ASSIGNMENT 3 MSD – C1

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Estimating Female Longevity Gains Using Age- Specific Sex Ratio at Death Across States and Rural /Urban Areas.

Analysing age-specific sex ratios at death provides crucial insights into gender-based mortality patterns and longevity disparities in India. This study defines sex ratio as the number of females per 1,000 males. Using the Civil Registration System (CRS) Report 2020, we estimate the age intervals where female longevity gains occur across states and rural/urban areas.

Our findings reveal significant deviations from natural biological differences, where men typically exhibit higher mortality rates due to physiological factors. However, India's sex ratio at death is influenced by socio-cultural and behavioral factors, disproportionately affecting male Mortality.

The difference in sex ratios at death can provide valuable insights into various

health and social dynamics within a population. Here are some key implications of the differences in sex ratios at death.

1.Health Disparities   2. Life Expectancy   3. Impact of Disease

4.Socio Economic Factors   5. Aging Population

A lower difference in sex ratio at death indicates higher female longevity relative to males in that age group.

The above table 1 shows the Sex Ratio of Andhra Pradesh:

Age interval	Sex ratio male	sex ratio female	Sex_Ratio_Death
Less than 1 Year	68.50713764	62.10788551	68.50713764
1 Year - 4 Year	78.19767442	69.93032637	78.19767442
5 Year - 14 Year	123.0769231	97.54901961	123.0769231
15 Year - 24 Year	71.77419355	82.74428274	71.77419355
25 Year - 34 Year	54.04435747	72.9757085	54.04435747
35 Year - 44 Year	46.77361427	48.76696616	46.77361427
45 Year - 54 Year	47.94918096	44.56898309	47.94918096
55 Year - 64 Year	58.61080841	54.52989363	58.61080841
65 Year - 69 Year	69.2202121	61.95605751	69.2202121
70 Year & above	77.31059872	63.54552502	77.31059872

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Interpretation of the above table

State: Andhra Pradesh

- The sex ratio at death for females is generally lower than that of males across most age groups, indicating that females tend to live longer, with fewer deaths relative to males.

- In the early age groups (e.g., "Less than 1 Year"), female mortality is slightly higher than male mortality. However, as we move to older age groups, the female sex ratio at death becomes progressively lower than that of males. For example:

  o 1-4 Years: Sex ratio for females is 97.55, indicating that nearly equal numbers of male and female deaths occur in this age range.

  o 15-24 Years: The sex ratio for females drops to 72.98, meaning fewer females die compared to males in this age group.

This suggests that females have higher survival rates as they age, compared to males.

- In both rural and urban settings, females tend to exhibit lower mortality rates than males, especially in the middle and older age ranges. This implies greater female longevity, particularly after the early childhood years.

Age interval	Sex _ratio_rural	Sex_ratio_urban	Sex_Ratio_Death
Less than 1 Year	81.5323455	73.81511028	81.5323455
1 Year - 4 Year	70.35903713	78.3533765	70.35903713
5 Year - 14 Year	68.35984265	80.25848142	68.35984265
15 Year - 24 Year	69.12632822	71.91385046	69.12632822
25 Year - 34 Year	63.09252048	66.93807801	63.09252048
35 Year - 44 Year	64.82325873	59.36315894	64.82325873
45 Year - 54 Year	56.76742612	61.17805151	56.76742612
55 Year - 64 Year	59.7955707	58.70827511	59.7955707
65 Year - 69 Year	69.00614855	65.27294723	69.00614855
70 Year & above	72.45978484	64.35854196	72.45978484

Table on Sex Ratio at death (Uttar Pradesh)

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The above Table shows the sex ratio at death of Uttar Pradesh:
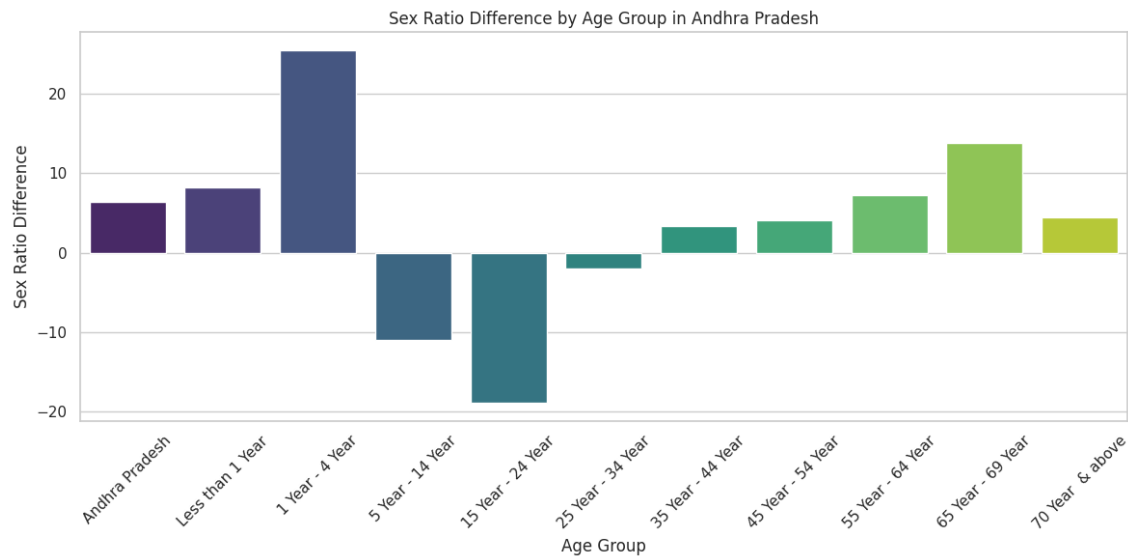
Interpretation of the Table:

1. The pattern in Uttar Pradesh mirrors that of Andhra Pradesh, with higher female mortality in infancy but progressively lower mortality rates as females age.

 For example:

- **Less than 1 Year: Female deaths (3829 total) are relatively high compared to males.**

- **15-24 Years: Female deaths decrease significantly, with a sex ratio at death of 71.91, indicating fewer female deaths in this age group.**

2.This trend suggests that while female mortality is high in the early years, females tend to survive longer than males into adulthood.

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Sex Ratio Difference by Age Group in Andhra Pradesh

Interpretation :

This graph depicts the sex ratio difference across various age groups in Andhra Pradesh. The sex ratio difference indicates the relative proportion of male to female deaths in each age group. A positive value means more male deaths, while a negative value indicates more female deaths.

1. Infant Mortality (Less than 1 Year)

- **The sex ratio difference is slightly positive, indicating that male mortality is marginally higher than female mortality. This suggests a small but significant gender disparity at birth, with more male infants dying than female infants.**

2. Early Childhood (1 Year - 4 Years)

- **There is a significant increase in male mortality compared to females in this age group, shown by the large positive bar. This indicates that males are more vulnerable in early childhood, leading to a higher death rate for boys in this age range.**

3. School Age (5 Year - 14 Years)

- **The graph shows a negative sex ratio difference, meaning more females than males die in this age group. This could reflect disparities in healthcare, nutrition, or societal factors that lead to higher female**

mortality during these years.

4. Adolescence and Early Adulthood (15 Year - 24 Years)

- **The sex ratio difference continues to be negative, indicating that female mortality is significantly higher than male mortality in this age group. This could suggest gender-based risks, possibly linked to maternal mortality, accidents, or other socio-economic factors affecting young women.**

5. Young and Middle Adulthood (25 Year - 54 Years)

- **The sex ratio differences in these age groups begin to even out. The values are slightly negative or close to zero, indicating that female and male mortality rates are relatively balanced during these years.**

6. Later Adulthood (55 Year - 64 Years)

- **As people age, there is a shift back towards higher male mortality, shown by a positive sex ratio difference. This is consistent with global trends where males often have higher mortality in later adulthood due to various factors such as cardiovascular diseases and lifestyle risks.**

7. Senior Age Groups (65 Year - 69 Years and above)

- **In the age group of 65 Year - 69 Years, the sex ratio difference rises sharply in favour of higher male mortality. This trend continues but lessens somewhat for the 70 Year & above group.**

The data suggests that males are more likely to die in older age groups, reflecting typical longevity trends where females tend to outlive males due to biological and social factors.

<mark>Conclusion</mark>

The graph reveals significant trends in sex ratio differences across age groups in Andhra Pradesh:

- **Higher male mortality in early childhood and late adulthood.**

- **Higher female mortality during adolescence and early adulthood.**

- **Gender disparities in mortality decrease during middle age but reappear later in life, with men experiencing greater mortality risks as they grow older.**

This graph highlights the need for gender-targeted health interventions in both early childhood and adolescence, as well as policies to support elderly men in improving their survival rates.

Sex Ratio difference graph (Uttar Pradesh)

Sex Ratio Difference by Age Group in Uttar Pradesh
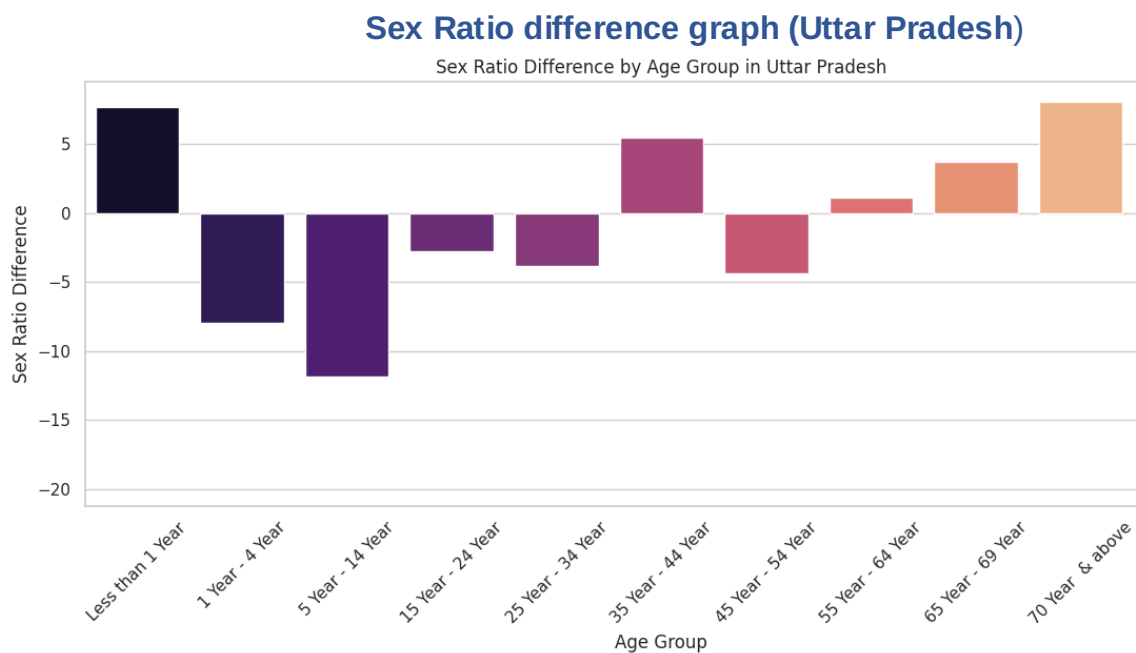
The updated graph also shows the **Sex Ratio Difference by Age Group in Uttar Pradesh**, with the Y-axis representing "Sex Ratio Difference" and the X-axis categorizing different "Age Groups." Here's a detailed interpretation of the key patterns in the graph:

1. **Less than 1 Year**: Positive sex ratio difference (about +6), meaning there are more males than females in this infant group.

2. **1 Year - 4 Year**: Significant negative difference (around -9), indicating a shortage of males in this age group.

3. **5 Year - 14 Year**: Larger negative difference (~-13), indicating a noticeable deficit of males compared to females in this school-going age group.

4. **15 Year - 24 Year**: Small negative difference (~-2), indicating a slight deficit of males in the young adult population.

5. **25 Year - 34 Year**: Small negative difference (~-2), similar to the 15-24 year age group, with a slight deficit of males.

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6. **35 Year - 44 Year**: Positive difference (~+5), indicating a surplus of males in this age group.

7. **45 Year - 54 Year**: Small negative difference (~-4), showing a deficit of males in this middle-aged group.

8. **55 Year - 64 Year**: Small positive difference (~+1), indicating a slight male surplus.

9. **65 Year - 69 Year**: Slightly larger positive difference (~+3), indicating more males than females in this age group.

10. **70 Years & above**: Large positive difference (~+8), showing a noticeable surplus of males in the elderly population.

Insights:

- There seems to be a consistent **male deficit** in younger age groups (especially 5-14 years), which may reflect social or demographic trends like sex-selective practices or differences in child mortality rates.

- As the age increases, particularly from 35 years onward, the trend reverses, showing a **surplus of males** in older age groups, especially after 70 years, which may indicate differences in life expectancy between genders.

- In Andhra Pradesh, the age group with the highest female longevity is 15 Year - 24 Year. The difference in sex ratio at death for this group is -18.93

In Uttar Pradesh, the age group with the highest female longevity is 5 years to 14 years . The difference in sex ratio at death for this group is -12.

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Question 2

Use the Sex Ratio at birth to examine its sensitivity towards magnitude of births to comment on the response of gender bias towards declining fertility levels.

Ans:

"The Sex Ratio at Birth (SRB) is a vital demographic indicator that measures the sex differential of the population at the onset of life. In India, the sex ratio is conventionally expressed as the number of females per thousand males, providing valuable insights into the population's sexual composition."

alternatively:

"The Sex Ratio at Birth serves as a crucial metric for assessing the sex disparity in the population from birth. In India, this ratio is quantified as the number of females per 1,000 males, offering a significant indicator of the population's demographic dynamics.

Sex Ratio At Birth can be calculated using the formula given below:

Sex Ratio of Birth:

$$Sex\ Ratio\ of\ Registered\ Birth = \frac{Number\ of\ female\ births\ registered\ during\ the\ year}{Number\ of\ male\ births\ registered\ during\ the\ year} \times 1000$$

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"The Sex Ratio at Birth (SRB) for 2020, based on registered birth events across various states, is presented below."

Sl. No.	State/Union Territory	Sex Ratio at Birth*
1.	Andhra Pradesh	939
2.	Arunachal Pradesh	1011
3.	Assam	956
4.	Bihar	964
5.	Chhattisgarh	940
6.	Goa	947
7.	Gujarat	909
8.	Haryana	916
9.	Himachal Pradesh	936
10.	Jharkhand	948
11.	Karnataka	949
12.	Kerala	969
13.	Madhya Pradesh	921
14.	Maharashtra	N.A.
15.	Manipur	880
16.	Meghalaya	922
17.	Mizoram	954
18.	Nagaland	953
19.	Odisha	941
20.	Punjab	925
21.	Rajasthan	952
22.	Sikkim	N.A.
23.	Tamil Nadu	939
24.	Telangana	937
25.	Tripura	974
26.	Uttarakhand	954
27.	Uttar Pradesh	N.A.
28.	West Bengal	951

"In the Indian context, the Sex Ratio at Birth (SRB) serves as a vital indicator of entrenched gender bias, exacerbated by declining fertility rates. The preference for male children in India has accelerated the decline in fertility, resulting in a skewed SRB. Analysing the sensitivity of SRB to birth rates offers valuable insights into how gender bias intensifies as fertility declines, highlighting the

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need for targeted interventions to address this critical issue."

Ideal and Practical Sex Ratios at Birth in India

The natural sex ratio at birth, without external interference, ranges from 943 to 952 females per 1,000 males. Fortunately, nearly 50% of Indian states have achieved this ideal range, including Arunachal Pradesh, Assam, Bihar, Goa, Jharkhand, Karnataka, Kerala, Mizoram, Nagaland, Rajasthan, Tripura, Uttarakhand, and West Bengal. Arunachal Pradesh leads with the highest sex ratio at birth of 1,011 females per 1,000 males.

Impact of Gender Bias on Sex Ratio at Birth

However, in states with gender bias and sex-selective practices, the practical sex ratio at birth becomes skewed, resulting in fewer females born per 1,000 males. Nationally, this translates to 893-909 females per 1,000 males. States with lower sex ratios at birth include Andhra Pradesh, Chhattisgarh, Gujarat, Haryana, Himachal Pradesh, Madhya Pradesh, Maharashtra, Manipur, Meghalaya, Odisha, Punjab, Sikkim, Tamil Nadu, and Telangana. Manipur has the lowest sex ratio at birth of 880 females per 1,000 males.

Fertility Decline and Gender Bias

As fertility rates decline, sex ratio at birth becomes increasingly sensitive to gender bias. With fewer children, each birth carries more weight in fulfilling gender preferences, particularly for sons. This affects the fertility replacement level of 2.1 children per woman, necessary for a stable population without migration.

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Consequences of Early Fertility Decline

In some states, early fertility decline has led to disproportionately skewed sex ratios at birth. As Total Fertility Rates drop below 2.1, families are more likely to resort to sex-selective practices to ensure a son. This is evident in regions where sex ratios at birth have surged, indicating increased gender bias. These findings highlight the need to address underlying gender biases to maintain a balanced population.

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