986	-496,183	291,810
Andhra Pradesh	-10,169	13,266	-22,343	27,732
Arunachal Prad.	-2,394	-1,077	-435	536
Assam	-9,739	4,482	-738	12,795
Bihar	7,336	24,781	8,597	45,609
Chhattisgarh	-53,943	-11,708	-16,107	
Goa	-4,848	-387	-4,176	547
Gujarat	-28,509	8,704	-3,896	25,969
Haryana	-58,491	-7,535	-24,886	1,990
HP	-8,881	-5,639	-2,668	
J & K	-28,432	-9,884	-21,059	4,915
Jharkhand	-16,796	3,082	-2,630	
Karnataka	-105,801	-4,488	-54,888	20,840
Kerala	-45,334	-3,248	-30,275	6,664
Madhya Pradesh	-45,727	7,450	-2,520	31,147
Maharashtra	-437,384	-63,732	-265,386	-140,726
Manipur	-2,237	-11	-901	1,154
Meghalaya	-3,310	-731	-1,642	1,199

States	Total	Rural	Female	Qualified
Mizoram	-537	181	-314	
Delhi	-76,780	-31	-30,893	8,051
Nagaland	-57	188	159	799
Odisha	-8,461	5,650	-1,036	12,031
Punjab	-53,684	-15,943	-20,194	10,315
Rajasthan	-38,902	2,676	-4,340	28,638
Sikkim	-819	16	-472	
Tamil Nadu	-69,602	4,669	-38,053	26,076
Tripura	-882	583	-974	1,484
Uttar Pradesh	-87,578	12,639	-10,646	51,709
Uttarakhand	-18,656	-3,274	-10,398	
West Bengal	-46,243	-5,858	3,045	30,781
A & N Islands	0	63	-75	
Chandigarh	-6,680		-3,221	
DNH	-1,363	12	-1,324	
Daman & Diu	144	-10	12	
Lakshadweep	-241		-749	
Puducherry	-5,967	-1,553	-3,881	153

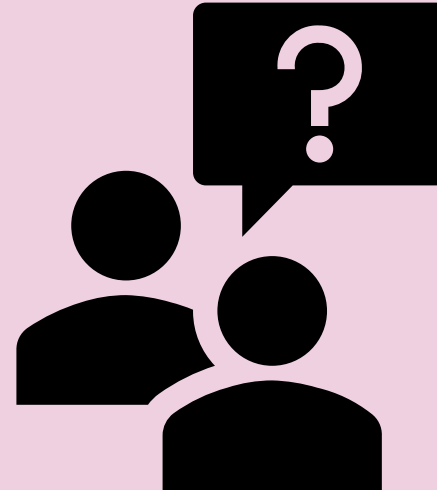


THANK YOU



OUR TEAM

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