Maternal Mortality in Black Mothers Caused by Excessive Bleeding

Group 3 Section A04
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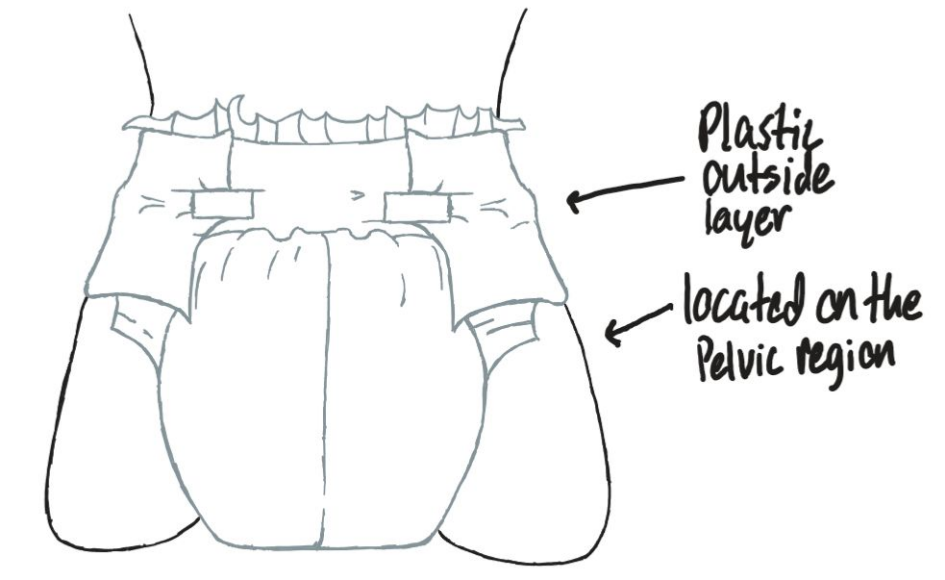
Problem Statement

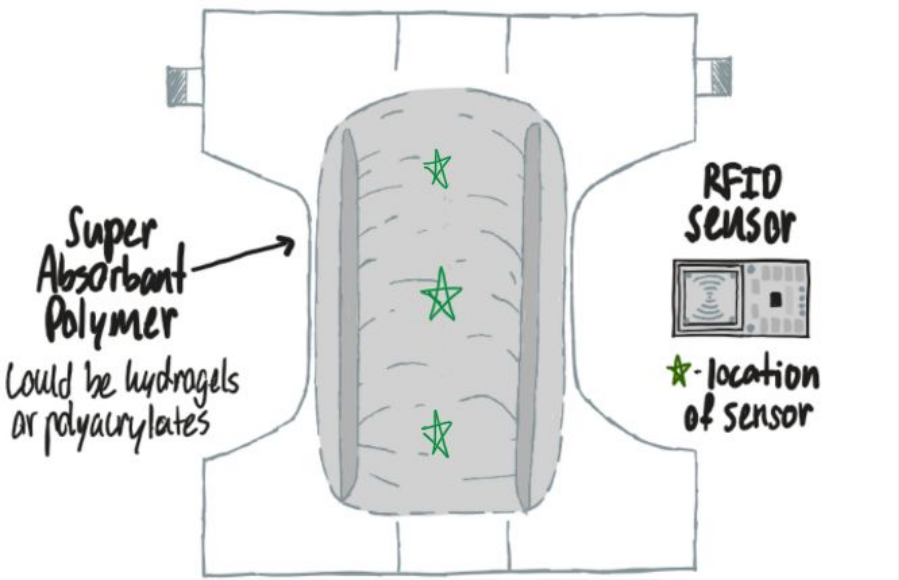
Our goal is to design a way to monitor **blood loss** in postpartum women that is **affordable**, **comfortable**, and **accurate** in its measurement in order to curb maternal mortality due to Postpartum Hemorrhaging.

User Group

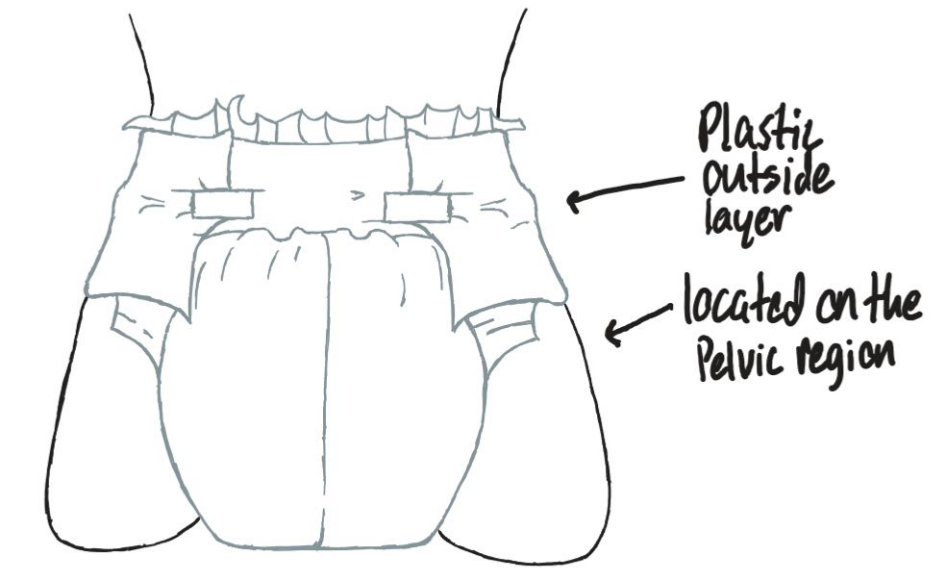
Black mothers from low socioeconomic backgrounds

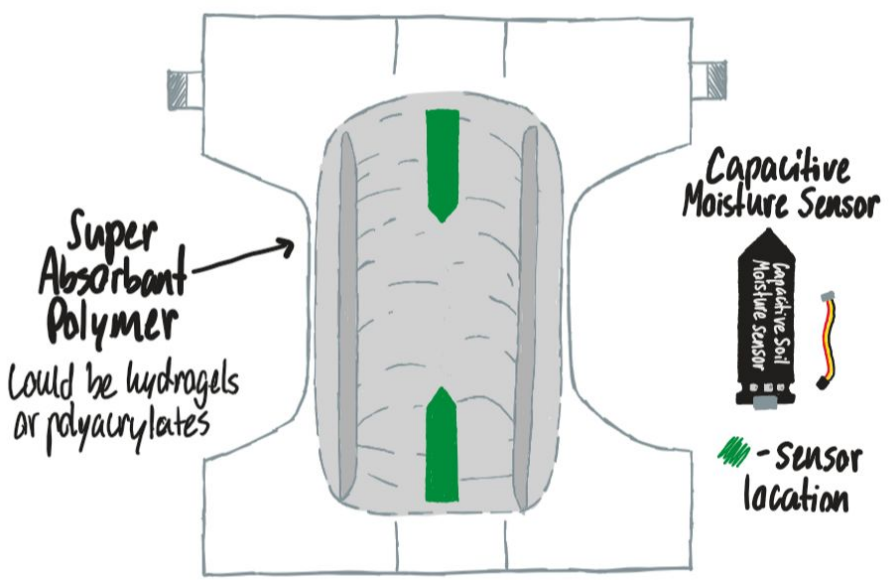
Design Concepts - RFID Tag Prototype





Design Concepts - Moisture Prototype





Testing Procedure

RFID Tag and Reader

1 Tag in Diaper

Measure out fake blood, confirm tag recognition, repeat until unrecognized

3 Tags in Diaper

Line the diaper with 3 RFID tags, repeat steps for 1 tag

Capacitance Moisture Sensor

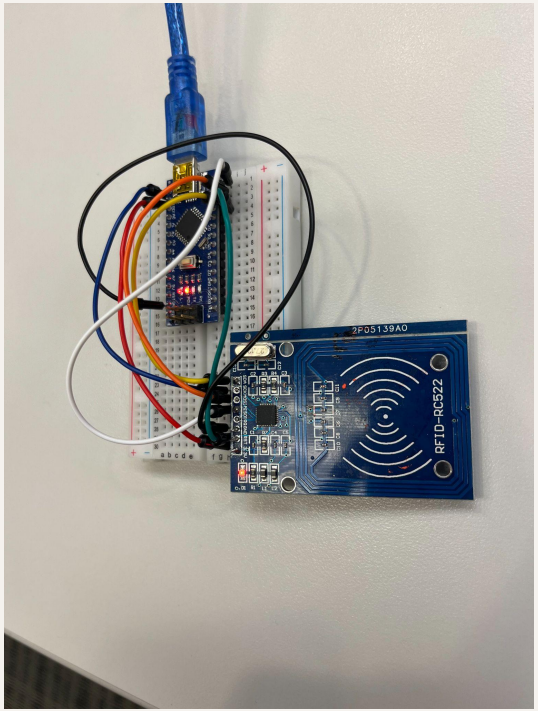
Sensor in Water

Place sensor in 25 mL of water, record moisture value, keep adding 25 mL of water

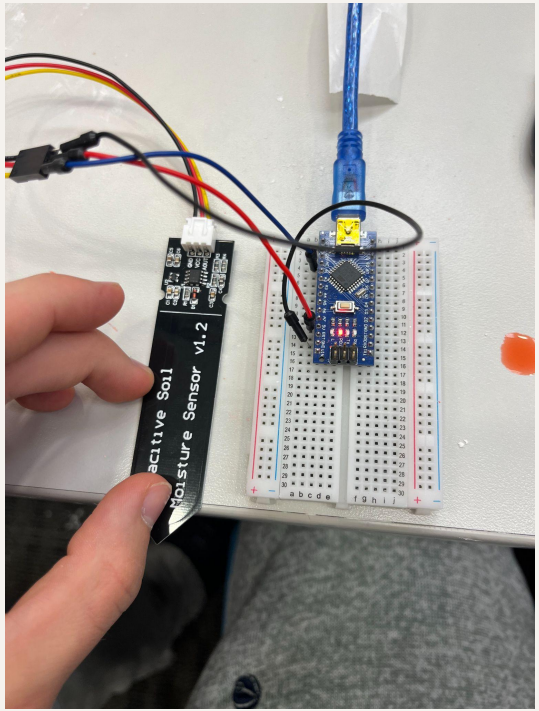
Sensor in Diaper

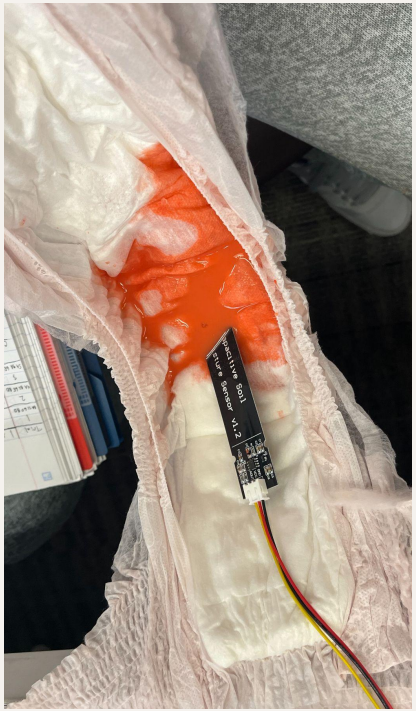
Secure sensor to diaper bottom, add 10 mL of blood at a time, repeat as needed

RFID Prototype



Moisture Prototype





Testing and Data Collection

RFID Tag Results	
Trial	Volume of Failure (mL)
1	260
2	75
3	70

Capacitance Moisture Sensor Results				
	Output Value			
Volume (mL)	Trial 1	Trial 2	Trial 3	Trial 4
0	487	481	483	483
25	280	425	463	296
50	240	450	417	330
75	215	327	328	332
100	215	285	291	308
125	223	293	284	309
150	200	280	255	284

C: > Users > timhi > OneDrive > Desktop > Coding > 2250 code.py > ...

```python
# Get volume inputs from the user
volume1 = int(input("Enter the first diaper volume: "))
volume2 = int(input("Enter the second diaper volume: "))
volume3 = int(input("Enter the third diaper volume: "))
volume4 = int(input("Enter the fourth diaper volume: "))

# Calculate the sum of the volumes
sum_of_volumes = volume1 + volume2 + volume3 + volume4

# Check the sum against different thresholds of volume
if sum_of_volumes < 300: #level is safe
    print(f"The sum of the volunmes is {sum_of_volumes}, " +
          "you are still within a safe level of blood loss.")
elif sum_of_volumes < 500: #level is moderately high
    print(f"The sum of the volunmes is {sum_of_volumes}, "
          + "you are still within a moderatley safe level of "
          + "blood loss but moniter the volumes closely as your level is high.")
else: #critial level
    print(f"The sum of the volunmes is {sum_of_volumes}, "
          + "you have reached an unsafe level of blood loss and "
          + "you should see your Gynaecologist.")
```

Computational Model

```
Enter the first diaper volume: 20
Enter the second diaper volumer: 200
Enter the third diaper volumer: 100
Enter the fourth diaper volume: 300
The sum of the volunmes is 620, you have reached an unsafe level of blood loss and you should see your Gynaecologist.
PS C:\Users\timhi\OneDrive\Desktop\Coding\CS2110\codingc> & C:/Users/timhi/AppData/Local/Microsoft/WindowsApps/python3.9.exe "c:/Users/timhi/OneDr
Enter the first diaper volume: 20
Enter the second diaper volumer: 30
Enter the third diaper volumer: 10
Enter the fourth diaper volume: 100
The sum of the volunmes is 160, you are still within a safe level of blood loss.
PS C:\Users\timhi\OneDrive\Desktop\Coding\CS2110\codingc> & C:/Users/timhi/AppData/Local/Microsoft/WindowsApps/python3.9.exe "c:/Users/timhi/OneDr
Enter the first diaper volume: 100
Enter the second diaper volume: 100
Enter the third diaper volume: 100
Enter the fourth diaper volume: 50
The sum of the volunmes is 350, you are still within a moderatley safe level of blood loss but moniter the volumes closely as your level is high.
```

Evaluation Criteria

Critical	Essential	Want
Reusable	Reliable	Uncomplicated Maintenance
Inexpensive	Durable	User Friendly
Hygienic	Accurate	Comfort
	Computational	

Pugh Matrix

Criteria	Standard Solution – Doctor's Visit	Concept 1 – RFID Sensor	Concept 2 – Moisture Sensor	Weight
Affordability	S	+	+	5
Ease of use and maintenance	S	+	S	4
Sensor Accuracy	S	S	+	4
Comfort	S	+	-	2
Feasibility of testing process	S	S	S	1
Evaluation Score	S	+11	+7	

Critical Questions

Where is the data collected by our product being stored?

How will the pricing compare to that of a standard postpartum diaper?

What will keep our user group from purchasing our product?

Where can our product be purchased by the user group?

Conclusions

After testing and evaluating our prototypes, we decided that we would stick to the RFID sensor if we were to move forward with this project.

Next Steps

- RFID reader with higher strength
- More testing
- Find funding
- Lowering cost of materials

References

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Thank you

Questions