Methodology

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Overview

A Deloitte actuarial study was developed to 1) analyze historical trends in US health care expenditures at a macro level; and 2) present two potential forecasts for future health care expenditures. The first forecast assumes that historical trends will continue unchanged. The second forecast explores how targeted investments, aimed at improving disease prevention and management, could impact health care costs by increasing both the average life span and health span (or the period of life spent in good health).

Data

Data sources

The study captured and categorized health-related spending across four dimensions: 1) medical claims; 2) pharmacy claims; 3) consumer; and 4) social or other. Below is an overview of the data sources used for these four dimensions, along with a summary of the analyses conducted to transform the raw data sets into the base data used in the model.

In general, the following questions were used to determine the four types of spending:

1. Is the spending directly related to medical services? For example, medical claims, prescription medications, mental health services, and dental health.
2. Is there evidence that this type of expenditure improves physical or mental health outcomes for some populations? For example, smoking cessation programs, using sunscreen to prevent cancer, and consumer spending on treadmills.
3. Is the expenditure intended to improve health outcomes (applies to consumer and social spending only)? For example, Medicaid-funded housing, Medicare nutrition benefits, and HSA-eligible items like acupuncture, fertility monitors, sunscreen, and weight-loss programs (excludes general economic or nonprofit spending not tied to health outcomes).

Expenditures were included in the analysis if they met criterion one, or if they met both criteria two and three. After identifying the type of spending, we then determined the sources for each category.

Medical

The methodology employed in the study used health insurance data from the Komodo Healthcare Map (Komodo),[1] which includes enrollment history and health care claims for both medical and pharmacy benefits across all settings. This nationwide data set, sourced from payers and refreshed quarterly, covers the period from 2017 to the most recent year available. From Komodo, we accessed information pertaining to the type of service (inpatient, outpatient, professional, or pharmacy) and total allowed amounts. We categorized the data by line of business, year, allowed amount for each service type, claim or script count, and member month. The data set includes information on over 50 million enrolled lives across all lines of business, including commercial (37 million enrolled lives), exchange (2 million enrolled lives), Medicare (7 million enrolled lives), and Medicaid (15 million enrolled lives) populations.

In addition to the Komodo claims data, we also used Sg2 CARE Grouper logic. The Sg2 CARE Grouper categorizes data across 27,000 unique disease and procedure pairings into easy-to-understand and flexible CARE family (disease state) and procedure categories. Finally, the team also leveraged the National Health Expenditures (NHE) data set published by the Centers for Medicare & Medicaid Services (CMS) Office of the Actuary to compare Komodo claims sample expenditures to total US population health care expenditures.

The following steps were followed to take the raw claims data to the baseline data used in the model:

1. Aggregated annual claims data from the Komodo Healthcare Map for inpatient, outpatient, and professional services for each year from 2019 to 2023
2. Used Sg2 mapping to assign care family disease and care group levels
    a. Care family disease: based on diagnosis code
    b. Care group level: based on procedure code
3. Grossed up data at the claim level to reflect total US population compared to Komodo sample population
    a. The Komodo data set encompasses a portion of the US population. To reflect the entire population, Komodo dollars must be scaled to the total spending in the US health care system.
    b. We created a scale-up factor by line of business (LOB) equal to total NHE expenditures for a given LOB divided by Komodo claims dollars for the same LOB. Separate scaling factors were calculated for each

major payer category: Medicare (including Medicare Advantage and fee-for-service), Medicaid and dual-eligible beneficiaries, commercial and exchange plans, and other payer types.

c. Each claim line was multiplied by the appropriate scaling factor by line of business.

After applying these steps, this was the baseline data used in our model for medical spending to represent spending for the entire United States and reconciled to the NHE expenditures.

Pharmacy

Pharmacy data was sourced from the Komodo Healthcare Map as described in the medical data source section. In addition, we used the Medi-Span drug database. Medi-Span is an industry standard for pharmacy data, providing up-to-date mappings from National Drug Code (NDC) to therapeutic drug class.
Finally, the team leveraged the NHE data set published by CMS Office of the Actuary to compare Komodo claims sample expenditures to total US population pharmaceutical expenditures.

The following steps were followed to take the raw claims data to the baseline data used in the model:

1. Aggregated Komodo pharmacy claims data from 2019 to 2023
2. Applied Medi-Span mapping at the NDC-level to assign therapeutic class
3. Grossed up data at the claim level to reflect the total US population compared to Komodo sample population, as described in the medical data source section
    a. Each claim line was multiplied by the appropriate scaling factor by LOB

After applying these steps, this was the baseline data used in our model for pharmacy spending to represent the spending for the entire United States and reconciled to the NHE expenditures.

Consumer

To estimate health care expenditures beyond traditional health care claims, revenue associated with consumer health care spending was included as its own category in the baseline data. The data source for consumer-related spending is a publicly available source, the Global Wellness Institute (GWI).[2] The GWI is a 501(c)(3) nonprofit organization with a mission to empower wellness worldwide by educating public and private sectors about preventive health and wellness. GWI's research, programs, and initiatives have been instrumental in the growth of the multitrillion dollar wellness economy—and in uniting health and wellness industries.

To determine "consumer" dollars, key characteristics of consumer influence were identified. Each category of spending from the GWI was evaluated against the following criteria where the more criteria that are met, the more "consumer-oriented" the spending is.

1. Choice in provider or site of care
2. Choice in the product or service being provided to them (for example, choosing which smart home device to buy versus not being able to choose what hip implant to get, consumer education)
3. Transparency around price
4. Multiple options (for example, not limited to one option due to a formulary or plan benefit package)
5. Consumer preference is taken into account even if the final decision isn't owned by the consumer (for example, using a cancer drug that is in the clinical trial stage)
6. Products marketed direct to consumers
7. Products paid outside traditional insurance

The following steps were followed to take data from the GWI to final expenditures used in the model:

1. Aggregate GWI data from 2019 to 2022
2. Determine "consumer" or "consumer influence" expenditures (see definition above)
3. Categorize consumer spending into "health care" or "health care–adjacent"
    a. "Health care" refers to the consumer expenditures on products, services, and activities directly related to maintaining or improving health and wellness (example: fitness technology).
    b. "Health care–adjacent" refers to consumer expenditures on products, services, and activities that support or enhance health and wellness but are not directly categorized under traditional health care (examples: sports and recreational activities, beauty products).
4. Only "health care" consumer spending was included in this analysis, as reported on directly in this article.
5. The final categories of spending included are:
    a. Fitness
    b. Mindful movement

c. Fitness technology
d. Healthy eating, nutrition, and weight loss
e. Mental wellness (for example, self-improvement, meditation, and mindfulness; brain-boosting nutraceuticals and botanicals; senses, spaces, and sleep)[3]
f. Traditional and complementary medicine
g. Workplace wellness

After applying these steps, this was the baseline data used in our model for consumer spending.

Social or other

In addition to health care claims and consumer health spending, the analysis includes health-related expenditures by government entities, referred to as "social or other" spending. These expenditures were sourced from the Centers for Medicare & Medicaid Services' NHE database, maintained by CMS's Office of the Actuary (OACT).

The NHE data set tracks health care spending by funding source (for example, private insurance, Medicare, or Medicaid), by type of service (for example, hospitals, physicians, or prescription drugs), and by payer category (for example, businesses, households, or governments). To prevent double counting, each NHE category was compared to Komodo claims data and consumer spending data. Overlapping categories were removed to isolate only additional expenditures not already included in our baseline.

The table below summarizes select spending categories and definitions from the CMS NHE data set,[4] which we used to capture health-related expenditures beyond traditional claims data:

Figure 1

Category of spending	Definition
Government public health activities	Includes state and local funding for public health departments, labs, and prevention programs
Other health, residential, and personal care	Includes spending for school health, worksite health care, Medicaid home and community-based waivers, some ambulance services, residential mental health and substance abuse treatment facilities, and residential intellectual and developmental disability facilities; generally provided in nontraditional settings
Retail durable medical products	Covers "retail" sales of items such as contact lenses, eyeglasses, and other ophthalmic products, surgical and orthopedic products, hearing aids, wheelchairs, and medical equipment rentals
Other retail nondurable medical products	Covers the "retail" sales of nonprescription drugs (products purchased over the counter such as analgesics and cough and allergy medications) and medical sundries (items such as surgical and medical instruments and surgical dressings, and diagnostic products such as needles and thermometers)
Clinical and dental services	Covers services rendered in establishments of health professionals, including physicians, clinics, dentists, and other medical professionals working under salary for a hospital, nursing home, or other type of health care establishment
Research	Research spending of nonprofit institutions and government entities (excludes drug, medical supply, and equipment manufacturers)

These steps were followed to take data from NHE to finalize the expenditures used in the model:

1. Aggregate National Health Expenditures from 2019 to 2023
2. Compare NHE spending to medical, pharmacy, and consumer data
3. Exclude NHE categories overlapping with spending already represented in model baseline data (figure 1)

After applying these steps, this was the baseline data used in our model for social or other spending.

Data limitations

Due to data constraints, this analysis did not include health care expenditures related to:

1. Elective surgeries that are not covered under medical insurance (for example, plastic surgery)
2. Vision services that are not covered under medical insurance
3. Any claims, personal labs, and spending not categorized into the categories through medical, pharmacy, consumer, or social as outlined above

Future versions of this analysis may reassess data availability to potentially include these health care expenditures.

Modeling approach

Spending alignment category mapping

The study aims to capture and categorize health-related spending across the four previously mentioned categories: medical, pharmacy, consumer, and social or other. Once health care expenditures are assigned to their respective categories, they are aligned to one of four health care spending alignment categories. The following spending alignment categories are used to organize the expenditures by overall intent of spending:

- **Treating conditions (reactive):** This category includes claims for treatment of illnesses, injuries, or deteriorating health. It encompasses interventions such as diagnostic procedures, surgeries, and medications such as antibiotics or chemotherapy.
- **Restoring health (reactive):** This category includes costs related to recovery and rehabilitation following illness, injury, or deteriorating health. Services may include medical treatments, physical therapy, and other interventions aimed at helping individuals regain their optimal health.
- **Managing or delaying symptoms (proactive):** This category covers services for patients with one or more chronic conditions, focusing on preventing complications and reducing symptom severity.
- **Promoting health (proactive):** This category includes claims for preventive services and wellness activities provided to individuals who are in good health. The goal is to prevent future health issues and enhance quality of life and mental well-being.

Organizing health care spending into four spending alignment categories highlights meaningful health-related activities and spending in addition to traditional reactive sick care, which is often the primary focus within the health care ecosystem. This approach also helps us to better understand how spending patterns change over time, both at the macro (systemwide) and micro (individual or subgroup) levels.

The methodology to map to the four spending alignment categories can be found in more detail starting in the “calculation steps” section below.

Disease state mapping

In addition to mapping health care spending to spending alignment categories, we also assigned them to one of the following disease states. Categorizing spending into disease states allows us to analyze trends and create a projection of future spending at a more granular level.

Initial disease states were selected leveraging the work from previous Deloitte research, which included the diseases contributing to the top 10 causes of death. Additional disease states and conditions were identified from review of medical and pharmacy claims to include those contributing to a significant amount of spending. The full list of disease states (or conditions) considered in this analysis are:

1. Alzheimer’s disease
2. Cancer
3. Chronic lower respiratory diseases
4. Dermatology
5. Diabetes
6. Gastroenterology
7. General medicine
8. General surgery
9. Gynecology
10. Heart disease
11. Infectious disease

12. Kidney disease
13. Mental health
14. Musculoskeletal diseases (back and neck)
15. Musculoskeletal diseases (all other)
16. Neurosciences
17. Obstetrics
18. Rheumatology
19. Sense organ diseases
20. Stroke
21. Substance use disorder
22. Other

Sg2 was leveraged to assign a care family disease and care group level to all medical and pharmacy claims. We use these assignments to map medical and pharmacy spending to one of the above disease states.

Consumer, social, and other spending categories were assigned to disease states based on the level of impact (high, medium, low, or zero) that each category had on a disease state, relative to other categories and other disease states. For example, research found that traditional and complementary medicine supports managing the symptoms and side effects of cancer and promoting the overall well-being of those living with cancer more than those living with the majority of other disease states, such as diabetes. The assumptions of how to allocate the spending by both origin of spending (consumer and social or other categories) and by disease state are based on extensive research and were validated by Deloitte clinical professionals. Further details outlining this process are included in the consumer and social sections below.

Drivers of prevention and recovery for each disease state were identified during our analysis, a process described in further detail in the sections below. Understanding what drives health care spending in each of these categories allowed us to quantify the potential Future of Health impact (specifically, investing in preventive and proactive measures) on both total spending and savings in these areas over time.

Projecting to 2040

Aging

An aging factor was applied to more accurately project health care spending to 2040. This factor adjusted spending dollars to account for a changing population, that is, one that is experiencing fewer deaths than current mortality projections due to longer, healthier lives resulting from improved disease prevention and recovery. This adjustment helps to ensure dollars are accounted for those individuals who would have otherwise died without improvements in preventive and proactive measures.

The mortality assumptions used in this analysis are the same as those published in previous Deloitte research on health span and life span.[5] The mortality tables developed for this article were based on review of the top diseases contributing to mortality and the impact the Future of Health model can have on mortality and longevity. In review of the methodology used and the mortality tables that operated as a baseline for that analysis, no updates were made or deemed necessary. (Please refer to the methodology section of the article for clarity on how the mortality tables were created.)

Savings

To quantify potential medical and pharmacy health care savings from the Future of Health model, disease states and conditions were selected and reviewed to determine opportunities to save money.

Savings is quantified across two components:

1. **Prevention:** Savings due to prevention of disease (or condition)
2. **Recovery:** Savings due to improved recovery or management of disease (or condition)

Deloitte identified five key drivers that contribute to quality of disease prevention, management, and recovery:

1. **Lifestyle factors:** Modifiable risk factors, including other disease states, which can cause a disease or an event (smoking, obesity, diet, physical activity, stress, and more), including those social determinant factors (like food access) that impact lifestyle.

2. **Health care quality and access:** Challenges to quality health care and access that result in a higher prevalence or variation in management of a disease, condition, or event.
3. **Environmental factors:** Familial environment, exposure to trauma, community dynamics, and others.
4. **Genetic factors:** Inherited genetics that make an individual predisposed to a disease.
5. Medical risk factors: Biological factors (for example, chemical imbalances in the brain), and preceding or cooccurring medical conditions.

Savings improvements are recognized as a result of changes made across these drivers of health. During the analysis, we quantified the impact of each driver on each disease state. The impact of the Future of Health model on each driver is also quantified. This allows us to determine the potential impact of the Future of Health model on total savings by disease state.

Investment

Achieving savings from a preventive and proactive care approach will involve a surge of investment, with stakeholders reallocating spending across preventing disease and recovery to drive long-term health and spending impacts. Investment dollars used in this analysis were therefore determined by leveraging anticipated health care savings from this shift in care.

Savings achieved through improvements in the five drivers listed above will involve investment today across the following categories:

1. **Medical:** Includes medical investments from private insurers, Medicare, providers, and health systems (medical interventions, covering more preventive or recovery care).
2. **Pharmacy:** Includes pharmacy investments from drug manufacturers (new therapeutics), private insurers (approval to pay for new therapeutics), Medicare, and others.
3. **Consumers:** Includes investments made by consumers or employers related to wellness across the following categories: fitness, mindful movement, fitness technology, healthy eating, nutrition and weight loss, mental wellness, traditional or complementary medicine, and workplace wellness.
4. **Social or other:** Includes government investments made through public health activities, other health, residential, and personal care, and research.

Calculation steps

Medical

Spending alignment category mapping

Once aligned on baseline medical data (the description can be found in the data source section), the following logic was applied to map medical claims specifically to each of the four spending alignment categories. First, medical claims were grouped by:

- Claim type (such as inpatient, outpatient, and professional)
- Care group level 3 (based on procedure code)
- Care family disease (based on diagnosis code)

Based on these grouping of claims (claim type + care group level + care family disease), the logic below was applied:

1. If the procedure is done proactively for a patient in good health, map to **promoting health**.
2. If the procedure is done proactively for a patient with chronic conditions, map to **managing symptoms**.
3. If the procedure is done reactively for a patient's health that is declining, map to **treating conditions**.
4. If the procedure is done reactively and performed after "treating conditions" to get a patient back to optimal health, map to **restoring health**.

One example is advanced imaging: computed tomography (CT) claims are mapped to "treating conditions" in most cases. This is because advanced imaging is generally done reactively to diagnose illnesses or injuries. Some types of advanced imaging are exceptions: for example, low-dose CT for lung cancer screening. Rather than "treating conditions," these claims are mapped to "promoting health." This is because these claims can be a screening used for patients with family history of cancer. Additional detailed rules similar to the example above for how all claims were mapped to spending alignment categories can be found in the appendix under the "Spending alignment categories mapping rules" table.

Disease state mapping
Once claims were mapped to a spending alignment category, they were then tagged to a specific disease state (or condition). The 21 conditions are detailed in the Modeling approach section. If a claim did not align with one of these 21 conditions, it was mapped to "other," where this category accounts for less than 5% of health care spending.

Komodo medical claims data were mapped to Sg2 care groups using procedure codes and disease states based on diagnosis codes. For example, leveraging the Sg2 algorithm, care family disease mapped to a claim could be acute kidney injury, acute renal failure, or chronic kidney disease. All three of these then would be mapped to "kidney disease" for the purposes of this analysis.

2040 projection (baseline)
After mapping to the spending alignment category and disease state, the next step was to determine baseline expenditures from 2023 to 2040. To determine this baseline, historical per member per month (PMPM) trends from 2019 to 2023 were analyzed and used to project future annual health care expenditures through 2040. The steps below outline this approach:

- Analyzed 2019 to 2023 Komodo allowed dollars across all lines of business
- Calculated historical annual PMPM trends by disease state and spending alignment category
- Determined two-year and four-year compound annual growth rate for each disease state and spending alignment category combination (for example, diabetes-treating conditions PMPM; diabetes-promoting health PMPM)
- Developed weighted average trend rate using two-thirds weight on two-year CAGR and one-third weight on the four-year CAGR
- Assigned a "trend group" based on the weighted average trend rate that corresponded to an annual future growth assumption based on the following definition:

Figure 2

Trend group	Trend rate
Rapid growth	15%
Moderate growth	8%
Slow growth	3%
No growth	0%
Slow decrease	–3%
Moderate decrease	–7%
Rapid decrease	–10%

- This is the forecasted trend rate applied annually through 2040 (held constant)
    - For example, a "moderate growth" trend group is trended at 8% annually from current state through 2040 (figure 2)
    - The process above combined with the pharmacy trend process generates an aggregate annual forecasted trend rate that is within 0.5% of the OACT NHE annual trend rate

With the above methodology, we estimated future spending based solely on historical trends, without including any assumptions about major changes or innovations in health care.

2040 projection (preventive and proactive measures)
After determining baseline expenditures, the model then took into consideration Future of Health model assumptions to calculate potential savings, and the investments required to achieve those savings (described in Modeling approach).

Aging
To calculate savings achieved through a shift to proactive care, assumptions around prevention of disease and improved mortality from disease were developed. While these assumptions will likely decrease total spending due to disease, there will be an opposite impact as a result of people living longer from avoiding disease. Therefore, an aging factor was developed to account for the expected improvements in mortality and resulting higher populations in the future than under current state.

To develop this aging factor, we started with the 2023 US population for each age from 0 to 100, where those older than 100 are grouped with age group 100 due to low data. Using Komodo data, we then calculated average PMPM medical claims spending for each age from 0 to 100, using an estimated PMPM amount for ages that lacked credible data. We then collected baseline mortality rates by age as well as improved mortality rates by age under the Future of Health model. The mortality assumptions used in this analysis are the same as those published in previous Deloitte research on life spans and health spans. The mortality tables developed for this article are based on review of the top diseases contributing to mortality and the impact the Future of Health can have on mortality and longevity.

With these mortality rates, we projected the potential population at each age for the years 2030, 2035, and 2040, starting from the 2023 census population. The 2023 census included 331 million people. Under the baseline mortality rates and assuming a constant birthrate, the projected potential 2040 population included 326 million people. Under the improved mortality rates, the projected potential 2040 population included 360 million people.

For each of these years, we then calculated total estimated health expenditures by multiplying the projected population at each age by the estimated average health care spending for that age. So as not to double count impacts and to only capture the impact of improved mortality, these spending estimates do not include any additional factors, such as trends or the Future of Health model's savings.

Finally, we determined the aging factor by comparing the total projected health care spending in 2040 under the Future of Health model's mortality-only scenario to the spending under the baseline scenario. Since improved mortality means more people will be alive in 2040, we anticipate higher overall health care spending simply because more people are living longer. This adjustment ensures our projections fully account for the impact of longer, healthier lives on future health care spending. The aging factor is applied after truing up claim spending to the national level under the NHE as described in the "Data sources" section.

Savings from prevention and improved management

As described under "Modeling approach," Future of Health assumptions were developed to determine possible savings. Savings assumptions are broken into savings achieved by preventing disease, then into savings achieved by improved recovery and disease management.

First, for each specific disease state, drivers of disease and disability were determined:

1. Conducted extensive research and interviews with internal clinical subject matter advisers on drivers of disease
    a. See "Modeling approach" for description of drivers.
    b. See "Appendix 3: Clinical subject matter advisers" for the list of clinical advisers interviewed.

2. Based on research, for each disease state, allocated percentages for driver of disease:
    a. For example, stroke may be driven by 80% lifestyle, 8% health care quality and access, 2% environmental, 5% genetic, and 5% non-modifiable factors.
    b. Note: To derive these numbers across the drivers of disease, the team used publicly available research that was then reviewed, discussed, and then leveraged in the model. There is no one single study for each disease that has these values specifically called out, and in some cases, judgement was made based on the combination of research and clinical experience on the team. For instance, up to 80% of strokes are considered preventable,[6] yet 50% of stroke survivors experience long-term disability.[7] Our analysis found that advances in hypertension management, rapid surgical response, and digital interventions can not only decrease the incidence of stroke, but also reduce the duration and severity of disability, potentially resulting in substantial savings in hospital and rehabilitation costs. Research sources and findings for the remaining disease state can be provided upon request.

3. Based on research, for each disease state, allocated percentages for drivers of disability:
    a. Drivers of disability do differ from drivers of disease.
    b. This was expanded upon in the Deloitte article on health span and life span.

4. Validated final percentage allocations for each disease and driver with clinical subject matter advisers.

Drivers of disease were used to determine savings impact related to prevention. Drivers of disability were used to determine the savings impact related to disease management (recovery). These percentages were used to understand how a disease could be influenced.

The next step was to then determine a savings percentage for both drivers of disease (prevention) and drivers of disability (recovery) that could be achievable for each driver. To do this, the team:

1. Conducted extensive research, including interviews with clinical subject matter advisers, to evaluate the impact of a shift to proactive care on each driver of disease or disability:
    a. For example, investment in disease prevention, early detection, and other proactive measures may have more ability to influence disease through lifestyle (better ways to manage caloric intake and micronutrients through apps) more so than non-modifiable factors such as age.
    b. We are committed to transparency and rigor in our methodology. Full citations and supporting research for all disease states analyzed can be provided upon request.

2. Assigned high, medium, low, or zero impact of investment in disease prevention, early detection, and other proactive measures to each driver and disease. This assignment was performed in combination with the clinical team and was independently assigned between the driver of disease and the drivers of disability.

3. Determined the percentage of high, medium, or low impact, leveraged from previously mentioned Deloitte research about life span and health span:
    a. High = 70%
    b. Medium = 45%
    c. Low = 20%
    d. Zero = 0%

4. Combined drivers of disease with Future of Health impact to determine potential savings impact.

A full example for how this approach was applied, using one disease state (diabetes) and one driver (lifestyle):

1. Conducted extensive research and determined the following breakdown for drivers of diabetes:
    a. 80% lifestyle
2. Conducted extensive research to determine the following breakdown for driver of disability with diabetes:
    a. 50% lifestyle
3. Conducted extensive research and determined the following impact of investment in disease prevention, early detection, and other proactive measures:
    a. Drivers of disease (prevention)
        i. Lifestyle = high
    b. Drivers of disability (recovery)
        i. Lifestyle = high
4. Validated assumptions with clinical subject matter advisers.
5. Determined potential savings of Future of Health approach:
    a. 80% driven by lifestyle x 70% Future of Health impact = 56% of diabetes spending could be avoided (savings) through prevention of the disease.
    b. Of the 44% that cannot be avoided, 50% lifestyle x 70% Future of Health impact = Additional 15.4% of diabetes spending could be avoided (savings) through improved disease management (recovery).

This same approach was applied for all disease states and drivers of disease or disability. These assumptions produce the total possible savings achieved through the Future of Health model.

Given the percentage is the total potential, a phase-in of savings achievable was implemented. The team recognized that while this is the total savings possible, the innovation and change involved to achieve 100% of these savings will likely not happen by 2040 and will not be realized immediately. Therefore, the model phases in a portion of the savings to be realized in each given year from 2026 to 2040 for each disease state, driver, and spending alignment category. The following outline the approach taken for how the model phases-in and caps assumed savings:

1. Promoting health spending alignment category assumes 0% savings:
    a. Dollars allocated to promoting health within diabetes, our model does not reduce as we expect these types of services to continue and increase in the future, therefore, no assumed savings for claims are allocated to promoting health.
2. Spending alignment categories with savings begin with 6% starting in 2026.
3. Each year, the portion of savings achieved increases from 2026 to 2040:
    a. Example: 2026 = 6% of savings achieved, then 2030 = 40% of savings achieved.
4. 2040 savings capped at 65%:

a. This is to recognize that, in 2040, not everyone has lived their full lives within the Future of Health model, therefore, we may not be able to achieve 100% of the savings indicated by our research. To account for this, we calibrated to mortality years, leveraging the same sources as the aging factor.

   We projected the Future of Health model's mortality assumption beyond 2040 to reflect a future scenario where the entire US population has lived full lives in the Future of Health approach. We then estimated total medical expenditures for the population expected to be alive at this time given improved mortality. The growth of expenditures in this scenario compared to current state was assessed against growth of expenditures expected in 2040 compared to current state.

   Under improved mortality assumptions alone (no savings assumptions due to preventive and proactive measures applied), total expenditures could be 34% higher under the complete Future of Health scenario. By 2040, under improved mortality assumptions, expenditures could be about 22% higher, which is only 65% of the way to 34%. Therefore, since our model only projects to 2040, we estimate 65% of the potential savings are likely to be achieved, found by taking 22% divided by 34%.

b. In the diabetes example, 56% of spending could be reduced through lifestyle improvements. By 2040, 65% of potential savings could be achieved, potentially resulting in 36.4% (56% x 65%) savings within treating conditions, managing symptoms, and restoring health.

These three key pieces were leveraged in the modeling to determine percentage of dollars to be saved: percentage driver of the disease or disability, Future of Health impact to that driver, and time horizon for actual savings achievable. In summary, annual prevention savings assumptions were applied to the baseline trended total spending by disease state, spending alignment category, and driver of health where our overarching approach was to:

1. Project estimated total allowed dollars through 2040 using medical spending trend by disease state and spending alignment category
2. Apply savings due to prevention assumptions (based on driver of health, Future of Health impact, and phase-in assumptions)
3. Dollars remaining after prevention savings, apply savings due to recovery assumptions (based on driver of health, Future of Health impact, and phase-in assumptions)
4. After determining potential savings due to prevention and recovery, subtract this from baseline projected dollars
5. Arrive at Future of Health dollars as a result of savings only

The following chart includes the disease states identified, the percentage of total spending attributed to each, and their potential impact on both recovery and prevention savings across the Future of Health dimensions:

Figure 3

Disease state	Percentage of total spending	Percentage of total savings
Alzheimer's disease	0.3%	0.2%
Cancer	9.1%	15.5%
Chronic lower respiratory diseases	5.2%	3.4%
Dermatology	2.4%	2.0%
Diabetes	4.3%	6.1%
Gastroenterology	4.0%	3.5%
General medicine	10.9%	4.0%
General surgery	3.2%	5.1%
Gynecology	2.3%	1.1%
Heart disease	9.0%	7.1%
Infectious disease	3.4%	1.7%
Kidney disease	2.0%	1.4%
Mental health	5.5%	7.7%
Musculoskeletal diseases (back and neck related only)	8.8%	7.0%
Musculoskeletal diseases (all other MSK diseases beyond back and neck related)	3.6%	1.6%
Neurosciences	5.1%	7.4%
Obstetrics	3.9%	2.7%

Other	1.9%	16.7%
Rheumatology	3.6%	2.2%
Sense organ diseases	0.8%	2.1%
Stroke	1.1%	0.6%
Substance use disorder	9.7%	1.1%
Total	**100%**	**100%**

Investment

Medical investments are made by private insurers, CMS, or providers and health systems related to medical interventions or medical claim coverage.

Literature research[8] based on driver of disease and investment areas entities conducted by the Deloitte Center for Health Solutions compared health care category impacts by drivers of disease subcategories. Each health care category was assigned a weight (high, medium, or low) based on the level of impact on drivers of disease subcategories (depending on the type and magnitude of interventions and programs seen through literature review under each category for the driver of disease subcategories) to get a weighted average. The results were as follows:

Figure 4

Driver of disease	Medical	Pharmacy	Consumer	Government
Lifestyle factors	20%	19%	33%	28%
Health care quality and access	35%	13%	22%	30%
Environment	15%	23%	15%	46%
Genetics	25%	38%	13%	25%
Medical risk factors	25%	25%	25%	25%

The return of investment (ROI) is likely to be realized after two years, thus investment assumed in 2024 is based on the savings expected in 2026. We recognize that ROI duration will differ across health care spending categories, thus, an average of two years was used as the basis of our calculations.

The ROI for medical investments was set as two-to-one ($2 is saved for every $1 of medical investment). Research shows that the ROI of medical investment differs across types of investments. The main sources supporting this research are JAMA Network,[9] Michigan Medicine,[10] and Advocates for Community Health.[11] The two-to-one assumption could be conservative, and it is likely that more savings will be generated than the assumptions included.[12]

Example: Steps to calculate total medical investment in 2024:

1. Sum product of driver of disease savings in 2026 (given the two-year lag assumption) and the medical investment factors above.
    a. 20% times aggregate savings across all health care spending categories in 2026 are driven by lifestyle factors. The other 80% of savings generated from lifestyle factors are from investments that come from pharmacy, consumer, and government spending. So only 20% of the savings are invested in medical and driving by lifestyle changes. The same applies to all categories while the percentages are different.
    b. 35% times aggregate savings across all health care spending categories in 2026 are driven by health care quality and access.
    c. 15% times aggregate savings across all health care spending categories in 2026 are driven by environment.
    d. 25% times aggregate savings across all health care spending categories in 2026 are driven by genetics.
    e. 25% times aggregate savings across all health care spending categories in 2026 are driven by medical risk factors.
2. Divide by two (medical investment ROI assumption).

This was done across all years by spending alignment category and disease state level to reflect the true place of investment. The final medical health care spending by year, accounting for improvements in preventive and proactive measures, equals: Baseline medical claims x (1 + aging factor) x (1 – savings percentage due to prevention and improvement management) + medical investment.

Pharmacy

Spending alignment category mapping

NDC codes were mapped from the Komodo data set to therapeutic classes utilizing the previously mentioned Medi-Span mapping file where there are over 100,000 NDC codes in Komodo. Therapeutic class detail rolls NDC-level information into about 100 therapeutic classes.

To categorize therapeutic classes into specific spending alignment categories, we applied a set of mapping rules based on how drugs are typically used as they appeared in the Komodo claims data. First, we identified the top drugs within each therapeutic class that together account for at least 80% of the total spending in that class. For each drug, we considered the context in which it is most often prescribed.

1. If a drug is given proactively to patients who are already in good health, it is mapped to the "promoting health" spending alignment category.
2. If it is given proactively to patients who have chronic conditions, it falls under "managing symptoms."
3. Drugs that are prescribed reactively in response to a decline in a patient's health are categorized as "treating conditions."
4. If a drug is used reactively after the initial treatment phase to help a patient return to optimal health, it is mapped to the "restoring health" spending alignment category.

This approach helps to ensure that each therapeutic class is aligned with how its most significant drugs are typically used in patient care.[13] For therapeutic classes with drugs that have multiple indications, the mapping to a spending alignment category was allocated between spending alignment categories. For example, the therapeutic class "cough, cold, or allergy" was allocated 50% to treating conditions and 50% to managing symptoms.

Disease state mapping

Each therapeutic drug class was mapped to one or more specific disease states. In some cases, a single drug class may be associated with multiple diseases, reflecting the range of conditions it can be used to treat based on Komodo pharmacy claims. To make these connections, we analyzed a sample of pharmacy claims that included diagnosis code information, which helped us understand how often each drug class is used for different diseases. We then conducted additional research to validate and refine the allocation percentages, helping to ensure that each therapeutic class is as accurately mapped to the appropriate disease states as possible. For example, the therapeutic class "antidiabetics" is 100% mapped to the diabetes disease state, whereas the "dermatological" class is split between the dermatology, rheumatology, and gastroenterology disease states.[14]

2040 projection (baseline)

After mapping the spending alignment category and disease state, the next step was to determine baseline expenditures from current state (2023) to 2040. To determine this baseline, historical PMPM trends from 2019 to 2023 were analyzed and used to project future annual health care expenditures through 2040. The steps below outline this approach:

1. 2019 to 2023 Komodo spending across all lines of business was analyzed and pharmacy claims were mapped to the disease state and spending alignment category based on therapeutic class.
2. Historical annual PMPM trends by disease state and spending alignment category were calculated.
3. Two-year and four-year CAGRs for each disease state and spending alignment category combination were determined.
4. A weighted average trend rate was developed using one-third weight on the two-year CAGR and two-thirds weight on the four-year CAGR.
    a. The weighting used to blend the two-year and four-year rates differs between pharmacy and medical. For pharmacy, two-year trends can be influenced by several variables, such as large loss-of-exclusivity events and new therapeutics such as GLP-1s. Recent trends may not be indicative of long-term trends, which is why greater emphasis was placed on the four-year trend when determining the final trend rate to be applied to the prescription claims data.
5. Assigned a trend group based on the weighted average trend rate that corresponded to an annual future growth assumption based on the following definition:

Figure 5

Trend group	Growth assumption
Rapid growth	8%
Moderate growth	5%
Slow growth	3%
No growth	0%
Slow decrease	–3%
Moderate decrease	–7%
Rapid decrease	–12%

- This is the forecasted trend rate applied annually through 2040 (held constant):
    - For example, a "moderate growth" trend group is trended at 5% annually from current state through 2040.
    - The process above, combined with the medical trend process, generates an aggregate annual forecasted trend rate that is within 0.5% of the OACT NHE annual trend rate.

With the above methodology, we estimated potential future spending based solely on historical trends, without including any assumptions about major changes or innovations in health care.

2040 Projection (preventive and proactive measures)

Aging
The pharmacy aging factor was calculated similarly to the medical aging factor as described above (please refer to the respective section). The pharmacy aging factor used allowed PMPM spending for pharmacy claims by age instead of medical claims.

Savings from prevention and improved management
Pharmacy savings were calculated similarly to the medical savings, as described above (please refer to the respective section).

Investment
The pharmacy investments were calculated similarly to the medical savings as described above (please refer to the respective section).

The final pharmacy health care spending by year, accounting for improvements in preventive and proactive measures, equals: Baseline pharmacy claims x (1 + aging factor) x (1 – savings percentage due to prevention and improvement management) + pharmacy investment.

Consumer

Spending alignment category mapping

Most consumer health care spending categories were mapped 100% to promoting health. Consumer expenditure is generally a proactive effort to improve health and wellness; thus, it is considered entirely under promoting health. Exceptions were made for healthy eating, nutrition, and weight loss (50% to promoting health and 50% to restoring health) and traditional and complementary medicine (25% across all spending alignment categories).

Disease state mapping

For each consumer spending category, a portion of spending was identified as spending that is not directed at improving people's health. To quantify this amount, an assumption for "non-disease state" spending for each consumer expenditure was determined.

- *Example:* Fitness technologies
    - A smartwatch can be discussed in the context of fitness and health as it has many capabilities that enable improved fitness and health. However, the watch has additional capabilities that expand beyond fitness, such as texting, calling, weather, alerts, and acting as a digital clock. Since the spending on a smartwatch is not solely for one's health, a certain percentage of the dollars spent are categorized as "non-disease state" spending.

The baseline for consumer expenditure health care spending was 85%, meaning 15% of spending was typically allocated to non-disease state spending. Exceptions were made, when appropriate, for the health care–related spending to be lower than 85% for a consumer health care category (for example, fitness technologies [65%] and workplace wellness [50%]). Additionally, traditional and complementary medicine spending was assumed to be 100% health care–related. This approach was used to help maintain conservatism in the results.

This portion of spending is excluded in the consumer spending calculations for disease states, meaning only the remaining health care related spending in each consumer expenditure is allocated across the 21 defined disease state categories.

Finally, each consumer expenditure was assigned an impact rating (high, medium, low, or zero) for each of the disease states to determine how impactful the consumer expenditures are on the spending for that disease state. We gathered internal clinicians that had a focus area in all the disease states that were studied (see Appendix 3). In these conversations, which were held based on the disease states, we discussed the benefits of each consumer expenditure (for example, mental wellness, traditional and complementary medicine) on the disease states to gain a deeper understanding of the impact of each spending category on the disease states. In doing this, we recognized that there needs to be a scale of high, medium, or low; for example, if we have any one category as "high" across the board for each disease state, it minimizes the fact that there should be variation in impact by disease.

The disease state "other" captures health-related spending that does not fall under the researched disease states. To account for this spending, we assumed an impact of all consumer expenditures as "low." In conversations with the clinical subject matter advisers, we determined that the impact on all other disease states is not zero, but this leaves the values conservative, and the most prominent disease states are addressed independently.

Acknowledging that there are benefits that result from each of these consumer expenditures, the goal of these discussions with the clinicians was to align on the degree of benefit. These conversations, backed by clinical subject matter advisers, allowed us to understand that certain consumer spending will have a more significant benefit on the health of some groups of people than others.

- *Example:* Fitness has a "low" impact for cancer but a "high" impact for diabetes. Due to the nature of cancer, a person being fit does not make having cancer significantly less likely as compared to diabetes, which is much more common in individuals who are less fit.[15]

By creating variations between disease states through the impact consumer expenditures have on them, we were able to discretely model and interpret how consumer spending can affect health outcomes.

2040 projection

To project the assumptions made for consumer expenditures on spending by disease state, data from the Global Wellness Institute (GWI) was leveraged to obtain spending from 2019 to 2022. The data was analyzed by type of consumer expenditure, and the one-year and three-year CAGRs were calculated for every year. A weighted average trend rate was developed using two-thirds weight on the three-year CAGR and one-third weight on the one-year CAGR. A trend group was assigned based on the weighted average trend rate which corresponded to an annual future growth assumption based on the following definition:

Figure 6

Trend group	Growth assumption
Rapid growth	15%
Moderate growth	7%
Slow growth	4%
No growth	0%
Slow decrease	–4%
Moderate decrease	–7%
Rapid decrease	–15%

The potential spending for each consumer expenditure category was then projected using the annual trend rate by year through 2040. The model does not assume any savings for consumer dollars as investments and growth in this area are likely to continue to drive medical and pharmacy spending savings in the long term.

2040 projection (preventive and proactive measures)

Aging
The aging factor for consumer health care dollars was set equal to the weighted average medical and pharmacy aging factor under the assumption that as people gain life span, there will be an equivalent increase in consumer spending.

Savings
The savings percentages for consumer health care dollars were set equal to the weighted average medical and pharmacy savings percentages under the assumption that as people become healthier, there will be an equivalent reduction in consumer spending.

Investment
The consumer investments were calculated similarly to the medical savings as described above (please refer to the respective section). The ROI for consumer investments was set to 3:1 ($3 is saved for every $1 of consumer investment). Research shows that the ROI of consumer investment differs across types of investments. The main sources supporting this research are the National Institutes of Health's (NIH) Nutrition and Health Intervention,[16] Journal of Clinical Sleep Medicine,[17] Frontiers in Environmental Health,[18] the NIH's Genomic Testing,[19] and Kaiser Family Foundation.[20] The 3:1 assumption could be conservative, and it is likely more savings will be generated than the assumptions included.

The final consumer health care spending by year, accounting for improvements in preventive and proactive measures, equals: Baseline consumer claims x (1 + the combined medical and pharmacy aging factor aging factor) x (1 – combined medical and pharmacy savings percentage due to prevention and improvement management) + consumer investment.

Social

Spending alignment category mapping

Public health expenditures, defined as spending outside of traditional medical and pharmacy claims, were analyzed using the NHE framework. This included government-funded programs (for example, Centers for Disease Control and Prevention and Health Resources Services Administrations), as well as other non-claims-based spending categories such as dental services, retail durable medical equipment (DME), and over-the-counter (OTC) retail medical products.

To prevent double counting, we excluded any public health categories already captured in the medical, pharmacy, or consumer spending analysis.

Government spending mapping to disease states

For agency-level government spending, budget documents and program descriptions were reviewed to identify key areas of health impact (for example, infectious disease, maternal health, or mental health). Each agency's total 2024 budget was allocated across disease categories using a structured mapping process informed by program goals, reported outcomes, and published evidence. This enabled us to assign a portion of federal and state public health dollars to specific disease states while avoiding overlaps with claims-based medical or pharmacy spending.

Example: For the CDC, approximately 50% of the agency's $11.6 billion 2024 budget was mapped to infectious disease efforts (for example, HIV, flu, and pandemic preparedness), with the remainder allocated to chronic disease prevention programs (for example, diabetes, heart disease, or cancer) and public health preparedness. This allowed for an attribution of funds to specific disease states.

Category mapping of non-agency social categories

For other social categories where budget detail is limited (for example, dental, DME, and OTC products), a category-based framework was applied to evaluate how each category contributes to each of the four categories (promoting health, managing symptoms, treating conditions, and restoring health).

These categories were further mapped to specific disease states using high-, medium-, or low-impact scores informed by literature reviews and interviews with clinical subject matter advisers; for instance:

- Dental services were assigned a high impact for cardiovascular disease relative to other disease state due to established links between oral inflammation and heart health,[21] but low for musculoskeletal disease.[22]
- For retail DME, only the portion deemed medically necessary for health improvement was included; spending on lifestyle or convenience features was excluded.[23]

To avoid overstating impacts, 100% of spending was assumed health-related unless expert consensus or documentation suggested otherwise. Conservative adjustments included:

- Retail DME: 15% excluded
- Dental services: 10% excluded

This two-tiered mapping approach of 1) budget-based for public programs; and 2) category-based for product categories helped to ensure that social or other spending was allocated accurately and conservatively across disease states.

Some expenditures could not be confidently assigned to one of the 21 disease states. In these cases—captured in a separate "other" disease category—a conservative low-impact rating was applied across all social categories. Similarly, spending not directly tied to health improvement (for example, convenience features in DME) was categorized as "non-disease state" and excluded from downstream disease mapping. These conservative assumptions helped to ensure the model did not overstate social spending impacts.

2040 projection

To project the assumptions made for social expenditures on spending by disease state, NHE data was leveraged to obtain past and projected spending for 2016 to 2032. The data was analyzed by type of social expenditure, and the five-year CAGR was calculated for every year. The spending for each social expenditure in the years 2033 to 2040 was then projected using the five-year CAGR.

The model does not assume any savings for social dollars as it is likely that investments and growth in this area will continue to drive medical and pharmacy spending savings in the long term.

2040 projection (preventive and proactive measures)

Aging
The aging factor for social or other health care dollars was set equal to the weighted average medical and pharmacy aging factor under the assumption that as people gain life span, there will be an equivalent increase in social or other spending.

Savings
The savings percentage for social or other health care dollars was set equal to the weighted average medical and pharmacy savings percentages under the assumption that as people become healthier, there will be an equivalent reduction in social or other spending.

Investment
The social investments were calculated similarly to the medical savings as described above (please refer to the respective section). The ROI for social or other investments was set to 4:1 ($4 is saved for every $1 of consumer investment). Research shows that the ROI of social or other investment differs across types of investments. The main sources supporting this research are the Assistant Secretary for Planning and Evaluation,[24] Healthcare Brew,[25] North Carolina Housing Finance Agency,[26] and Office of Disease Prevention and Health Promotion.[27] The 4:1 assumption could be conservative, and it is likely more savings will be generated than the assumptions included.

The final social health care spending by year, accounting for improvements in preventive and proactive measures, equals: Baseline social claims x (1 + the combined medical and pharmacy aging factor aging factor) x (1 – combined medical and pharmacy savings percentage due to prevention and improvement management) + social investment.

Results and reporting

Total US health care spending results

We aggregated the medical, pharmacy, consumer, and social or other health care spending by year under the 1) baseline assumptions (current state); and 2) Future of Health assumptions (achievable state). The spending under baseline assumptions minus the spending under Future of Health assumptions equals the total US health care spending savings.

Savings were also generated at a granular level (for example, disease state, spending alignment category, line of business, and age).

Historical trends

- Measured annual medical PMPM trends (Komodo) from 2019 to 2023 at the disease state and spending alignment category level.
- Measured annual pharmacy PMPM trends (Komodo) from 2019 to 2023 at the disease state and spending alignment category level.
- Measured consumer annual trends (GWI) from 2019 to 2022 at the consumer category level.
- Measured social or other annual trends (NHE) from 2019 to 2023 at the NHE category level.

Appendix 1: Glossary

Spending alignment category mapping

Spending alignment category mapping rules

Certain adjustments made to the mapping rules were based on internal clinical discussions and jointly decided with our actuarial experience and source data. Many adjustments were based on the source diagnosis codes found on the claims and reviewed collectively across the research team to determine the appropriate mapping.

Figure 7

Care group level 2	General rule	Exceptions to general rule
Advanced imaging—CT	Spending alignment category: Treating conditions Reasoning: Advanced imaging is generally done reactively and to diagnose illness or injury	Exception: Advanced imaging—CT: low-dose CT lung cancer screening Spending alignment category: Promoting health Reasoning: Can be cancer screenings for people with family history
Advanced imaging—MRI	Spending alignment category: Treating conditions Reasoning: Advanced imaging is generally done reactively to diagnose illness or injury	
Advanced imaging—PET	Spending alignment category: Treating conditions Reasoning: Advanced imaging is generally done reactively and to diagnose illness or injury	
Behavioral health services	Spending alignment category: Promoting health for preventive services and managing symptoms for non-preventive services Reasoning: Non-preventive services assume the person is managing for behavioral health disorder	Exception: Screenings and follow-up encounters for behavior health services and assessments Spending alignment category: 20% promoting health and 80% managing symptoms Reasoning: It is unclear if these screenings are done on a preventive measure or not
Chemotherapy	Spending alignment category: Treating conditions Reasoning: Treatment for cancer patients	
Dental	Spending alignment category: Treating conditions Reasoning: Dental claims submitted through medical benefit are usually related to dental trauma	
Diagnostics	Spending alignment category: Promoting health for preventive services and treating conditions for non-preventive services Reasoning: Non-preventive services assume the person is unwell and diagnosing the disease is part of treatment	Exception: Screenings and follow-up encounters Spending alignment category: 20% promoting health, 80% treating conditions Reasoning: It is unclear if these screenings are done on a preventive measure or not Exception: diagnostics: Fetal monitoring and nonstress tests Spending alignment category: Promoting health Reasoning: This is a routine diagnosis that doesn't fall into creating conditions

DME and supplies	Spending alignment category: Restoring health for orthopedic reasons and managing symptoms for non-orthopedic reasons Reasoning: DME for orthopedic reasons is part of the healing process (getting to 100%), DME for non-orthopedic reasons is usually to manage symptoms	Exception: DME and supplies—enteral and parenteral nutrition Spending alignment category: Treating conditions Reasoning: Malnourishment is treated using this DME
Endoscopy	Spending alignment category: Treating conditions Reasoning: Endoscopies are done reactively and is done to diagnose illness or injury	Exception: colonoscopy Spending alignment category: Promoting health if done for screening reason, otherwise treating conditions Reasoning: Can be done on routine and preventive purposes
Lab—Chemistry/hematology	Spending alignment category: Promoting health for preventive services and treating conditions for non-preventive services Reasoning: Non-preventive services assume the person is receiving lab tests on a routine basis	Exception: Screenings and follow-up encounters for behavior health services and assessments Spending alignment category: 20% promoting health, 80% treating conditions Reasoning: it is unclear if these screenings are done on a preventive measure or not
Lab—Microbiology/pathology	Spending alignment category: Promoting health for preventive services and treating conditions for non-preventive services Reasoning: Non-preventive services assume the person is receiving lab tests on routine basis	
Lab—Other	Spending alignment category: Promoting health for preventive services and treating conditions for non-preventive services Reasoning: Non-preventive services assume the person is receiving lab tests on a routine basis	
Medications	Spending alignment category: Promoting health for preventive services and treating conditions for non-preventive services Reasoning: Non-preventive services assume the person is receiving medications on preventive purpose	Exception: Screenings and follow-up encounters for behavior health services or assessments Spending alignment category: 20% promoting health, 80% treating conditions Reasoning: It is unclear if these screenings are done on a preventive measure or not
Non-chemotherapy infusions	Spending alignment category: Treating conditions Reasoning: Usually associated with treating illness	
Other	Spending alignment category: 70% treating conditions, 10% restoring health, 10% managing symptoms, 10% promoting health Reasoning: Costing splits based on the overall results from non-"other" care groups.	
Post-acute services	Spending alignment category: Managing symptoms Reasoning: Involved in making people comfortable and manage symptoms	
Procedures—Major	Spending alignment category: Treating conditions Reasoning: Surgeries are primarily used for	Exception: Neurostimulator procedure, pacemakers and implantable defibrillators Spending alignment category: Managing symptoms

	diagnostic purposes (if someone is ill) or used primarily for treatment	Reasoning: Devices are be inserted to manage symptoms Exception: Dialysis, AV fistula Spending alignment category: Managing symptoms Reasoning: Dialysis is performed repeatedly with intention of managing symptoms as opposed to treatment Exception: Bariatric surgery Spending alignment category: Managing symptoms Reasoning: Procedures performed with intention of managing and preventing symptoms instead of direct treatment
Procedures—Minor	Spending alignment category: Treating conditions Reasoning: Surgeries are primarily used for diagnostic purposes (if someone is ill) or for treatment	
Radiation therapy	Spending alignment category: Treating conditions Reasoning: Cancer treatment	
Rehabilitation	Spending alignment category: Restoring health Reasoning: Goal is to restore health after disease or injury	
Standard imaging—Nuclear medicine or SPECT	Spending alignment category: Promoting health for preventive services and treating conditions for non-preventive services Reasoning: Non-preventive services assume the person is receiving lab tests on a routine basis	Exception: Level II fetal ultrasound and screening mammography Spending alignment category: Promoting health Reasoning: Routine imaging to screen the body
Standard imaging—US	Spending alignment category: Promoting health for preventive services and treating conditions for non-preventive services Reasoning: Non-preventive services assume the person is receiving lab tests on a routine basis	
Standard imaging—X-ray	Spending alignment category: Promoting health for preventive services and treating conditions for non-preventive services Reasoning: Non-preventive services assume the person is receiving lab tests on a routine basis	
Vaccine administration	Spending alignment category: Promoting health Reasoning: Proactively building antibodies through vaccines	
Visits—Emergent	Spending alignment category: Treating conditions Reasoning: Emergent visits are not routine or preventive	
Visits—Evaluation and management	Spending alignment category: 25% promoting health, 25% managing symptoms, 50% treating conditions Reasoning: Making an assumption because	Exception: Care management and supervision, education visits, home evaluation and management Spending alignment category: promoting health if preventive wellness service,

	it's unclear if office visits are preventive, routine, or due to illness	otherwise managing symptoms Reasoning: These evaluation and management visits are more focused on disease management (unless otherwise labeled as preventive) and less on treatment
Visits—Observation	Spending alignment category: 25% promoting health, 25% managing symptoms, 50% treating conditions Reasoning: Office visit are either preventive/routine or due to sickness; split accordingly	
Visits—Urgent	Spending alignment category: Treating conditions Reasoning: Urgent visits are not routine/preventive	

For inpatient, all stays mapped to "treating sickness" except:

Figure 8

Sg2 care group level 1	**Sg2 care group level 2**	**Mapping**
General medicine	Rehab	Restoring health
General surgery	Bariatric surgery	Managing symptoms
General surgery	Transplant	Restoring health
Neonatology and normal newborn	Normal newborn	Promoting health
Orthopedics	Orthopedics: Medical	Restoring Health
Spine	Spine disorders, injuries, and non-specified pain	Restoring Health
Women's health	Antepartum	Promoting health
Women's health	C-sections and vaginal deliveries	Restoring health

To categorize therapeutic classes into specific spending alignment categories, we applied a set of mapping rules based on how drugs are typically used.[28] First, we identified the top drugs within each therapeutic class that together account for at least 80% of the total spending in that class. For each drug, we considered the context in which it is most often prescribed.

1. If a drug is given proactively to patients who are already in good health, it is mapped to the "promoting health" spending alignment category.
2. If it is given proactively to patients who have chronic conditions, it falls under "managing symptoms."
3. Drugs that are prescribed reactively in response to a decline in a patient's health are categorized as "treating conditions."
4. If a drug is used reactively after the initial treatment phase to help a patient return to optimal health, it is mapped to the "restoring health" spending alignment category.

This approach helps to ensure that each therapeutic class is aligned with how its most significant drugs are typically used in patient care. For therapeutic classes with drugs that have multiple indications, the mapping to a spending alignment category

was allocated between spending alignment categories. For example, the therapeutic class "cough, cold, and allergy" was allocated 50% to treating conditions and 50% to managing symptoms.

Figure 9

Therapeutic class	Treating conditions	Restoring health	Managing Symptoms	Promoting Health
ADHD, anti-narcolepsy, anti-obesity, and anorexiants	0%	0%	100%	0%
Allergenic extracts and biologicals (miscellaneous)	40%	0%	60%	0%
Alternative medicines	0%	50%	50%	0%
Amebicides	50%	0%	50%	0%
Aminoglycosides	100%	0%	0%	0%
Analgesics: Anti-inflammatory	10%	0%	90%	0%
Analgesics: Non-narcotic	0%	0%	100%	0%
Analgesics: Opioid	20%	0%	80%	0%
Androgens: Anabolic	0%	20%	80%	0%
Anorectal and related products	50%	0%	50%	0%
Antacids	100%	0%	0%	0%
Anthelmintics	100%	0%	0%	0%
Antianginal agents	0%	0%	100%	0%
Antianxiety agents	0%	0%	100%	0%
Antiarrhythmics	0%	40%	0%	60%
Anti-asthmatic and bronchodilator agents	0%	0%	100%	0%
Anticoagulants	0%	0%	100%	0%
Anticonvulsants	0%	0%	100%	0%
Antidepressants	0%	0%	100%	0%
Antidiabetics	0%	0%	100%	0%
Antidiarrheal and probiotic agents	75%	0%	25%	0%
Antidotes and specific antagonists	50%	0%	50%	0%
Antiemetics	60%	0%	0%	40%
Antifungals	75%	0%	0%	25%
Antihistamines	50%	0%	50%	0%
Anti-hyperlipidemic	0%	0%	100%	0%
Antihypertensives	0%	20%	70%	10%
Anti-infective agents (miscellaneous)	75%	0%	25%	0%
Antimalarials	60%	0%	0%	40%
Anti-myasthenic and cholinergic agents	0%	0%	100%	0%
Antimycobacterial agents	0%	60%	0%	40%
Antineoplastics and adjunctive therapies	100%	0%	0%	0%
Anti-Parkinson's and related therapy agents	0%	0%	100%	0%
Antipsychotics and antimanic agents	0%	0%	100%	0%
Antiseptics and disinfectants	0%	0%	0%	100%
Antivirals	0%	0%	100%	0%
Beta blockers	50%	0%	50%	0%
Calcium channel blockers	0%	0%	100%	0%

Cardiotonics	0%	0%	100%	0%
Cardiovascular agents, misc.	34%	33%	33%	0%
Cephalosporins	50%	0%	50%	0%
Chemicals	100%	0%	0%	0%
Contraceptives	0%	0%	50%	50%
Corticosteroids	0%	0%	100%	0%
Cough, cold, and allergy	50%	0%	50%	0%
Dermatologicals	10%	0%	80%	10%
Diagnostic products	0%	0%	100%	0%
Dietary and dietary management products	0%	50%	0%	50%
Digestive aids	0%	0%	100%	0%
Diuretics	100%	0%	0%	0%
Endocrine and metabolic agents, misc.	55%	0%	45%	0%
Estrogens	20%	0%	40%	40%
Fluoroquinolones	100%	0%	0%	0%
Gastrointestinal agents, misc.	50%	0%	50%	0%
General anesthetics	0%	0%	0%	100%
Genitourinary agents, misc.	10%	20%	70%	0%
Gout agents	35%	0%	50%	15%
Hematological agents, misc.	0%	0%	75%	25%
Hematopoietic agents	0%	50%	50%	0%
Hemostatics	50%	0%	50%	0%
Hypnotics, sedatives, and sleep disorder agents	50%	0%	50%	0%
Laxatives	50%	0%	0%	50%
Local anesthetics-parenteral	0%	100%	0%	0%
Macrolides	50%	0%	50%	0%
Medical devices and supplies	0%	0%	85%	15%
Migraine products	0%	0%	100%	0%
Minerals and electrolytes	50%	0%	0%	50%
Miscellaneous therapeutic classes	40%	0%	40%	20%
Mouth, throat, and dental agents	0%	0%	0%	100%
Multivitamins	50%	0%	50%	0%
Musculoskeletal therapy agents	100%	0%	0%	0%
Nasal agents: systemic and topical	67%	0%	33%	0%
Neuromuscular agents	0%	0%	100%	0%
Nutrients	70%	0%	30%	0%
Ophthalmic agents	100%	0%	0%	0%
Otic agents	40%	30%	0%	30%
Oxytocics	0%	100%	0%	0%
Passive immunizing and treatment agents	100%	0%	0%	0%
Penicillins	0%	0%	0%	100%
Pharmaceutical adjuvants	0%	0%	33%	67%
Progestins	0%	0%	100%	0%

Psychotherapeutic and neurological agents, misc.	40%	0%	50%	10%
Respiratory agents, misc.	0%	0%	0%	100%
Sulfonamides	60%	0%	20%	20%
Tetracyclines	0%	0%	100%	0%
Thyroid agents	0%	0%	0%	100%
Toxoids	100%	0%	0%	0%
Ulcer drugs, antispasmodics, and anticholinergics	0%	0%	100%	0%
Urinary antispasmodics	0%	0%	0%	100%
Vaccines	20%	0%	40%	40%
Vaginal and related products	100%	0%	0%	0%
Vasopressors	0%	0%	0%	100%
Vitamins	50%	0%	50%	0%
N/A	35%	15%	45%	5%

Drivers of disease

For the analysis, each disease state was assessed across five categories that drive both prevention and better maintenance: lifestyle, health quality and access, environment, genetics, and non-modifiable risks. The following is a brief definition of each of these drivers:

Figure 10

Driver	Description
Lifestyle factors	Modifiable risk factors, including other disease states, which can cause a disease or event (smoking, obesity, diet, physical activity, stress, and more), including the social determinants of health (like food access) that impact lifestyle
Health care quality and access	Barriers to quality health care and access that result in a death-causing condition or event
Environmental factors	Familial environment, exposure to trauma, community dynamics, and more
Genetic factors	Inherited genetics that make an individual predisposed to a disease
Non-modifiable	Biological factors (for example, chemical imbalances in the brain) and preceding or cooccurring medical conditions

Appendix 2: Data notes

Komodo Healthcare Map

Appendix 3: Clinical subject matter advisers

Figure 11

Disease state	Clinical subject matter adviser (Deloitte)
Alzheimer's disease	Russell Bailey
Cancer	Felix Matthews, Ken Abrams
Chronic lower respiratory diseases	Bill Fera
Dermatology	Rich Stone
Diabetes	Ken Abrams
Gastroenterology	Jay Bhatt, Bill Fera
General medicine	Jay Bhatt, Bill Fera, Shaun Rangappa, Mark Ediger
General surgery	Felix Matthews
Gynecology	Margaret Punch
Heart disease	Ken Abrams
Infectious disease	Mark Snyder
Kidney disease	Ken Abrams
Mental health	Jennifer Harsh
Musculoskeletal diseases (all other)	Ken Abrams
Musculoskeletal diseases (back and neck)	Ken Abrams
Neurosciences	Russell Bailey
Obstetrics	Margaret Punch
Rheumatology	Jay Bhatt, Ken Abrams
Sense organ diseases	Ken Abrams
Stroke	Russell Bailey
Substance use disorder	Jennifer Harsh

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This analysis, including its methodologies and assumptions, was conducted under the direction of Andrew Davis, FSA, MAAA, with Chris Kottenstette, FSA, MAAA, leading its development. Both Andrew Davis and Chris Kottenstette meet the qualification standards set by the American Academy of Actuaries and are appropriately qualified to supervise and produce this analysis.

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