

Gen AI Playbook

Datathon 2024

Understanding

**MATERNAL HEALTH
CHALLENGES IN UNITED
STATES**

using Gen AI tools

Twin Data Stars

MATERNAL HEALTH CHALLENGES IN UNITED STATES

The Time for Action is **NOW**

Maternal health crisis is marked by rising mortality rates, racial disparities, and inadequate prenatal care leading to significant economic and healthcare systemic changes

22.4

Maternal deaths per 100,000 live births which is alarmingly high as compared to other high income nations

2.5-4
.5x

Nationally, American Indian/Alaska Native, Black and Hawaiian/Pacific Islander women have rates of **maternal mortality** that were **2.5 to 4.5** times greater than other groups.



Sources

https://assets.americashealthrankings.org/app/uploads/ahr_2024_databrief-final-web.pdf

[ahr_2024databrief-stateprofiles.pdf \(americashealthrankings.org\)](#)

https://www.americashealthrankings.org/learn/reports/maternal-and-infant-health-disparities-data-brief?utm_source=mediaexternal&utm_medium=newsroomstory&utm_campaign=2024maternal&utm_content=report

Maternal health crisis is marked by rising mortality rates, racial disparities, and inadequate prenatal care leading to significant economic and healthcare systemic changes

\$60B annual expenditure on maternal health impacting members, payers and employers alike

32.9

Maternal deaths per 100,000 live births which is alarmingly high as compared to other developed nations

3-4x

Deaths in black women from pregnancy related complications compared to white women

20%

Pregnant women do not receive adequate prenatal care leading to preventable complications

Voices for Change

“

While pregnancy should be a time of immense hope and a positive experience for all women, it is still a dangerous experience for millions around the world who lack access to high quality, respectful healthcare.

Dr. Tedros Adhanom Ghebreyesus

Director-General, World Health Organization (WHO)

Globally, a woman dies from complications in childbirth every minute.

Jessica Capshaw

Actress and Maternal Health Advocate

Every baby's first breath on Earth could be one of peace and love. Every mother should be healthy and strong. Every birth could be safe and loving. But our world is not there yet.

Robin Lim

CNN Hero of the Year, Founder of Yayasan Bumi Sehat (Healthy Mother Earth Foundation)

I know that I can't solve all the maternal health challenges in the world by myself. I need and want others to join me. In order to reverse the maternal health crisis for black women in the U.S., we need concrete policies from our leaders and better protocols from hospitals.

Christy Turlington Burns

Founder of Every Mother Counts, Global Maternal Health Advocate

As indicated by the increase in maternal mortality in 2010, right now it's more dangerous to give birth in California than in Kuwait or Bosnia.

Amnesty International

”

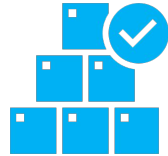
Call to action to address this crisis effectively

HHS Programs



Addressing maternal health through care delivery, access to care and social factors

Healthy Start Programs



Coordinating pre-natal and postpartum care, providing pregnancy and parenting education and referrals to services for depression, domestic violence etc.

AMA Recommendations



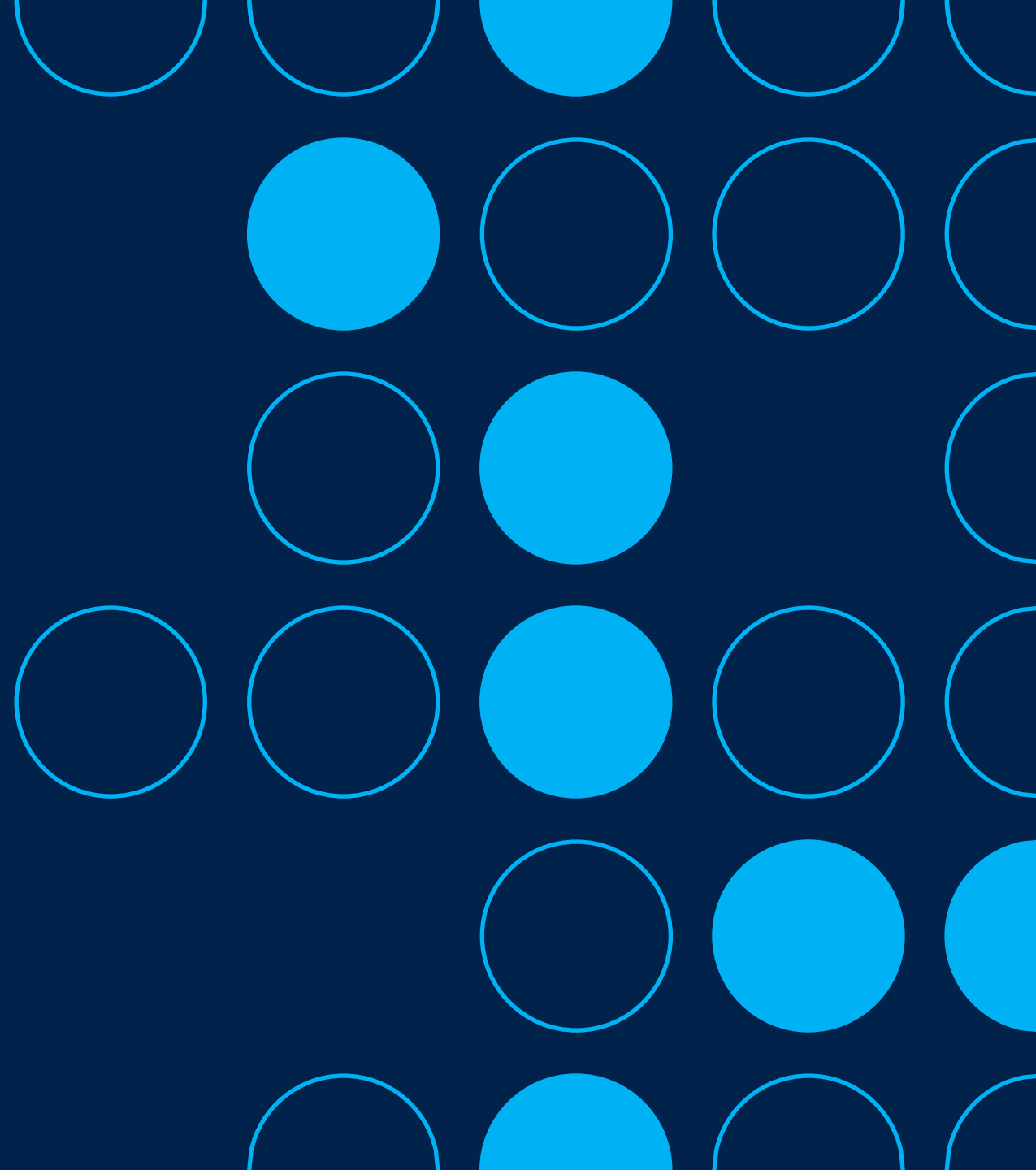
Comprehensive list of recommendations to improve U.S. maternal health, including reducing maternal mortality rates by 50% by 2025

White House Initiatives



Nationwide focus on improving maternal health by reducing low-risk cesarean deliveries by 25% and controlling blood pressure in 80% reproductive age women

Goal Approach & Results



Reimagining maternal health with Gen AI



Personalized Care Plans

Analyze a patient's medical history, lifestyle, and genetic information to create tailored care plans that address individual needs ensuring a more accurate and effective treatment



Predictive Analytics

Predict potential complications in pregnancies by analyzing vast amounts of data. This allows for early intervention and preventive measures, significantly reducing risks



Virtual Assistants

AI-powered chatbots and virtual assistants can provide 24/7 support to expectant mothers, answering questions, reminding them of appointments, and providing personalized health advice based on real-time data



Remote Monitoring

Wearable technology combined with AI can monitor vital signs and other health metrics of pregnant women. This data can be continuously analyzed to detect any abnormalities early, ensuring timely medical attention



Education and Training

Create customized educational content for both healthcare providers and patients; it can simulate various scenarios for training healthcare workers, improving their ability to manage complications during childbirth



Resource Allocation

Optimize the allocation of healthcare resources by predicting areas with higher maternal health risk ensuring that the right resources are deployed where they are needed the most



Mental Health Support

Provide mental health support by offering counseling services, detecting signs of postpartum depression early, and connecting women with the necessary mental health resources



Data-Driven Policy Making

AI can help identify trends and underlying issues in maternal health by analyzing large datasets, which can be leveraged by policymakers to create targeted interventions and improve healthcare policies

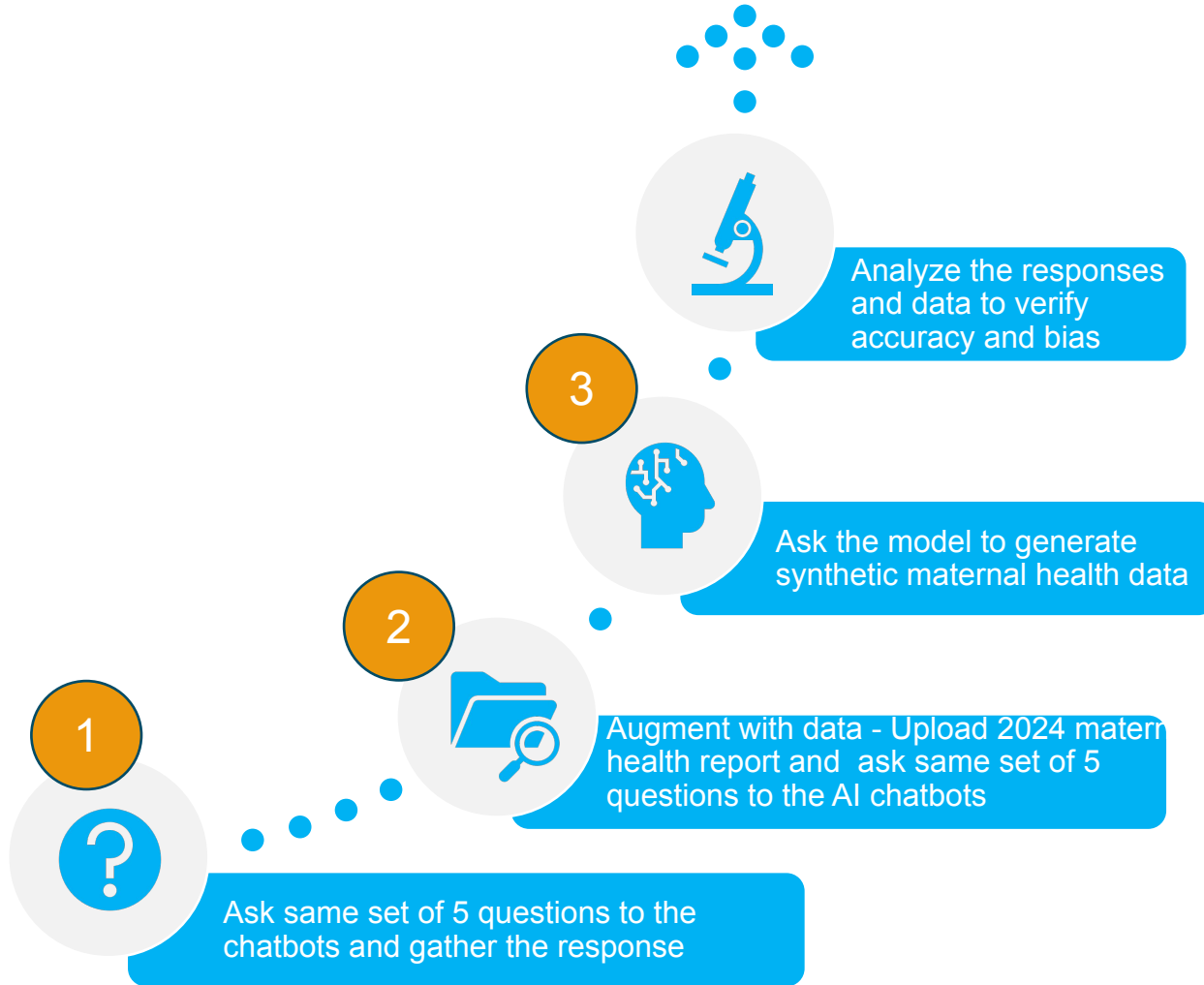
Goal

- ✓ Explore the following use cases for Gen AI chatbot platforms to understand US Maternal health challenge
 - Question Answer
 - Question and Answer with additional data
 - Synthetic data generation
- ✓ Compare responses and characteristics for 3 Gen AI models
 - ChatGPT 4o - Open AI
 - Claude 3.5 Sonnet - Anthropic
 - Gemini 1.5 Flash - Google
- ✓ Look for misinformation in the responses - spot check method
- ✓ Explore NotebookLM to create content to present results

Platforms' Overview

Feature	ChatGPT 4o	Gemini Flash 1.5	Claude 3.5 Sonnet	Gemini 1.5 Pro-notebook
Developer	OpenAI	Google	Anthropic	Google
Focus	Versatility Reasoning	Speed Real-time interactions	Strong reasoning Coding	General AI capabilities
Strengths	Image generation Internet access	Quick responses Real-time chat	Large context window Coding	Multimodal reasoning General tasks
Use Cases	Various applications, including coding and math problems	Chat applications Quick interactions	Complex problem-solving Coding	General AI tasks Multimodal applications

Our approach



Model	Model Size	Parameters
ChatGPT 4o	Large	~1.8 trillion parameters
Gemini Flash 1.5	Small	8 billion parameters
Claude 3.5 Sonnet	Medium	~175 billion parameters

- ChatGPT 4o is the largest among the three making it highly capable for complex tasks
- Gemini Flash 1.5 is the smallest, optimized for speed and efficiency
- Claude 3.5 Sonnet falls in between offering a balance of speed and intelligence

Questions and Ground truth

Ask the same set of 5 questions to the chatbots and gather responses without uploading the source files

Alabama



Disparity Highlights

Across measures with available state-level demographic data, the highlighted disparity ratios indicate where disparities are largest between racial/ethnic and education groups with the highest and lowest rates during a single time period.

Uninsured by Race/Ethnicity

3.8x
between Hispanic (377%) and Asian (10.0%) females ages 18-44.

Uninsured by Education

5.7x
between females ages 18-44 with less than a high school education (29.5%) and those who are college graduates (5.2%).

Trend Highlights

In each category of measures with available state-level demographic data, the trends reveal the most significant increases or decreases observed in a single demographic group over time.

Social & Economic Factors

30%▼

Residential Mobility from 22.8% to 15.9% of females ages 18-44 with less than a high school education between 2010-2014 and 2018-2022.

76%▲

Poverty from 3.3% to 5.8% of females ages 18-44 with household incomes of \$50,000-\$74,999 between 2010-2014 and 2018-2022.

Physical Environment

43%▼

Severe Housing Cost Burden from 20.5% to 11.6% of multiracial females ages 18-44 between 2010-2014 and 2018-2022.

10%▲

Severe Housing Cost Burden from 55.9% to 61.5% of females ages 18-44 with household incomes below \$25,000 between 2010-2014 and 2018-2022.

Clinical Care

48%▼

Uninsured from 19.2% to 10.0% of Asian females ages 18-44 between 2010-2014 and 2018-2022.

Population Estimates

Number of females ages 18-44 affected annually in Alabama (2018-2022)

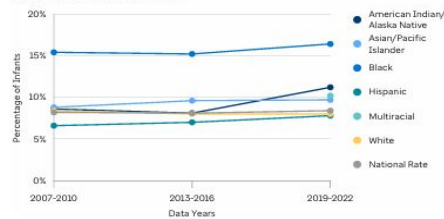
177,500 Living in Poverty

104,700 Experiencing Severe Housing Cost Burden

132,200 Uninsured

Trends

Low Birth Weight
By Race/Ethnicity in Alabama



Healthy People 2030 (HP2030) Targets

Infant Mortality

National Rate: 5.5
HP2030 Target: 5.0



Maternal Mortality

National Rate: 22.4
HP2030 Target: 15.7



Severe Maternal Morbidity

National Rate: 88.3
HP2030 Target: 64.4



1

How does the national rate of maternal mortality compare to the Healthy People 2030 target?

National rate is 22.4 while healthy People 2030 target is 15.7

2

Based on 2024 America's Health Rankings® Maternal and Infant Health Disparities Data Brief, what are the social and economic factors contributing to maternal mortality?

Poverty, Residential Mobility

3

In which state is the disparity in uninsured rates by education level the largest?

Arkansas

4

Which state has the highest maternal mortality rate?

Alabama

5

Which race/ethnicity has the highest mortality rate?

American Indian/Alaska Native

Use Case 1: Basic Q & A

1

How does the national rate of maternal mortality compare to the Healthy People 2030 target?

Gemini & ChatGPT: Provided inaccurate information and results that could not be trusted

Claude: Provided a more truthful response, acknowledging it doesn't have access to report

2

Based on 2024 America's Health Rankings Maternal and Infant Health Disparities Data Brief ,What are the social and economic factors contributing to maternal mortality?

Gemini & ChatGPT: Provided a limited list of factors and were uncertain if they had access to the report

Claude: Acknowledged it doesn't have access to report

3

In which state is the disparity in uninsured rates by race/ethnicity the largest?

All Models: Could not definitively answer the question without access to specific data

4

Which state has the highest maternal mortality rate?

Gemini & ChatGPT: Provided inaccurate information; Gemini stated Mississippi while ChatGPT gave Tennessee as the response

Claude: Incorrectly identified Louisiana as having consistently high rates.

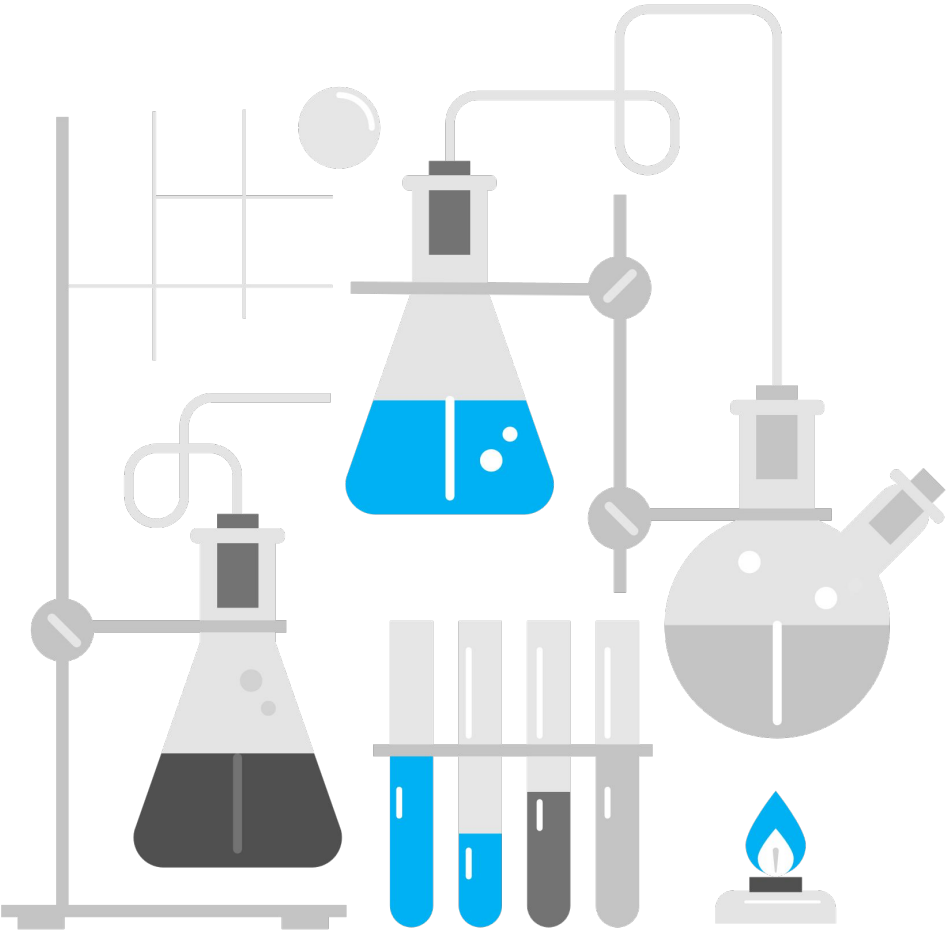
5

Which race/ethnicity has the highest maternal mortality rate based on the 2024 maternal health report?

All Models: identified "Black, non-Hispanic women".

Experiment 2

Ask the same set of 5 questions to the chatbots and gather the response after uploading source files



1

How does the national rate of maternal mortality compare to the Healthy People 2030 target?

National rate is 22.4 while healthy People 2030 target is 15.7

2

Based on 2024 America's Health Rankings® Maternal and Infant Health Disparities Data Brief, what are the social and economic factors contributing to maternal mortality?

Poverty, Residential Mobility

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Based on 2024 America's Health Rankings® Maternal and Infant Health Disparities Data Brief, in which state is the disparity in uninsured rates by education level the largest?

Arkansas

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Based on 2024 America's Health Rankings® Maternal and Infant Health Disparities Data Brief, Which state has the highest maternal mortality rate?

Alabama

5

Based on 2024 America's Health Rankings® Maternal and Infant Health Disparities Data Brief, which race/ethnicity has the highest mortality rate?

American Indian/Alaska Native

Use Case 2 : Q & A with Additional Context

1

How does the national rate of maternal mortality compare to the Healthy People 2030 target?

Gemini: Provided an incomplete response, mentioning six states meeting the target but not stating the national rate
ChatGPT & Claude: Accurately identified the national rate and compared it to the Healthy People 2030 target

2

Based on 2024 America's Health Rankings Maternal and Infant Health Disparities Data Brief, What are the social and economic factors contributing to maternal mortality?

All Models: Struggled to extract the exact answer, indicating difficulty with complex reports

3

In which state is the disparity in uninsured rates by race/ethnicity the largest?

ChatGPT & Claude: Correctly identified Arkansas
Gemini : Could not provide definite answer

4

Which state has the highest maternal mortality rate?

Gemini: Could not determine the answer from the provided document
ChatGPT: Alabama
Claude: Incorrectly identified Arizona

5

Which race/ethnicity has the highest maternal mortality rate based on the 2024 maternal health report?

All Models: Correctly identified "American Indian/Alaska Native" as having the highest rate

Use case 3: Synthetic data generation

Prompt: Generate 10 synthetic records for following schema - first name, last name, age, gender, length of pregnancy, education, ethnicity

Gemini

First Name	Last Name	Age	Gender	Length of Preg	Education	Ethnicity
Maria	Ramirez	28	Female	40 weeks	Bachelor's Degri	Hispanic
David	Lee	32	Male	39 weeks	High School Dipl	Asian
Sarah	Johnson	25	Female	38 weeks	Associate's Degri	White
Ahmed	Khan	35	Male	41 weeks	Master's Degree	Middle Eastern
Emily	Chen	27	Female	37 weeks	High School Dipl	Asian
Michael	Brown	30	Male	40 weeks	Bachelor's Degri	Black or African American
Olivia	Martinez	29	Female	38 weeks	Associate's Degri	Hispanic
Ethan	Kim	33	Male	39 weeks	Master's Degree	Asian
Ava	Wilson	26	Female	37 weeks	High School Dipl	White
Noah	Patel	31	Male	40 weeks	Bachelor's Degri	Indian

ChatGPT

No males in the generated data

First Name	Last Name	Age	Gender	Length of Pregnancy (wks)	Education	Ethnicity
Sarah	Thompson	28	Female	38	Bachelor's	Caucasian
Maria	Gonzalez	32	Female	40	Master's	Hispanic
Emily	Johnson	25	Female	37	High School	African American
Rachel	Davis	29	Female	36	Associate's	Asian
Olivia	Brown	27	Female	39	Bachelor's	Caucasian
Jessica	Patel	31	Female	41	PhD	Indian
Hannah	Wong	24	Female	38	Some College	Asian
Laura	Garcia	33	Female	40	Master's	Hispanic
Angela	Martinez	30	Female	37	Bachelor's	Hispanic
Chloe	Robinson	26	Female	39	High School	Caucasian

Claude

Several entries for males include "N/A" in the "Length of Pregnancy" column, acknowledging this biological fact

First Name	Last Name	Age	Gender	Length of Pregnancy (wks)	Education	Ethnicity
Emily	Johnson	28	Female	38 weeks	Bachelor's deg	Caucasian
Miguel	Rodriguez	32	Male	N/A	High school dipl	Hispanic
Aisha	Patel	35	Female	42 weeks	Master's degree	South Asian
Liam	O'Connor	29	Male	N/A	Associate's deg	Irish
Zoe	Chen	31	Female	40 weeks	PhD	Chinese
Jamal	Williams	26	Male	N/A	Some college	African American
Sofia	Novak	33	Female	36 weeks	Bachelor's deg	Eastern European
Ethan	Smith	30	Male	N/A	High school dipl	Caucasian
Fatima	Al-Sayed	37	Female	39 weeks	Master's degree	Middle Eastern
Olivia	Thompson	25	Female	41 weeks	Bachelor's deg	Mixed race

Use Case - Content creation for Datathon Submission

Task	What we did	Tools used
Summarization: Create notes from brainstorming discussions	Recorded our meeting, and from the audio generated text	Wav to Text - NotebookLM
Experiments and results recording	Did the work and created a google doc and and Excel	Gen AI tools, Gemini, Claude and GPT
Podcast	Create a Podcast to share	NotebookLM
Question Generation	Took a few questions from Gen AI with prompting techniques	NotebookLM

Overall Observations

Out of the 3 models we tested with the limited scope, ChatGPT and Claude gave more accurate, meaningful answers compared to Gemini, in our experimentation

Q&A Accuracy

All three models exhibited inconsistencies and did not provide accurate results without additional sources

Additional Context

Adding additional sources did not significantly improve Q&A accuracy

Complex Information

Models struggled to extract specific details and draw comprehensive conclusions from the report, particularly when dealing with complex data or formatting

Synthetic Data

Models inconsistent handling biological reality. USE CAUTION

There is ambiguity surrounding males and pregnancy-related data generated from Gemini.

It listed "Length of Pregnancy" for both males suggesting potential errors or misunderstandings within the synthetic data generation.

Ambiguity arises from the inclusion of "Length of Pregnancy" data for males, which contradicts biological reality, highlighting the importance of carefully considering and validating synthetic data, especially when it relates to sensitive or complex topics like pregnancy.

While synthetic data generated by Claude also has several entries for males include "N/A" in the "Length of Pregnancy" column, acknowledging this biological fact, **the sources (chatbots) themselves do not offer definitive reasons for the inclusion of males in this context.**

Great productivity improving tool for Content Generation, e.g. presentation creation , summarization etc.

Learnings

- Choose the model thoughtfully for the tasks - All models are not the same
- Review the results - The models are not at a maturity yet to completely trust the responses natively, build systems to review results
- Careful consideration and validation are necessary when using Gen AI for synthetic data generation in sensitive domains.
- Few Gen AI models has limitations in processing complex data and drawing conclusions from reports.
- Great for content creation , productivity improvement
- It is a journey and keep continuing to learn with deep technical exploration

Thank you!

Twin Data Stars

Jayanthi Suryanarayana

Praneesha Goel

Sowmya Polavarapu

Playbook at

[**https://github.com/jaynetra/Datathon2024**](https://github.com/jaynetra/Datathon2024)