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MENSTRUAL HEALTH SURVEY - COVID-19 LOCKDOWN: MACHINE LEARNING ANALYSIS

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ABSTRACT

The paper deals with the results of a survey regarding menstrual health during Covid- 19 Lockdown carried out by an NGO, Sacchi Saheli. A range of questions were asked from the subjects, and the results of the survey were then analysed using machine learning algorithms like categorical data encoding and model selection. The ML (Machine Learning) model prepared from the results of the survey, showed correlation between different problems faced by women, giving a plausible cause-effect relationship between various factors. All the results of the ML model indicate high correlation of access to sanitary products, to hesitation in asking male members of the family to get sanitary products from markets, gynaecological problems experienced by women, if someone in the subject's family have tested positive for Covid-19, and hike in prices of sanitary products in local shops and markets. The conclusion points to the harsh reality that societal norms and taboos regarding open discussion on menstrual health have led to very low awareness, and extreme problems in access to proper sanitary products for many women.

Keywords: Menstrual Health, Menstrual Hygiene, Sanitary Products, Covid-19 Lockdown

Introduction

This project was carried out using many Machine Learning algorithms on a dataset ofthe survey carried out by Sacchi Saheli. The survey was conducted to analyse the changes in menstruation patterns, availability of sanitary products, health issues, and other such problems faced by people during the lockdown period in comparison to the ongoing post- lockdown period. The subjects of the survey were mostly young girls (13-18 years) from government schools, and women belonging to the lower middle class. They were asked to answer the following questions:

1. Name

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2. Age
3. City
4. Profession
5. Father s / Husband s Occupation
6. Did you or anyone in your family test positive for COVID-19?
7. Have you been experiencing stress, anxiety, mood swings etc. (more than usual) during or since the lockdown?
8. During the lockdown, did you notice any change in your menstrual cycle?
9. Which sanitary products did you use before lockdown?
10. What was the primary source of your sanitary items (Sanitary Pads etc) before lockdown?
11. Did the COVID-19 Lockdown affect the availability of sanitary products for you?
12. What was the primary source for sanitary items(sanitary pads etc) during thelockdown?
13. Were/Are sanitary products available to you during lockdown?
14. If sanitary products were/are not available to you during lockdown, what elsedid/do you use while on your period?
15. During the lockdown did/do you hesitate in asking other/male members of yourfamily to get sanitary pads for you?
16. Which sanitary products do you wish to use after the lockdown?
17. Did prices of sanitary products increase in stores near you during the lockdown?
18. Did you suffer/Are you suffering from any gynaecological problems during the lockdown?
19. If yes, what kind of medicine did you take/are you taking?

The survey results were analysed using machine learning tools in python libraries like NumPy, SciPy, Pandas, SciKit-learn etc. After applying the algorithms and techniques like categorical data encoding, feature selection and model selection, the correlation between the different responses was calculated with respect to accessibility ofsanitary products.

Key to Abbreviations

- **Alternative** : If there were any alternatives to the sanitary products the subjecthad to use

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during the lockdown due to inaccessibility.

- **'Hesitation** : If the subject experienced hesitation in asking male members of theirfamily to get sanitary products for them during the lockdown
- **Medicine** : What kind of medicine the subject took for a gynaecological problem(if any): allopathic, homeopathic, home remedies or none.
- **Profession** : The subject s source of income
- **SPAfter** : Availability of sanitary products after the lockdown
- **SPBefore** : Availability of sanitary products before the lockdown
- **SourceBefore** : Source of sanitary products before the lockdown (school, nearbystore, or NGO)
- **SourceDuring** : Source of sanitary products during the lockdown (school, nearby store, or NGO)
- **Scaledage** : Age of the subject
- **AccessEffect** : If there was any effect on accessibility of sanitary products due to the lockdown
- **PriceHike** : If there was any hike in prices of sanitary products in the subject s nearby stores
- **FamilyCovidP** : If there was a member of the subject s family who tested positive for Covid-19.
- **GynProb** : If the subject suffered from a gynaecological problem during the lockdown
- **Stress** : If the subject experienced stress during the lockdown

Observations

After applying the required ML algorithms to the data from the survey, the correlation between various different responses was obtained. For this model, the Pearson method of calculating correlation was used.

In this model, the aim was to find the features (responses) with the highest correlation to the feature AccessEffect , i.e., whether the access to sanitary products was affected due to the

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lockdown. According to the model, The highest plausible correlation with AccessEffect was Hesitation (Surpassing Medicine , SourceDuring , GynProb , scaled_age and Alternative because their correlation to AccessEffect is majorly due tothe fact that almost 90% of the responses to all these questions were the same.)

The high correlation between Hesitation and AccessEffect indicates the fact that sanitary products were inaccessible to a majority of young girls, due to their hesitation towards asking their male family members to get the required products for them.

The next in line for correlation to AccessEffect is Stress , which was in turn foundto have a high correlation with GynProb , Hesitation , PriceHike , and FamilyCovidP .

This shows that access to sanitary products during the lockdown was also restricteddue to various gynaecological problems experienced by women, the hike in prices of sanitary products in local shops, and if someone in their family had tested positive for Covid-19.

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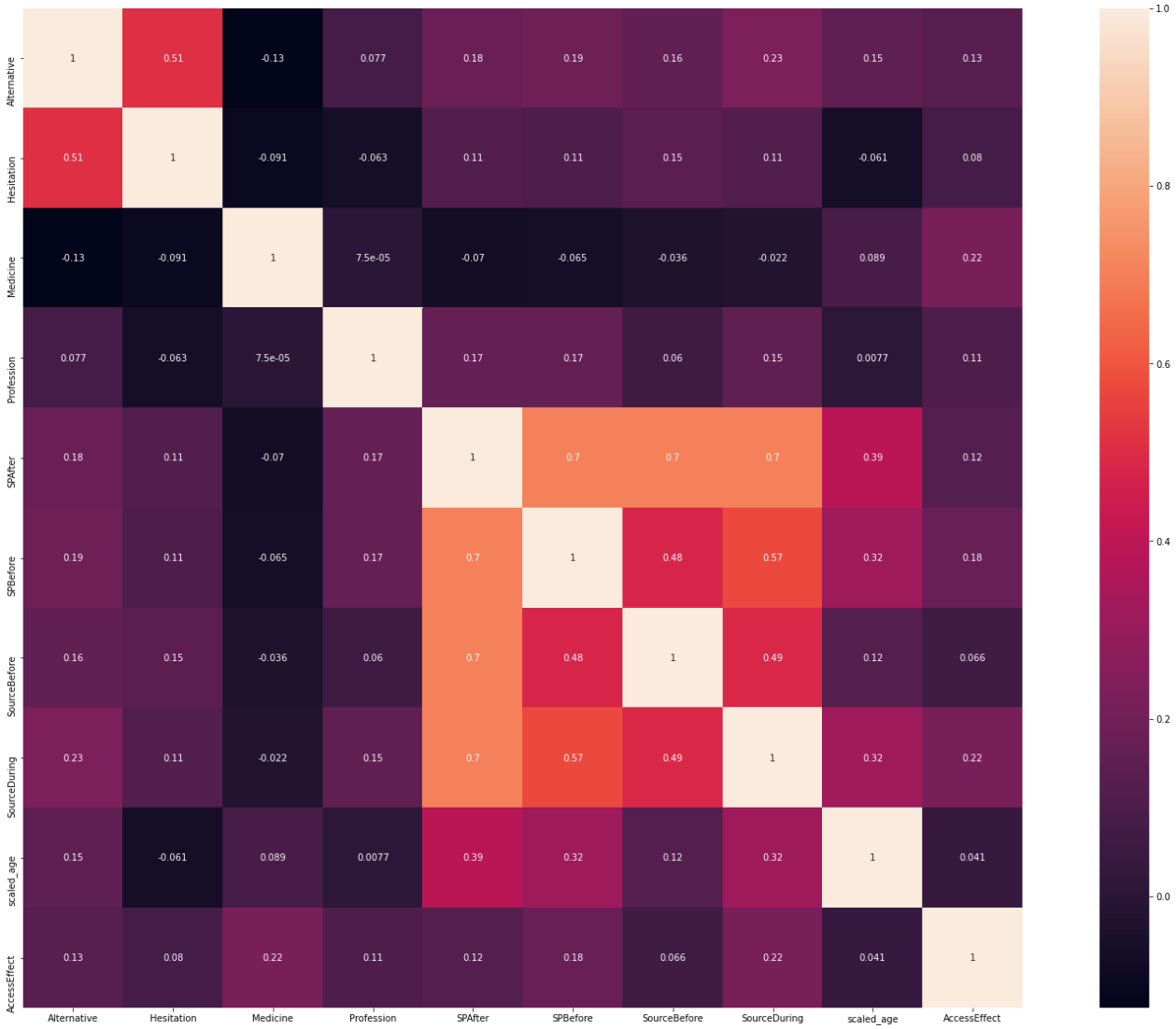
1. Correlation Heat-map from the model



This heat-map shows correlation between 10 factors ('Alternative', 'Hesitation', 'Medicine', 'Profession', 'SPAfter', 'SPBefore', 'SourceBefore', 'SourceDuring', 'scaled_age', 'AccessEffect') in colour-coded format.

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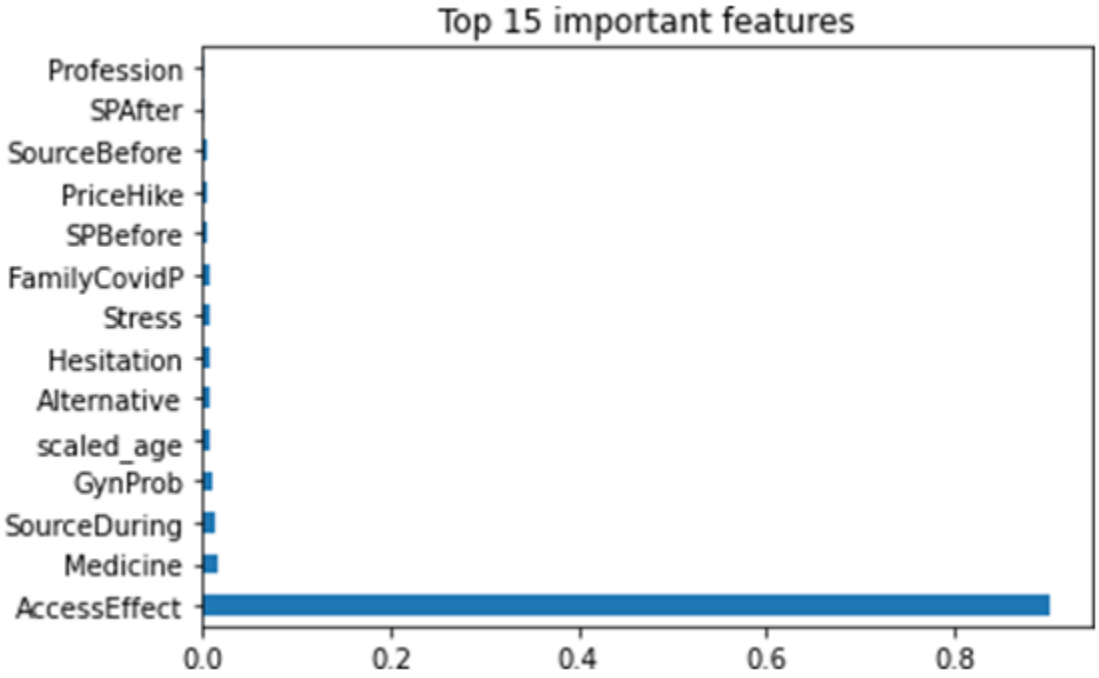
2. Bar-Graph of Top 15 Important Features with respect to correlation with 'AccessEffect'



This bar graph shows 15 features with the highest correlation (range: 0 - 1) with 'AccessEffect'. The reason for such low values of correlation is that the number of subjects for the survey were very high, as a result of which the end results became more diverse and hard to correlate. Nonetheless, even the low values of correlation provide a sufficiently above average basis for comparison between the features.

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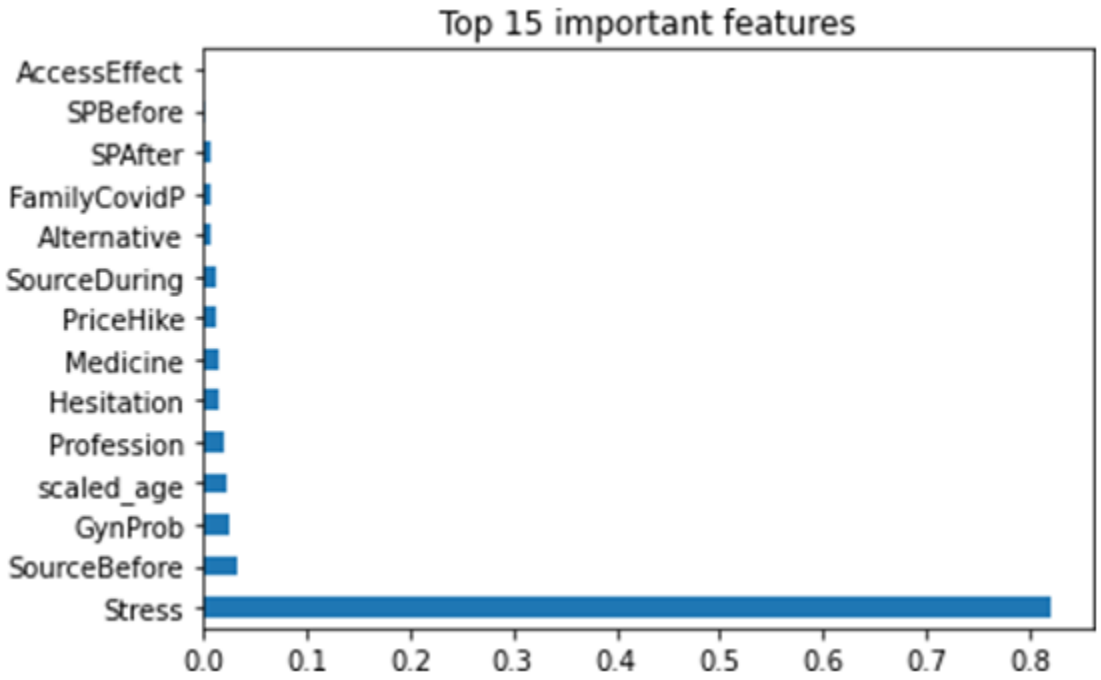
3. Bar-Graph of Top 15 Important Features with respect to correlation with 'Stress'



This bar graph shows 15 features with the highest correlation (range: 0 - 1) with 'Stress'. The reason for such low values of correlation is that the number of subjects forthe survey were very high, as a result of which the end results became more diverse andhard to correlate. Nonetheless, even the low values of correlation provide a sufficiently above average basis for comparison between the features.

Result and Discussion

Some points to be noted before proceeding with drawing conclusions from the machine learning analysis performed, are that some correlations calculated here may seemsenseless from a logical point of view (like the highest correlation between Stress experienced and Source of sanitary products before lockdown). But one has to keep in mind that the correlation calculations have been performed mathematically, by deriving scaled numeric values associated with the categorical variables which the data was initially in the form of, so some illogical correlations might have been drawn by connecting the frequency of similar answers together.

A. The major factors which dictate the conclusion from the analysis are:

1. AccessEffect : If there was any effect on accessibility of sanitary products due to the

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lockdown

2. Hesitation : If the subject experienced hesitation in asking male members of their family to get sanitary products for them during the lockdown

3. PriceHike : If there was any hike in prices of sanitary products in thesubject s nearby stores

4. FamilyCovidP : If there was a member of the subject s family who tested positive for Covid-19

5. GynProb : If the subject suffered from a gynaecological problemduring the lockdown

6. Stress : If the subject experienced stress during the lockdown

B. The access to sanitary products during the lockdown was mostly affected by the hesitation the subjects experienced in asking male members of their family to get sanitary products for them. This could be due to the fact that in lower middle class families, women are usually housewives, and even if they aren t, they rely on their husbands, fathers or brothers to do the major tasks for the family, like getting the monthly ration, paying the bills etc. During the lockdown, this role would have been even more intensified, as only selected members of a family could go out for chores, which was most commonly the male. Also, talking openly about menstruation and discussing menstrual hygiene is still a taboo in Indian households, which may have held many women back from expressing their need for sanitary products during a timewhen they couldn t go out themselves due to safety reasons.

C. Inaccessibility of sanitary products was also a problem for women experiencing gynaecological problems, who might need certain specific products or medication for their condition, which they weren t able to procure during the extremities of the lockdown. This probably meant that a majority of such women couldn t continue to consult their gynaecologists, which is even worse, especially if the condition requires immediate attention. It s also worth noting that a majority of the women suffering from gynaecological problems also said in the survey, that they were using home remedies and not prescribed medication for their treatment. This could even cause their problems to worsen.

D. If someone in the subject s family had tested positive for Covid-19, they were more likely to not have ready access to sanitary products. This could be because the priority would be given to the family member with the virus, and the rest of the familywould be taking extra precautions now that they experienced the virus firsthand. This shift in priorities would lead to only necessary communication and transactions with the outside world, like shopping only for essentials , which usually includes food and medicines. Since discussion on menstrual hygiene and female reproductive health is extremely limited in the country,

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sanitary products may not make the cutoff for being an essential .

E. For many women from lower middle class families, an irrational hike in prices could also be an obstacle to accessibility of sanitary products. As it happened with many other products during the lockdown, the shopkeepers may have started to withhold their supply of sanitary products and demand an exceptionally high price for them, which could lead to many financially weak subjects being unable to use quality sanitary products, which were previously affordable.

Conclusion

The results from the model show that access to sanitary products was majorly restricted by various social, cultural and economic factors. Societal norms and taboos about discussion on menstrual health and hygiene have hindered a very basic right to procure essential sanitary products. Patriarchal ideas and practices seem to be a thing of the past, but they are still very much prevalent, plaguing the lives of women and young girls in the most unfortunate of ways. Women living in one of the most developed metropolitan cities have been experiencing problems in procuring products to ensure basic health and hygiene since even before the pandemic. The lockdown has further amplified the situation, making it almost impossible to get sanitary products for women belonging to lower-middle class households, as sanitary products are being sold at irrationally high prices by local shopkeepers and chemists during the lockdown. Women are been forced touse cloths instead of proper sanitary products, which might lead to their health making a turn for the worse. With their main source of sanitary products, like government schools and NGO's, being shut down during the lockdown, they have been experiencing extreme situations due to lack of proper hygienic methods. Many women experiencing gynaecological problems have been using home-remedies instead of consulting an obstetrician, and the harsh reality of the situation is that even before the lockdown was imposed, these problems persisted, due to lack of awareness among both the women, and their families, regarding proper ways to ensure menstrual health and hygiene. The lockdown has simply brought the situation to light.

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The completion of this paper would not have been possible without the NGO Sacchi Saheli, who carried out the survey with the help of numerous other members and volunteers. Working with Sacchi Saheli was an enlightening and unique experience, memories of which I will forever cherish. I would like to express deep and sincere gratitude to all my mentors at Sacchi Saheli, who believed in me and gave me the opportunity to be a part of Sacchi Saheli's initiatives. Working with them has been very eye-opening. I was fully aware of the situation which we were addressing through this survey, but to listen to the details, and to talk to the people affected,

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made the situation so real; that it was not just on paper, but an actual problem faced by people living not so far away from me. I talked to students, their mothers, their sisters. Each one of them had a different thing to say, and some questioned me in ways that were so humbling. This made me realise that it might have started as a volunteer program, but it ended up being so much more than that. This was when I was inspired to analyse the results of the survey, so that I could be instrumental in spreading awareness about menstrual health and hygiene, and also about the situations prevailing in modern society, affected by recent factors, like the lockdown. I am thus eternally grateful to Sacchi Saheli for giving me this opportunity.

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