Business and Marketing Analysis Research in Healthcare Technology for Remote Patient Monitoring Services

Cowriters:
Qianwen Wang
Yifei Zhao
School of Business, University of Wisconsin-Madison
MHR 765: Contemporary Topics
Dr. Adam J Bock
April 30, 2024

deliverable checklist

1. Voice of customer/ stakeholder: interviews
2. Voice of customer/ stakeholder: online survey
3. **Market/ market size/ market trends analysis**

Executive Summary

This part targeted on the scopes of the key proposals along with its execution procedures, under an outline starting with the current marketing position of Chirp, the introduction to criterias associated with implementation of remote patient monitoring (RPM) technologies in healthcare sectors for aging home & nursing home usage, and willingness to pay for new products per market segment.

Within the Exploratory Analysis, overview of the caregiving industry's essential features are identified and explained. Driving insights from the data, our team were able to discern some informative patterns from the associated research centered around the idea of emerging new technologies in terms of its adaptation and purchase willingness from the consumer side. In terms of demographic information, insights were retrieved on potential high-stake population exposure to falling injuries, along from some analysis about the future of aging generations who are susceptible from the baneful influence under dementia, the segment group of consumer portrayed with high purchasing power as well as high willingness to adapt for new digital services. Our team delved into the studies showing an uptrend of spending power as well as the deteriorative impact from dementia upon the aging generations from our current society.

Pivoting into the next part, the report exploited the secondary data to uncover market patterns as well as potential growth opportunities in fields where digital caregiving is mostly needed. At the last part, the report inquiries on finding actual market size based on the governmental dataset, from multiple levels of aspects.

Progress Report

Sponsor's current position:

In the current healthcare domain and especially in aging care and nursing home with Remote Patient Monitoring (RPM) services, Chirp was estimated to acquire an serviceable obtainable market share of $100M in the domain by approximately 2% market share in 5 years, account for a total 170K population of subscribers. The total addressable market within the US was estimated as $9B.

Market size and trends analysis

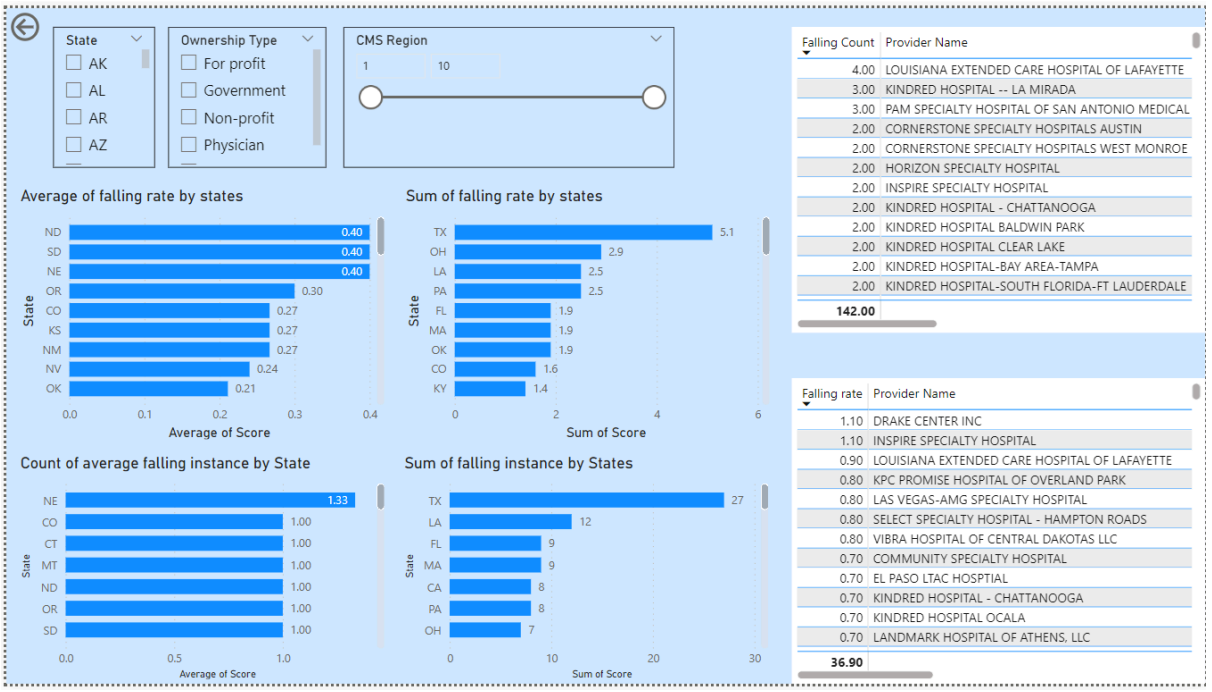
Secondary data for exploratory analysis

To better identify the optimal region for Chirp's product initiation into the U.S. market, our team took advantage of the existing secondary data sources, mostly third-party data gathered from *Statista*, as well as several trustworthy sources from websites like *npj* and *Pew Research Center*. Exploratory analysis was conducted based on the understanding of the macro industrial trends as well as the market demand analysis.

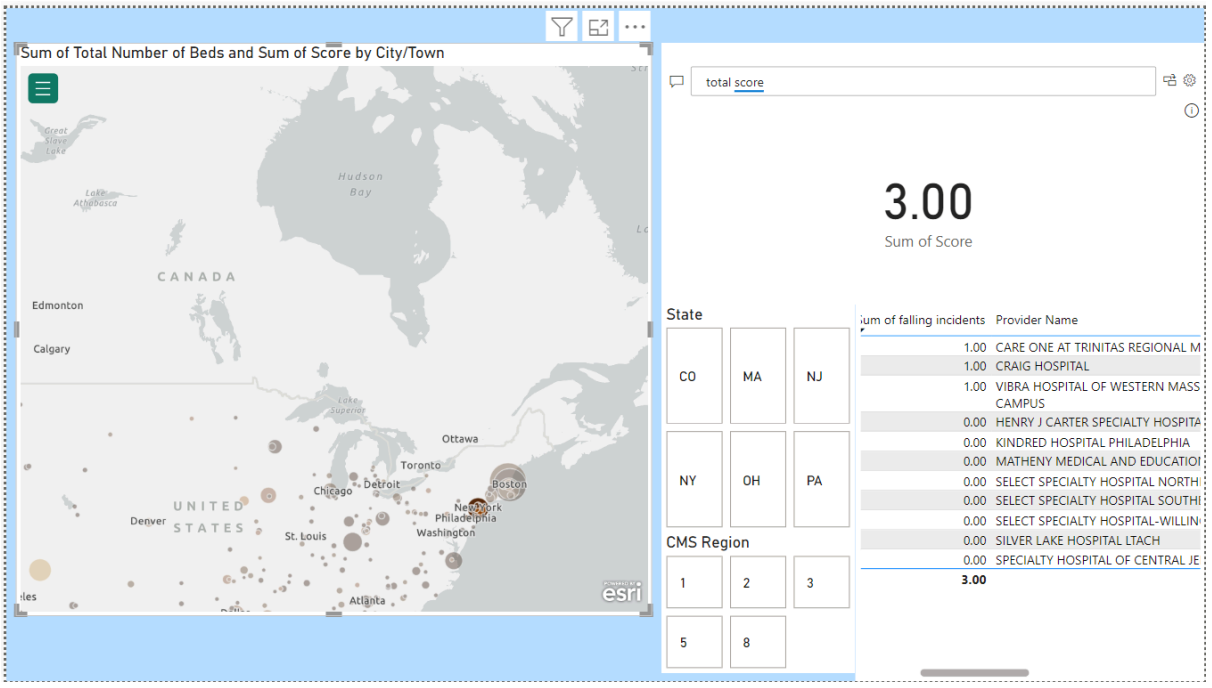
Primary data for market discovery analysis

The primary data source, Data.CMS.gov, effectively generates insights by interpreting the narratives revealed by the data, which guide our future business decisions towards profitability. In our primary research, we delve deeply into the study of fall incident injury statistics. To enhance the analysis's utility and interactivity, our team utilizes the Power BI dashboard as a tool to transform raw data into compelling stories and visual graphs. The initial dataset, sourced from CMS.gov—a governmental agency that oversees long-term-care hospitals (LTCH) at both national and local levels—is integrated within the dashboard. The dashboard is structured into three key sections: analysis of regional market size, examination of regional demand, and geographical identification of market size. Each section offers unique advantages and provides detailed insights into data patterns from various perspectives. To have a sense of how the interface operates, the following snapshots are attached for the purpose of preview:

Dashboard 1: On the bottom showcases the four metrics identifying the total obtainable market size, with each value shown in descending order to identify the top priority of target entities. The top left table showed the metadata of the facility, along with key variables accounting for its market share as well as the contact information.



Dashboard 2: On the bottom left showcases key metrics that factor in the demand of RPM service based on the frequencies of falling incidents. On the right showcased the table with entities given the selected filter attributes.



Dashboard 3: A visual-friendly map showcases the headcount of beds by facility level from each state. Top right shows a generative query assistant that display data output based on the question.

Overview for the Healthcare Sector

There are many different types of falls, such as flat falls, being knocked down by car, neurological falls, pathological falls, and pharmacological falls.

Choose highest applicable score from each category		Circle all that apply at the time of this fall
History of falling	No	0
	Yes	25
Secondary diagnosis (More than one diagnosis)	No	0
	Yes	15
Ambulatory aid	None, on bedrest, uses W/C, or nurse assists	0
	Crutches, cane(s), walker	15
	Furniture	30
IV/Heparin lock or saline PIID	No	0
	Yes	20
Gait/transferring	Normal, on bedrest, immobile	0
	Weak (Uses touch for balance)	10
	Impaired (Unsteady, difficulty rising to stand)	20
Mental status	Oriented to own ability	0
	Forgets limitation	15
Total Morse Fall Scale score at the time of fall (high risk >50)		

Before go to hospital / nursing home:

Hospitals and nursing homes have many risk assessments such as: the *Morse fall scale* to evaluate the risk of falls at admission. Rank people by several different risk levels and with different care.

Treatment / housing criterias:

Inperson Monitor:

Patients will have extra care with high risk, such as nurses will *check twice an hour*. Or in some way they will be required not to leave the bed during the treatment.

Digital Monitor

Some facilities have *cameras* in the corridor or main gate, depending on the policies individually, and it's also different within general ward, intensive care unit, emergency room, ICU.

And most of them have *nursing call systems*, and since there will be plenty of people in the facilities, it's rare that a patient falls down but no one is found. They also have *push bottoms* distributed within facilities such as the bathroom, restroom and many of them will have wearable devices, or in more convenient ways, they have mobile phones behind.

Post Surgery requirement:

When people take *medicine that may cause dizziness or weakness* such as blood pressure medicine, local anesthetic, painkillers, or diuretics, or any other different surgery, they will be asked to sit, stand, slow walk, and exercise gradually. And a higher frequency of falls happen after they leave the hospital.

Business Aspect:

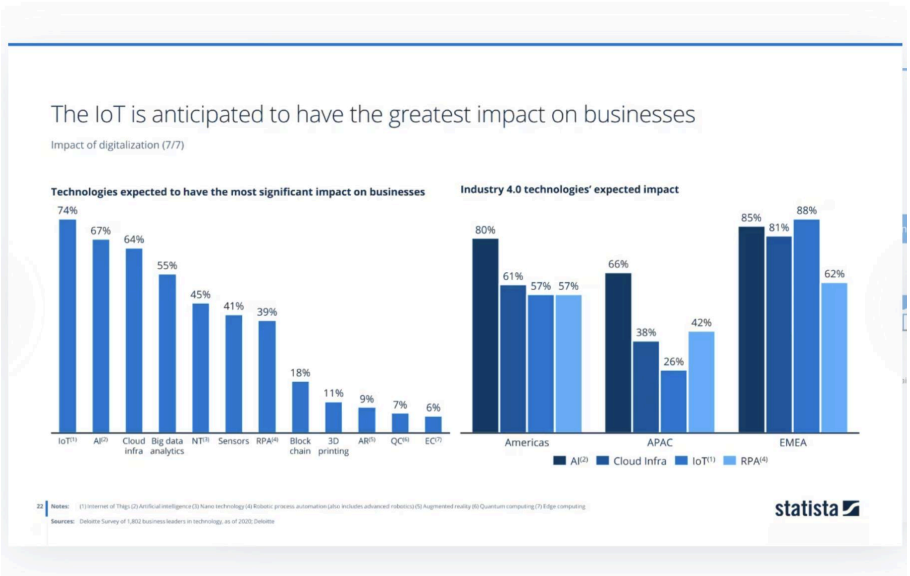
After many investigations, we contacted an orthopedic surgeon who has been in the industry for more than 50 years and has several hospitals of his own. From a comprehensive understanding, from the perspective of hospitals or nursing homes, if an institution wants to introduce new equipment, the most important thing to consider is how much money they will pay or spend if a patient falls in their own facilities. In comparison, if the introduction of new equipment can make it obsolete or solve the problem from its root, how much money can they save out of it?

"If the installation of new equipment can make a profit of at least $1, then it is acceptable for hospitals or nursing homes to introduce it. If the profit reaches

$10, then they will definitely introduce it." said by one General surgical oncologist during the interview.

Decades ago, the requirement piloting process was deemed as similar as shown from the introduction of cameras. At that time, the businesses were analyzing aspects of the camera's price, niche of the market they could serve, at what height, and returns on investment. From a consumer perspective, the fundamental principle is nothing else but the profit margins as well as other conditional trade-offs that maximize the fortune out of the investment. The conclusion from the research was deemed highly aligned with our initial hypothesis.

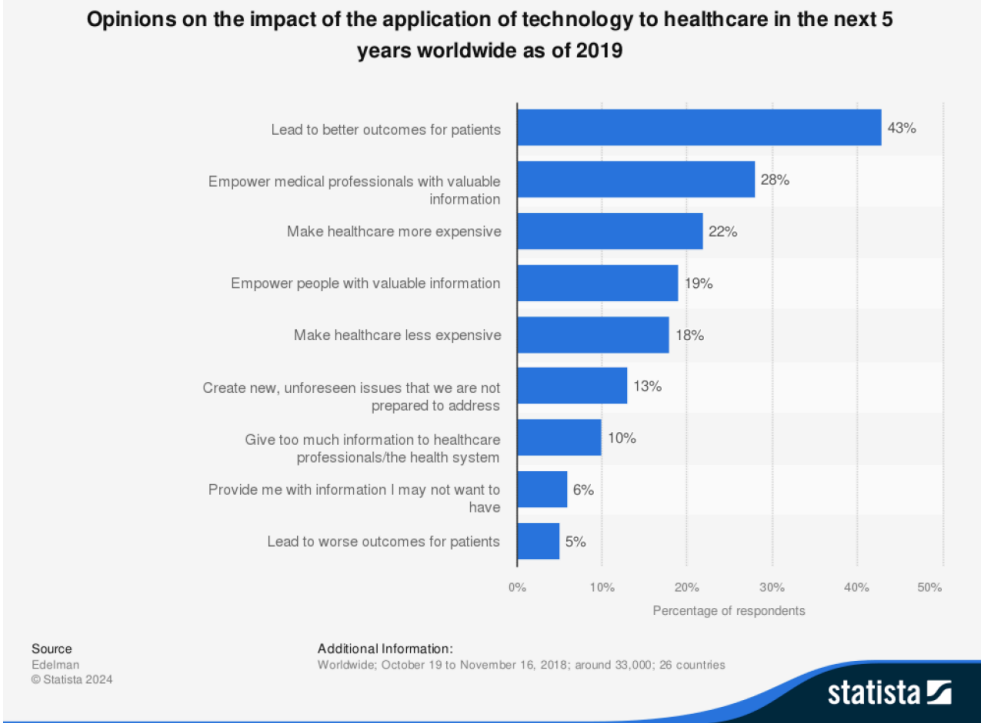
Exploratory Market Analysis: Assessing Healthcare's Technological Shift



Disruptive technologies: one undeniable fact is that the healthcare industry is in a phase of disruptive technological renovation, in which more technologies are emerging and taking over the market; more market opportunities have been scouted, which means more new equipment have been invested. The Internet of Things (IoT) encompasses a variety of medical technologies including remote patient monitoring equipment, precision surgical instruments, and more. Within a survey from a group of business leaders, 74% believed that IoT will have a significant impact on the business. This statement was further confirmed by healthcare professionals, with 43% agreed that technology will significantly improve the quality of care.

We can confirm quite confidently a considerable improvement in the healthcare industry, through technologies such as artificial intelligence (AI) and cloud infrastructure that have the potential to carry out informative insights for the healthcare professionals, as well as improvements in caregiving capabilities and

quality of service, which all ultimately leads to lucrative business model if implemented properly with associated initiatives to penetrate the prioritized market shares and expand shares to new regions thereafter.

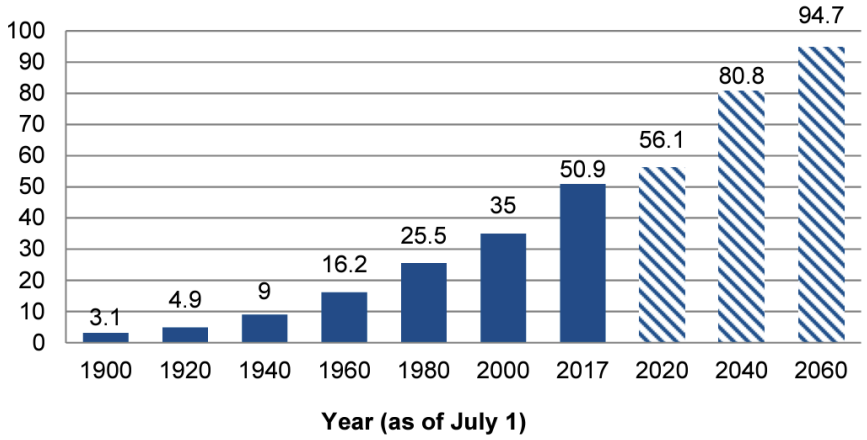


Last but not least, excessive digitalization could backfire in unexpected outcomes as there long exists concerns about the high stakes of digital failure and its consequential cost. In the very sensitive aspects of the medical health domain, such drawbacks can be amplified and induced to higher odds of medical costs and conflicts, as any mistake performed on the client could be fatal.

The Future Growth of Aging Population

Statistics from the 2018 U.S. Census have highlighted a couple of factors: The population age 65 and over has increased from 37.8 million in 2007 to 50.9 million in 2017 (a 34% increase) and is projected to reach 94.7 million in 2060 (Figure 1). By 2040, there will be about 80.8 million older persons, over twice their number in 2000. People aged 65 and over represented 15.6% of the population in the year 2017 but are expected to grow to 21.6% of the population by 2040. The 85 and over population is projected to more than double from 6.5 million in 2017 to 14.4 million in 2040 (a 123% increase).

Figure 1: Number of Persons Age 65 and Over: 1900-2060 (numbers in millions)

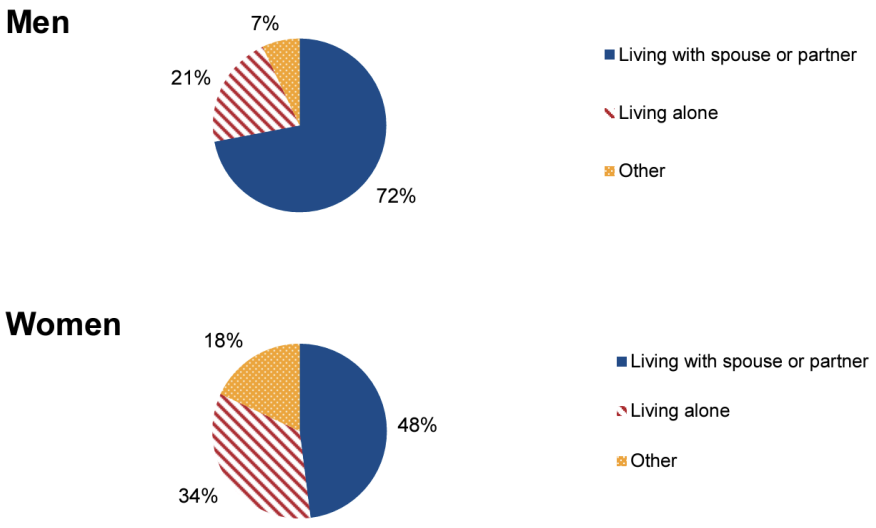


Note: Increments in years are uneven. Striped bars indicate projections.
Source: U.S. Census Bureau, Population Estimates and Projections.

Living Arrangements

A relatively small number of people (1.2 million) aged 65 and over lived in nursing homes in 2017. However, the percentage increases dramatically with age, ranging from 1% for persons ages 65-74 to 3% for persons ages 75-84 and 9% for persons age 85 and over.

Figure 3: Living Arrangements of Persons Age 65 and Over, 2018



Source: U.S. Census Bureau, Current Population Survey, Annual Social and Economic Supplement.

Health Care Service

In 2017, 7.6 million seniors had at least one overnight hospital stay. Of these, 11% stayed once, 3% twice, and 2% three or more times, roughly double the rates of those aged 45-64, where 6% stayed once, 1% twice, and 1% three or more times.

Caregiving

As people age, their need for caregiving rises. From January to June 2018, 20% of adults over 85 required personal care, more than double the 9% of those aged 75-84 and quintuple the 4% of those 65-74. Additionally, older adults frequently care for younger relatives; in 2017, 1.1 million grandparents aged 60 and over were primary caregivers for grandchildren under 18. Among these, 59% were grandmothers and 41% grandfathers. Furthermore, in 2015, of the 3.6 million people with Intellectual and Developmental Disabilities (I/DD) living with family, 24% had caregivers over 60, with state percentages ranging from 11% in Alaska to 25% in Florida.

The Unyielding Challenge of Dementia and its Impact on Social Care Budgets

As the population ages, we face many chronic illnesses that mainly affect the elderly, such as arthritis, diabetes, heart disease, and cancer. Alzheimer's disease, however, significantly impacts the quality of life for seniors by incapacitating sufferers and imposing heavy burdens on state resources. Despite substantial healthcare spending on other conditions, Alzheimer's remains without a cure or effective treatment, causing ongoing decline in patients. This disease not only results in high costs and global impacts but also places extreme demands on health and social care systems. In the U.S., 5 million people currently live with Alzheimer's, a number expected to increase to 16 million by 2050. While treatments for dementia may emerge within the next 5-10 years, they are likely to be expensive and increase healthcare expenditures. However, developing effective treatments could greatly benefit the aging global population and reduce the economic burden on countries with aging demographics. Managing these health issues efficiently is crucial to prevent them from overwhelming both state and private health sector finances.

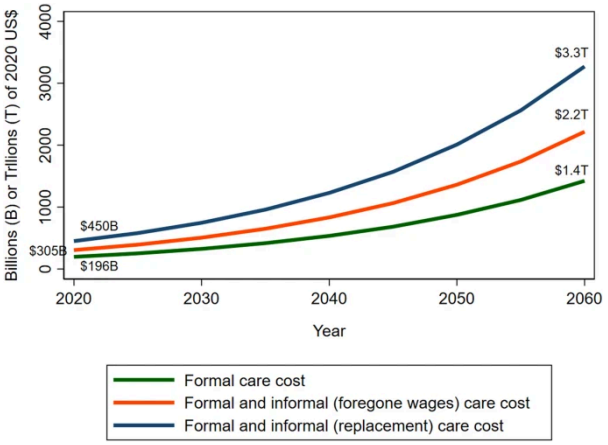
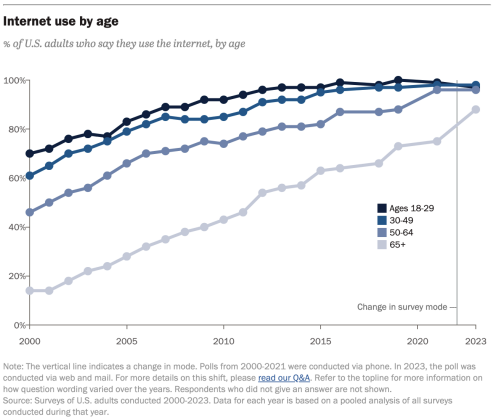


Figure 1 presents the future projections of care cost (2020 US$). Under the base case scenario, the annual aggregate formal care cost for ADRDs was an estimated $196 billion (95% uncertainty range [UR]: $179–$213 billion) in 2020 and was projected to increase to $1.4 trillion (95% UR: $837 billion–$2.2 trillion) by 2060. Aggregate formal and informal care (replacement method) cost was estimated to increase from $450 billion (95% UR: $424–$478 billion) in 2020 to $3.3 trillion (95% UR: $1.9–$5.1 trillion) in 2060. Aggregate formal and informal care (foregone wages method) cost was estimated to increase from $305 billion (95% UR: $278–$333 billion) in 2020 to $2.2 trillion (95% UR: $1.3–$3.5 trillion) in 2060.

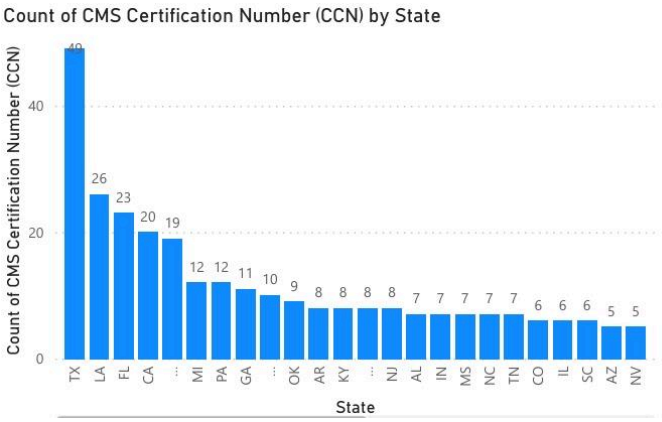


Elderly individuals are increasingly embracing technology, with a growing number of seniors becoming proficient in using the internet for various purposes. This trend presents numerous opportunities for businesses targeting this demographic, provided they adapt their offerings to meet the preferences and aspirations of this age group. As societies age and the demographic makeup shifts, new industries are emerging to provide care solutions, with technology playing a crucial role. However, the potential extends beyond care, as there are various emerging technology sectors that should cater to an older demographic that possesses greater spending power, owns property, and has ample leisure time compared to younger generations like millennials.

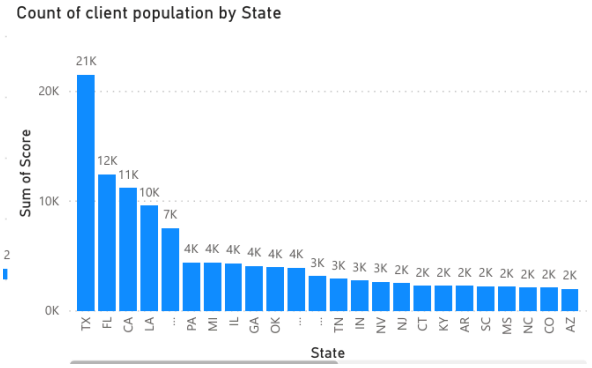
Long Term Care Hospital Provider Data: Identifying high-stake regions related to market size discovery by state level

After analyzing macro industry trends, it's beneficial to focus on Chirp's specific field of expertise: fall detection and proactive prevention. Utilizing datasets from long-term care hospitals provided by the Centers for Medicare & Medicaid Services, our team

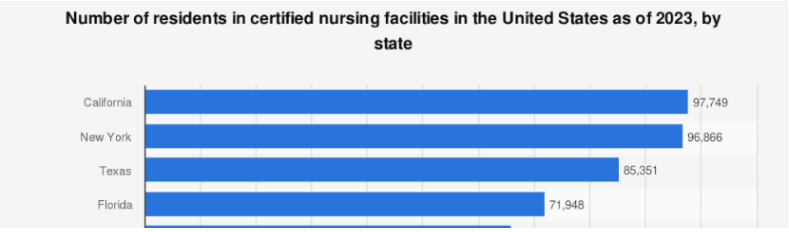
pinpointed regions with the highest frequency of fall incidents, indicating a potentially higher market demand. This analysis considered the number of facilities, identified by their CMS certification numbers, participating over the 2022-2023 period. Given the dataset's governmental source, we have high confidence in its accuracy and detail, which clearly illustrates both the total client population and the subset experiencing falls at each facility.



We began our market size analysis by performing summary statistics to assess the total number of hospitals in each state. Using CMS certification numbers to identify individual institutions, we found that Texas has the largest number of long-term care institutes at 49, with Louisiana having nearly half as many. It's notable that the Middle South regions dominate the top tiers, highlighting potential areas for geographic pilot programs for providers. However, a significant limitation is the reliance on absolute numbers for facility counts without considering the state's population, which should inform the requisite number of healthcare facilities. Additionally, the distribution of LTCH counts could be subject to systematic bias in the dataset. To address these issues and gain a comprehensive market perspective, our team supplemented our analysis with national data research. This external validation largely supports our findings, as demonstrated in subsequent analyses.

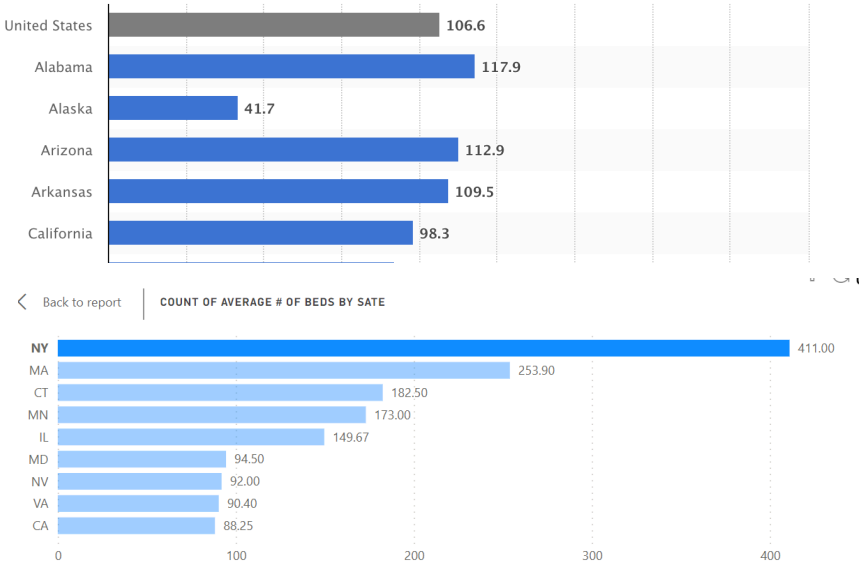


In the second part, we have identified the total population of housing residents through the year 2022-2023 per state. The outcome seems like a resemblance from the previous facility count breakdowns.



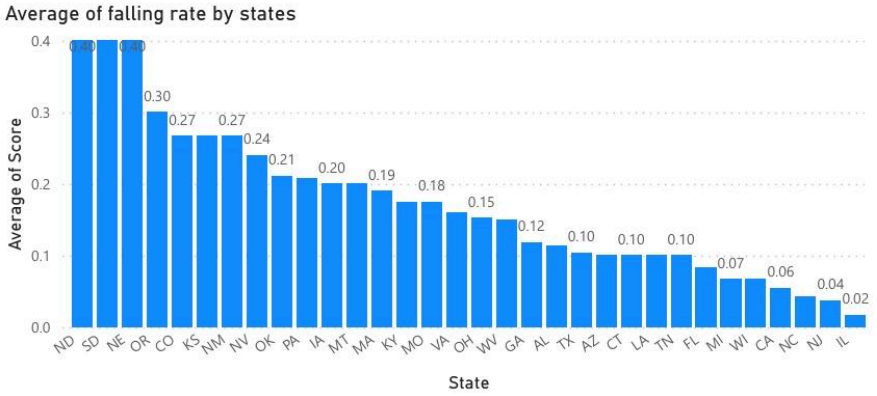
To further prop up the credibility of our research findings, we conducted an additional external review using data from Statista. This investigation revealed similar patterns, further supporting our conclusions. Specifically, the states with the highest number of residents in certified nursing facilities are California, New York, Texas, and Florida. This alignment with national data lends substantial validation to the results of our primary research.

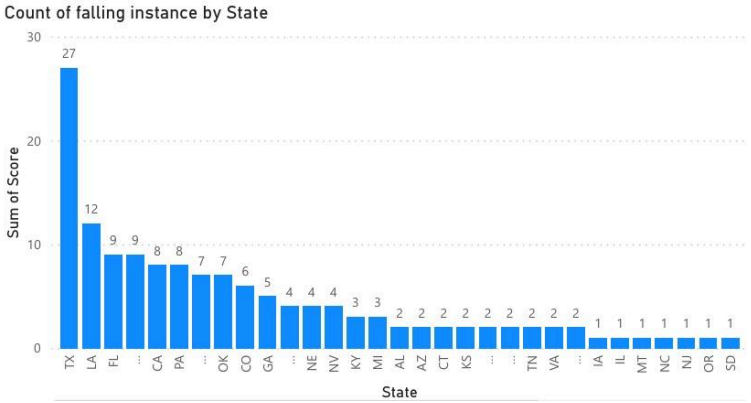
Additionally, examining the average number of beds per facility in each state provides another useful metric for assessing potential market size.



Referring to the third-source data from *Statista*, our team identified Alabama, Alaska, and Arizona as the top 3 prioritized states with the most averaged bed headcount. Counterfactually, our primary research yields different outcomes which leads to New York, Massachusetts, and Connecticut being the top 3 positions. The divergency can be attributed to the bias of sample selection within the governmental data(2022-2023), namely that only one inquiry was documented for the NY state.

Followed by the summary statistics,the study shifted focus onto the clinical metrics, which intuitively speaks off the quality and share of service provided by the facilities in general.
Based on the analysis, North Dakota, South Dakota and Nebraska come to be the top three tiers off the chart, tied up with a score of 40%, implicating worse quality of service level than average U.S. facilities.





Lastly, we analyzed the falling incidents recorded by state. Notably, Texas reported a higher-than-average number of falls compared to Louisiana and other major cities with numerous long-term care facilities. The substantially outstanding amount of falls in Texas can be attributed to its sizable population, which is nearly 30 million.

Conclusion

Our primary research has identified several key insights: the United States shows a significant clustering of Long Term Care Hospitals primarily in the middle South regions, while the East and West Coasts, notably in New York and California, present substantial untapped market potential. However, Chirp should be wary of the fact that oversaturated markets like NY and MA have a fairly well-developed healthcare system as well as a considerable amount of incubators' market shares and higher competitions, setting barriers for market entrance of new competitors. Chirp should strategically consider entering these identified market segments with cautions and passions respectively. By implementing region-targeted strategies, Chirp can capitalize on these opportunities efficiently, maximizing market penetration while maintaining manageable cost margins. In hope that the above approach will enable Chirp to expand its outreach effectively in high-demand areas, we sincerely appreciate the given opportunity and considerations.

Resources

1. Market statistics chart 1: https://www.statista.com/study/66974/in-depth-report-industry-40/
2. Market statistics chart 2: https://www.statista.com/statistics/1073292/opinions-on-impacts-of-technology-application-to-healthcare/
3. Market statistics chart 3: https://www.statista.com/statistics/276293/total-revenues-of-american-and-european-medical-technology-companies/
4. Cost of care for Alzheimer's disease and related dementias in the United States: 2016 to 2060: https://www.nature.com/articles/s41514-024-00136-6
5. Internet, Broadband Fact Sheet: https://www.pewresearch.org/internet/fact-sheet/internet-broadband/?tabId=tab-9a15d0d3-3bff-4e9e-a329-6e328bc7bcce
6. 2018 Profile of Old Americans chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://acl.gov/sites/default/files/Aging%20and%20Disability%20in%20America/2018OlderAmericansProfile.pdf