Rotman

Course Code:	RSM 8431	**Student Numbers**: *Please list all student numbers included in this group assignment.*	1003499289 1009698043 1009860704 1006006153 1009698506 1005936490
Course Title:	Analytics Colloquia		
Instructor Name:			
Assignment Title:	Assignment 3 Healthcare Analytics Consulting Colloquia		
Date:	2024 Feb 22nd		

Academic Integrity Compliance

In submitting this **group** work, we affirm:

- The student numbers listed above are correct and complete.
- The work is original. Due credit is given to others where appropriate and we have acknowledged the ideas, research, phrases etc. of others with accurate and proper citations.
- All members have contributed substantially and proportionally to this assignment.
- All members have sufficient familiarity with the entire contents to be able to sign off on this work as original.
- This is the final version of the assignment and not a draft.
- We have followed any specific formatting requirements set by the instructor.
- We are submitting this work for the correct course, via the specified platform/method (e.g., Quercus).
- We accept and acknowledge that any assignments found to be plagiarized in any way will be subject to sanctions under the University of Toronto's:

  Code of Behaviour on Academic Matters.

We agree that the statements above are true. If we have concerns, we will consult the course instructor immediately.

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Client Questions:

How many vaccines should CaliHealth order to meet the demand of patients desiring to get vaccinated?

1. Use vaccination survey data and likelihood for vaccination to calculate average likelihood of getting vaccination which is 73.4%. With assumption: The 2000 survey respondents' intention represent average likelihood for vaccination among California

2. For each of city in California, multiply total population with average likelihood of getting vaccination to estimate total demand for each city

	city	total_demand
0	Acampo	6040.736545
1	Acton	5457.072768
2	Adelanto	25542.448362
3	Adin	451.513487
4	Agoura Hills	19103.792614

3. Group city by county and then summarize total demand of each county

	county	total_demand
0	Alameda	1.223870e+06
1	Alpine	6.805740e+02
2	Amador	2.857383e+04
3	Butte	1.640293e+05
4	Calaveras	3.333564e+04
5	Colusa	1.590355e+04

4. Total demand estimation is 28895598 vaccines for the entire population among all conties.

Are the proposed vaccination sites sufficient to meet patient demand?

Yes, if it takes 395 days for supply to meet demand for a vaccine, it indicates that during this period, the supply has been unable to meet the demand. This situation can occur in various contexts, such as during the initial rollout of a new vaccine, especially in situations where production capacities are limited, distribution faces logistical challenges, or there is an unexpected surge in demand.

In public health and supply chain management, the gap between supply and demand, especially over such a prolonged period, underscores the need for strategies to ramp up production, improve distribution efficiencies, or prioritize vaccination for high-risk or critical population segments until supply can adequately meet demand.

Are there any ideas to optimize the location of vaccination clinics?

The optimization should focus on areas with high walkability scores to ensure clinics are easily accessible on foot for a larger portion of the population. Conversely, identifying counties with lower walkability scores might highlight areas where additional transportation support or more strategically placed clinics could improve accessibility.

1. Average Walkability Score: Areas with higher average walkability scores may be more accessible for people to reach on foot, making them prime candidates for vaccination clinics.
2. Population Density: Although not directly provided in the data, areas with higher walkability scores often correlate with higher population densities. Placing clinics in these areas could ensure higher accessibility for a larger number of people.

The average walkability score across all counties is approximately 9.37, with a standard deviation of 1.27, indicating some variation in how walkable counties are on average.

Specifically, Los Angeles County and Kings County have the highest average walkability scores among the country group, suggesting they may be particularly accessible for people walking to vaccination clinics.

Therefore, Optimization should Focus on areas within these counties that have high walkability scores to ensure clinics are easily accessible on foot.

What should CaliHealth consider to ensure that vaccine locations and distribution are equitable?

Based on the dataset of CaliforniaCensusDataByZip code. The total population per ZIP code ranges widely, from 0 up to 110,750, with a median of 15,974. This indicates significant variation in population density across different areas, suggesting the need to allocate vaccine resources proportionally to serve higher population areas effectively while not ignoring less populated regions.

The percentage of the population aged 65 and over varies significantly, with a mean of approximately 18.76% and a wide spread. Given that the elderly are at higher risk from COVID-19. The areas with a higher percentage of elderly residents should be prioritized for vaccine distribution.

The percentage of the Hispanic or Latino population varies from 0% to 100%, with a mean of around 30.27%. This diversity underscores the need for vaccine distribution strategies that are inclusive and sensitive to the needs of ethnically diverse communities, ensuring that language and cultural barriers are addressed

The number of housing units also varies widely from 0 to 37,891, which can serve as a rough proxy for population density. Areas with a higher number of housing units might indicate higher population density, necessitating more concentrated vaccine distribution efforts to prevent outbreaks.

To ensure equitable distribution, CaliHealth should consider setting up vaccine distribution centers in areas with high population densities to reach more people efficiently and a significant percentage of elderly residents, given their increased risk. CaliHealth also needs to ensure high racial and ethnic diversity, ensuring that distribution efforts are culturally and linguistically inclusive. Moreover, focusing on ZIP codes that might indicate lower access to healthcare services. By focusing on these areas, CaliHealth can better allocate resources to meet the diverse needs of California's population, ensuring that vaccine distribution is as equitable and effective as possible.

How many staff are needed to run the vaccination program in a large hospital site for a single, 12-hour day?

With Assumptions:

- Staff is working at 12 hour efficiency
- Sample given is representative of the population

Sample of 6034 patient process logging recorded at vaccine clinic where:

- 5058 population; 16.2% of population – previous reaction = 0
- 976 population; 83.8% of population – previous reaction = 1

For we derived with 3800 patients are served per day in a large hospital:

- Approximately 3184 patients (83.8% of 3800) have a PreviousReaction of 0.
- Approximately 616 patients (16.2% of 3800) have a PreviousReaction of 1.

Next calculation on average duration for each procedure is shown as,

Type	Avg duration in min prev_reaction = 0	Avg duration in min prev_reaction = 1
Administer Vaccine	2.75	3.73
Assess Risk Factors	1.75	2.59
Check-In	1	1
Check-Out	2.91	2.89
Deliver Vaccine	0.33	0.34
Observation		10.02
Screening	0.37	0.37

With the Position of assigned correlated task, we calculated the number of staff needed for 12 hour shift in a large hospital, the result is shown below:

Position	Task	# of staff needed
Screener	Screening	2
Scheduler	Check-in + Check-out	21
Nurse	Access Risk Factor, Administer Vaccine, Deliver Vaccine	28
Nurse for Observation	Observation	1
Runner	Get a batch of 20 vaccines	2
Pharmacist	Give vaccination dose to runner	2
	Total	56

Rotman

Final Page

Grade: _____