KHYATI KAUL- STATA ASSIGNMENT Semester 2

S243DEC18

Question 1.

We created a new variable inst_del to indicate whether a child was delivered in a healthcare institution. We used the variable m15, which gives the **place of delivery**, and assigned a value of 1 if the delivery occurred in a **public, private, or NGO health facility**, and 0 if it occurred at **home or other non-institutional settings**.

We also used label define and label values to assign readable labels ("Institutional" and "Non-institutional") to the new variable.

Output:

inst_del	Freq.	Percent	Cum.
Non-institutional	28,391	55.15	55.15
Institutional	23,093	44.85	100.00
Total	51,484	100.00	

Question 2.

To understand how institutional delivery differs across social groups, we performed descriptive cross-tabulations of inst_del with:

- s118 → Caste categories
- v025 → Type of residence (Urban/Rural)
- v130 → Religion

Caste cross tab output:

type of caste or tribe	inst_del: Non-insti	Instituti	Total
scheduled caste	5,641	3,508	9,149
	61.66	38.34	100.00
scheduled tribe	6,211	2,159	8,370
	74.21	25.79	100.00
other backward class	9,455	7,273	16,728
	56.52	43.48	100.00
none of them	6,082	8,977	15,059
	40.39	59.61	100.00
dk	84	133	217
	38.71	61.29	100.00
Total	27,473	22,050	49,523
	55.48	44.52	100.00

We find that institutional delivery rates are highest among those with no caste affiliation (59.6%) and lowest among Scheduled Tribes (25.8%). Scheduled Castes and OBCs show moderate levels of institutional delivery at 38.3% and 43.5% respectively, indicating disparities in access across caste groups.

Residence cross tab output:

type of place of residence	inst_del Non-insti	Instituti	Total
urban	6,304	13,151	19,455
	32.40	67.60	100.00
rural	22,087	9,942	32,029
	68.96	31.04	100.00
Total	28,391	23,093	51,484
	55.15	44.85	100.00

Institutional delivery is significantly **more common in urban areas (67.6%)** than in rural areas (31.0%). This highlights a sharp urban–rural divide in institutional access and usage.

Caste cross tab output:

	inst_del		
religion	Non-insti	Instituti	Total
hindu	19,041	16,411	35,452
	53.71	46.29	100.00
muslim	4,970	3,615	8,585

| 57.89 42.11 | 100.00

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christian | 3,170 1,886 | 5,056

| 62.70 37.30 | 100.00

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sikh | 362 522 | 884

| 40.95 59.05 | 100.00

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buddhist/neo-buddhist | 256 302 | 558

| 45.88 54.12 | 100.00

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jain | 5 103 | 108

| 4.63 95.37 | 100.00

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jewish | 0 2 | 2

| 0.00 100.00 | 100.00

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no religion | 24 9 | 33

| 72.73 27.27 | 100.00

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donyi polo | 108 73 | 181

| 59.67 40.33 | 100.00

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other | 421 151 | 572

| 73.60 26.40 | 100.00

Total | 28,357 23,074 | 51,431

| 55.14 44.86 | 100.00

Among major religions, Jains (95.4%) and Sikhs (59.1%) show the highest rates of institutional delivery. Christians (37.3%) and Muslims (42.1%) are slightly below average. Hindus, the largest group, report a mid-range rate of 46.3%. Minor religions and “No religion” groups show more varied outcomes.

Question 3.

Regression Output-

logit inst_del v012 v133 v715 caste_sc caste_st caste_obc urban rel_hi

> ndu rel_muslim rel_christian

Iteration 0: log likelihood = -35297.995

Iteration 1: log likelihood = -26684.005

Iteration 2: log likelihood = -26652.63

Iteration 3: log likelihood = -26652.578

Iteration 4: log likelihood = -26652.578

Logistic regression Number of obs =

> 51,318

LR chi2(10) = 17

> 290.83

Prob > chi2 =

> 0.0000

Log likelihood = -26652.578 Pseudo R2 =

> 0.2449

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inst_del | Coef. Std. Err. z P>|z| [95% Conf. Int

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> erval]
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> ------
      v012 |  -.0102411   .0020469    -5.00   0.000     -.014253   -.0
> 062293
      v133 |   .1993545   .0025134    79.32   0.000     .1944283    .2
> 042808
      v715 |   .0040101   .0011236     3.57   0.000     .0018079    .0
> 062124
   caste_sc |  -.4176078   .0326036   -12.81   0.000    -.4815096   -.3
> 537059
   caste_st |   -.955484   .0419317   -22.79   0.000    -1.037669   -.8
> 732993
  caste_obc |  -.2646379   .0266647    -9.92   0.000    -.3168998    -.
> 212376
      urban |   1.122672   .0223637    50.20   0.000     1.07884    1.
> 166504
  rel_hindu |  -.2863176   .0533212    -5.37   0.000    -.3908253    -
> .18181
 rel_muslim |  -.5323088   .0590416    -9.02   0.000    -.6480283   -.4
> 165894
rel_christ~n |  -.5001042   .0641461    -7.80   0.000    -.6258283   -.3
> 743801
      _cons |  -.7703311    .080027    -9.63   0.000    -.9271811    -.
> 613481
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We estimated a **logit model** to identify the factors influencing whether a child was delivered in an institution (inst_del = 1). The model includes the mother's and father's education, age of the mother, caste dummies, residence type, and religion dummies.

The model is statistically significant overall (Prob > chi2 = 0.000) with a **Pseudo R^2 of 0.245**, indicating a moderate fit.

Key Findings:

- Mother's education (v133): Strongest positive predictor. Each additional year increases the likelihood of institutional delivery (coef = 0.199, *p < 0.001*).
- Father's education (v715): Small but significant positive effect (coef = 0.004, *p < 0.001*).
- Age of the mother (v012): Slight negative effect (coef = -0.010, *p < 0.001*), indicating younger mothers are more likely to deliver institutionally.
- Caste effects (ref = None of them): SC, ST, and OBC are significantly less likely to use institutional delivery, especially ST (coef = -0.955, *p < 0.001*).
- Urban residence (urban): Strong positive influence (coef = 1.12, *p < 0.001*), confirming better access in cities.
- Religion (ref = others): Hindus, Muslims, and Christians all show significantly lower odds of institutional delivery compared to other religious groups.

Question 4.

Average marginal effects Number of obs =

> 51,318

Model VCE : OIM

Expression : Pr(inst_del), predict()

dy/dx w.r.t. : v012 v133 v715 caste_sc caste_st caste_obc urban

rel_hindu rel_muslim rel_christian

> ------

| Delta-method

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          |      dy/dx   Std. Err.      z    P>|z|     [95% Conf. Int
> erval]
-------------+------------------------------------------------------------
> ------
      v012 |   -.001761   .0003517    -5.01   0.000    -.0024503   -.0
> 010718
      v133 |   .0342804   .0003282   104.45   0.000     .0336371    .0
> 349237
      v715 |   .0006896   .0001931     3.57   0.000      .000311    .0
> 010681
   caste_sc |  -.0718106   .0055773   -12.88   0.000    -.0827419   -.0
> 608792
   caste_st |  -.1643021    .007099   -23.14   0.000    -.1782158   -.1
> 503883
  caste_obc |  -.0455063   .0045706    -9.96   0.000    -.0544645   -.0
> 365482
      urban |   .1930512   .0035172    54.89   0.000     .1861576    .1
> 999449
  rel_hindu |  -.0492343   .0091609    -5.37   0.000    -.0671893   -.0
> 312793
 rel_muslim |  -.0915342   .0101269    -9.04   0.000    -.1113826   -.0
> 716858
rel_christ~n |  -.0859964   .0110076    -7.81   0.000    -.1075709   -.0
> 644218
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```

We used the margins, dydx(*) command after the logistic regression to estimate average marginal effects (AMEs). These tell us the **change in probability of institutional delivery when each independent variable increases by one unit**, holding other variables constant.

Key Interpretations:

- **Continuous Variables**
  - **Mother's age (v012)**: A one-year increase in age **reduces** the probability of institutional delivery by **0.18 percentage points** (*dy/dx = -0.00176*, ***p < 0.001***). Older mothers are slightly less likely to use institutional facilities.
  - **Mother's education (v133)**: Each additional year of education **increases** the likelihood by **3.4 percentage points** (*dy/dx = 0.034*, ***p < 0.001***). This is the strongest positive predictor.
  - **Father's education (v715)**: Also increases the probability, but very slightly—**0.07 percentage points** per year (*dy/dx = 0.00069*, ***p < 0.001***).
- **Caste (Ref = None of Them)**
  - **Scheduled Caste (caste_sc)**: Institutional delivery probability is **7.2 percentage points lower** than the reference group.
  - **Scheduled Tribe (caste_st)**: Institutional delivery is **16.4 percentage points lower**, the **largest negative effect** among caste groups.
  - **OBC (caste_obc)**: Reduces the probability by **4.6 percentage points**.

All caste effects are statistically significant (**p < 0.001**) and indicate **lower access or utilization among marginalized groups**.

- **Residence**
  - **Urban (urban)**: Increases the probability of institutional delivery by **19.3 percentage points**. This is the **largest positive effect**, confirming a strong urban–rural divide in access to services.
- **Religion (Ref = Others)**
  - **Hindu (rel_hindu)**: Reduces the probability by **4.9 percentage points**
  - **Muslim (rel_muslim)**: Decreases likelihood by **9.2 percentage points**
  - **Christian (rel_christian)**: Lowers probability by **8.6 percentage points**

All religion variables are statistically significant (**p < 0.001**) and show **lower probability of institutional delivery** compared to other religious groups (e.g. Jains, Sikhs, etc.).

The average marginal effects (AMEs) from the logistic regression offer valuable insights into the probability of institutional delivery based on individual characteristics and social group identity.

Education emerges as the most influential factor: a one-year increase in the **mother's education** leads to a **3.4 percentage point rise** in the likelihood of institutional delivery, reflecting the empowering role of education in healthcare decision-making. Although the impact of **father's education** is smaller (0.07 percentage points), it remains statistically significant, suggesting that both parents' educational levels contribute to maternal health choices.

Age of the mother has a small but negative effect, indicating that **younger mothers** are slightly more inclined toward institutional delivery, potentially due to greater exposure to modern health information or targeted health programs aimed at young mothers.

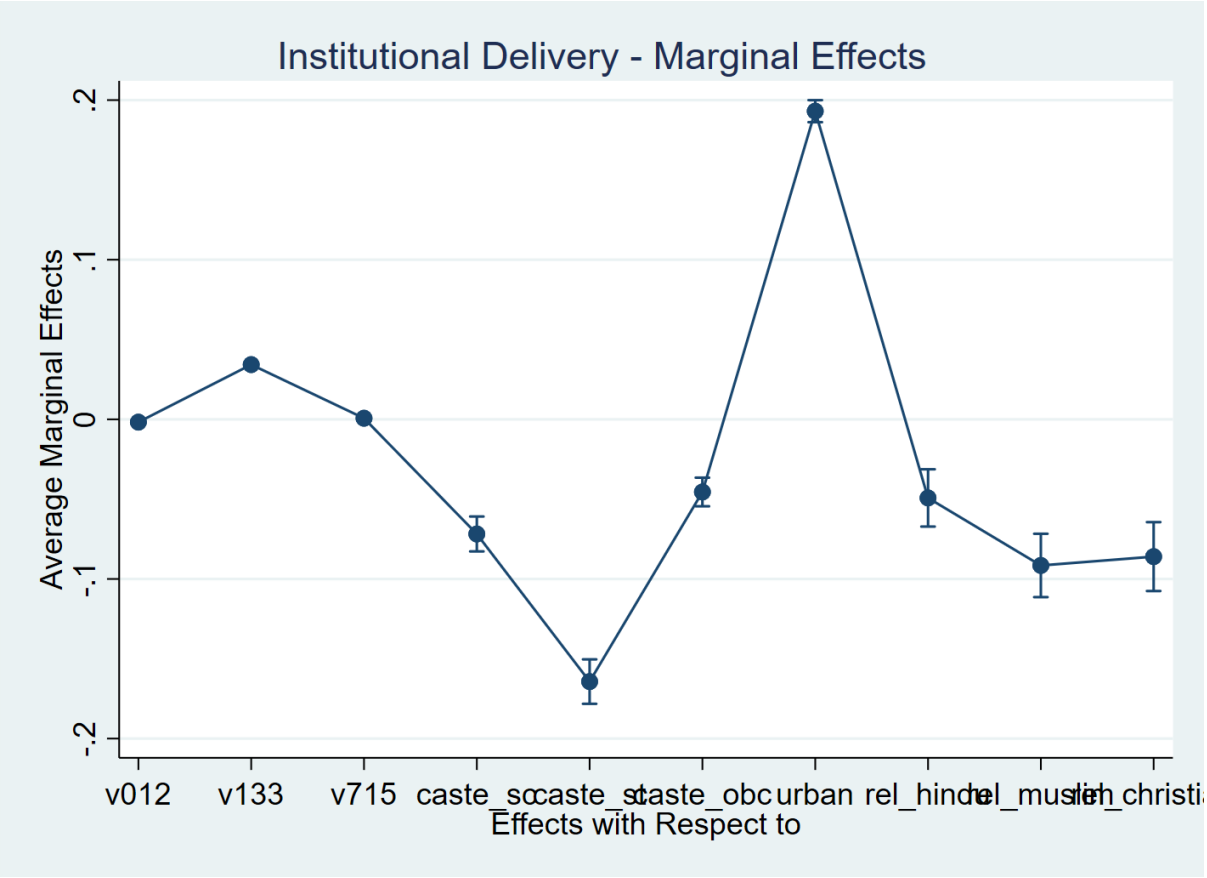
Social identity also plays a substantial role. Belonging to a **Scheduled Tribe** reduces the probability of institutional delivery by **16.4 percentage points**, the steepest disadvantage among caste categories. Similarly, **Scheduled Castes** and **OBCs** face significant disadvantages of **7.2 and 4.6 percentage points**, respectively. These disparities underscore persistent **structural inequalities** in access to institutional healthcare.

Living in **urban areas** increases the chance of institutional delivery by nearly **19.3 percentage points**, making it the strongest positive factor in the model. This highlights the critical gap in healthcare infrastructure and access between rural and urban populations.

Religious identity also affects outcomes: women identifying as **Hindu, Muslim, or Christian** are **less likely** to use institutional services compared to other religious groups (e.g., Jain, Sikh), with **Muslim women facing a 9.2 percentage point disadvantage**. This may reflect varying cultural preferences, trust in health institutions, or economic barriers.

Overall, the marginal effects confirm that **education, urban location, caste, and religion** significantly influence maternal healthcare behaviour. The results emphasize the importance of **inclusive, group-sensitive policies** aimed at closing these critical gaps in maternal health access.

Graph: Average Marginal Effects of Key Determinants



The above graph summarizes the influence of each explanatory variable on the probability of institutional delivery, based on the average marginal effects from the logistic regression model.

From this as well, we can also draw similar conclusions that is-

- **Urban residence (urban)** has the **largest positive marginal effect**, increasing the probability of institutional delivery by nearly **20 percentage points**. This confirms a clear advantage for mothers living in urban areas.
- **Mother's education (v133)** shows the next highest positive effect, reinforcing that **education is a critical enabler** of access to institutional maternal care.
- Variables like **Scheduled Tribe (caste_st)** and **Scheduled Caste (caste_sc)** are associated with **strong negative effects**, highlighting the **disadvantages faced by marginalized caste groups**.
- **Religious affiliation** (Muslim, Christian, Hindu) also shows **negative marginal effects**, indicating that these groups are statistically **less likely** to access institutional care compared to others (such as Jains or Sikhs, which are part of the reference category).

- While **father's education (v715)** and **mother's age (v012)** show statistically significant effects, their magnitudes are relatively smaller.

This graph reinforces that urban residence and mother's education are the most influential positive factors, while caste disadvantage and religious affiliation act as significant barriers to institutional delivery. The clear gaps depicted by this chart call for targeted policy interventions focused on rural, less-educated, and marginalized communities.

Test: Mother's Education vs Father's Education

I also conducted a hypothesis test to check whether **mother's education (v133) and father's education (v715)** have **equal effects** on the probability of institutional delivery.

The null hypothesis was:

H_o: β_{v133} = β_{v715}
H_1: β_{v133} ≠ β_{v715}

The test yielded:

- **Chi-squared(1) = 4331.40**
- **p-value = 0.0000**

The result is **highly significant**, so we reject the null hypothesis. This means that **mother's education has a statistically different (and stronger)** effect on institutional delivery than father's education. This reinforces the critical role of women's education in maternal healthcare decisions.