Memorial Sloan Kettering Cancer Center

DigITs
DIGITAL, INFORMATICS, TECHNOLOGY

MSK ONCall

All things oncology, on call for all

Team 3

August 7, 2020 – DigITs Intern Summer Challenge

August 2020

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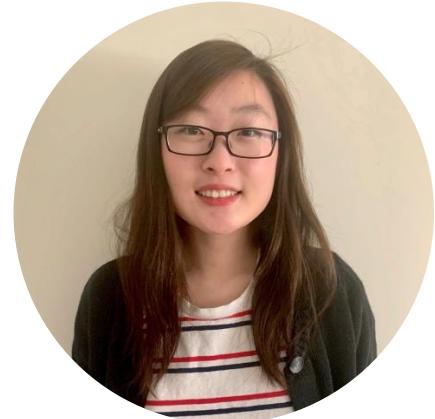
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MSK ⊕ ONCall
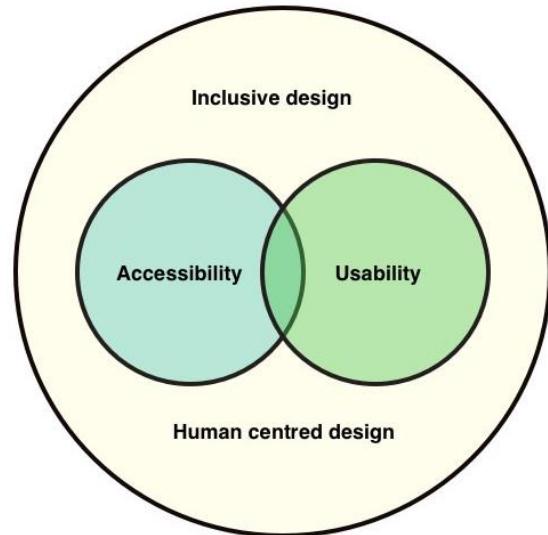
Creating a digital knowledgebase for the layperson

Agenda
All things oncology, on call for all

MSK ⊕ ON**Call**

Inclusive design

Accessibility | Usability

Human centred design

Accessibility: *the qualities that make an experience open to all*

Inclusive Design: *enables and draws on the full range of human diversity*

1 What does a cross-platform, accessible knowledge base look like? How do we leverage **unique community touchpoints** to serve the layperson?
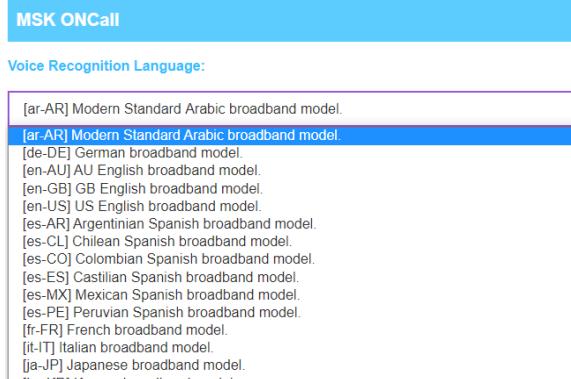
2 How can we view MSK through the lens of **3 representative personas** to understand user needs of intersectional demographics?

3 What will it take for MSK to achieve its big bet of becoming the go-to **"digital dragon" of health information**?

MSK ONCall

Accessibility begins with intuitive content design and curation

Harness AI to provide individualized experiences for different user needs

Tapping into existing communities allows us much greater reach than MSK-to-individual efforts

Intuitive content design

↓

Software as a tool for accessibility

↓

Unique hardware touchpoints

↓

Our target populations

How do we model for diverse groups of health consumers?

intersectionality (n):

the complex, cumulative way in which the effects of multiple forms of discrimination (such as racism, sexism, and classism) combine, overlap, or intersect especially in the experiences of marginalized individuals or groups

Persona 1: Salvador

Salvador's Story

- 47-year old low-income construction worker from Honduras
- Works in Sacramento, CA in an urban area
- Concerns over melanoma due to symptoms; recently discovered new moles and spots on face
- Can't take time off work
- Relies on smartphone for internet access

57.5 million Americans, or **18% of the population** in the continental US and Hawaii, identified themselves as Hispanic or Latino in 2016.
—U.S. Census Bureau

Cancer is the leading cause of death among Hispanics, accounting for **21% of deaths**.
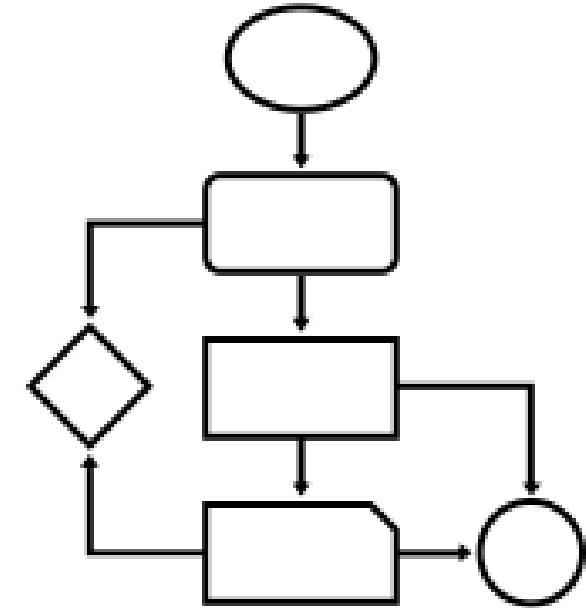
|	Hispanic Origin (All Subgroups)	Hispanic Subgroup: Central American	Nonhispanic Whites (All Subgroups)
Income Below Federal Poverty Level	23.5 %	23.1%	10.6%
Speak English "not well" or "not at all"	25.5%	35.3%	11.3%
Less than High School Diploma, aged over 25 years	34.4%	44.1%	8.0%

- Start simple, get as complex as desired

- Minimize information overload

- Going down the "**rabbit hole,**" neural network design

- Users are coming from everywhere, so we should meet them where they are

  - Multilingual access

  - Disability accessibility

  - Writing for lower reading levels

"Rabbit hole" style
of content layout

This is what we mean by "content accessibility matters"

Not this…

MSK ⊕ ONCall

Messages

What would you like to understand?

ASK

SYMPTOMS

TREATMENTS

STAYING HEALTHY

FOR FAMILIES

Cancer A-Z   MSK Research   Site Options   Further Links

📖 BOOKMARKS

Messages

SITE OPTIONS

Accessibility

English ▼ | Language

OFF | Text magnification

OFF | Reduced site colors

OFF | Dark mode

OFF | Video transcriptions

OFF | Closed captioning

OFF | Replace images with text

OFF | Highlight links
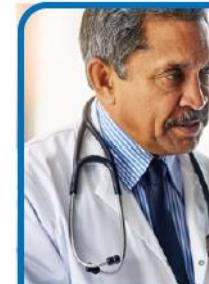
Advanced | SHOW

Submit

STAYING HEALTHY | FOR FAMILIES

A S K

Cancer A-Z | MSK Research | Site Options | Further Links | 📑 BOOKMARKS

MSK ⊕ ONCall

ASK

SYMPTOMS

TREATMENTS

STAYING HEALTHY

FOR FAMILIES

Cancer A-Z   MSK Research   Site Options   Further Links

BOOKMARKS

What would you like to understand? 🔍   Symptoms   Treatments   Staying Healthy   For Families

Lumps and bumps on my arm 🔊

A S K

Should I be concerned?

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit.

What are the different types of moles?

TRANSCRIPT

▶ How To: check for skin cancer 1:01

Not what you were looking for?

Colorless lumps

Lumps under the skin

Red skin spots

How often should I visit my dermatologist?

This page was tagged under:

Melanoma (topic)

Visible symptoms

Benign symptoms

✉ Contact a doctor

Diving into the symptom ⊕

What is melanoma? ⊕

Messages

What would you like to understand? Symptoms Treatments Staying Healthy For Families

ASK

Diving into the symptom 🔊 ➕

The ABCDE's of melanoma

Benign **Malignant**

Asymmetry: One side is different from the other

Border is irregular, notched, or blurred
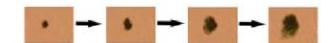
Color is mixed

Diameter is larger than 6 millimeters

Mole **E**volves over time

It is normal when...
- Lorem ipsum dolor sit amet
- Consectetuer adipiscing elit
- Sed diam nonummy nibh euismod tincidunt
- Ut laoreet dolore magna aliquam erat volutpat
- Ut wisi enim ad minim veniam
- Quis nostrud exerci tation ullamcorper suscipit

You should contact your doctor if... ✉
- Lorem ipsum dolor sit amet
- Consectetuer adipiscing elit
- Sed diam nonummy nibh euismod tincidunt
- Ut laoreet dolore magna aliquam erat volutpat
- Ut wisi enim ad minim veniam
- Quis nostrud exerci tation ullamcorper suscipit

What is melanoma? 🔊 ➕

TRANSCRIPT

ABOUT MELANOMA
OVERVIEW OF THE MOST ...ROUS FORM OF SKIN CANCER

1:37

What is melanoma?

Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod tincidunt ut laoreet dolore magna aliquam erat volutpat. Ut wisi enim ad minim veniam, quis nostrud exerci tation ullamcorper suscipit. Lorem ipsum dolor sit amet, consectetuer adipiscing elit, sed diam nonummy nibh euismod

Learn more about this topic
Melanoma (topic)
Melanoma symptoms
Melanoma treatments
Melanoma FAQ's

Related resources
More infographics
More videos
Videos for families
MSK's research
Stories from MSK patients

Cancer A-Z MSK Research Site Options Further Links 📑 BOOKMARKS

Hello, I can teach you more about cancer.

Behind the Scenes

Artificial Intelligence
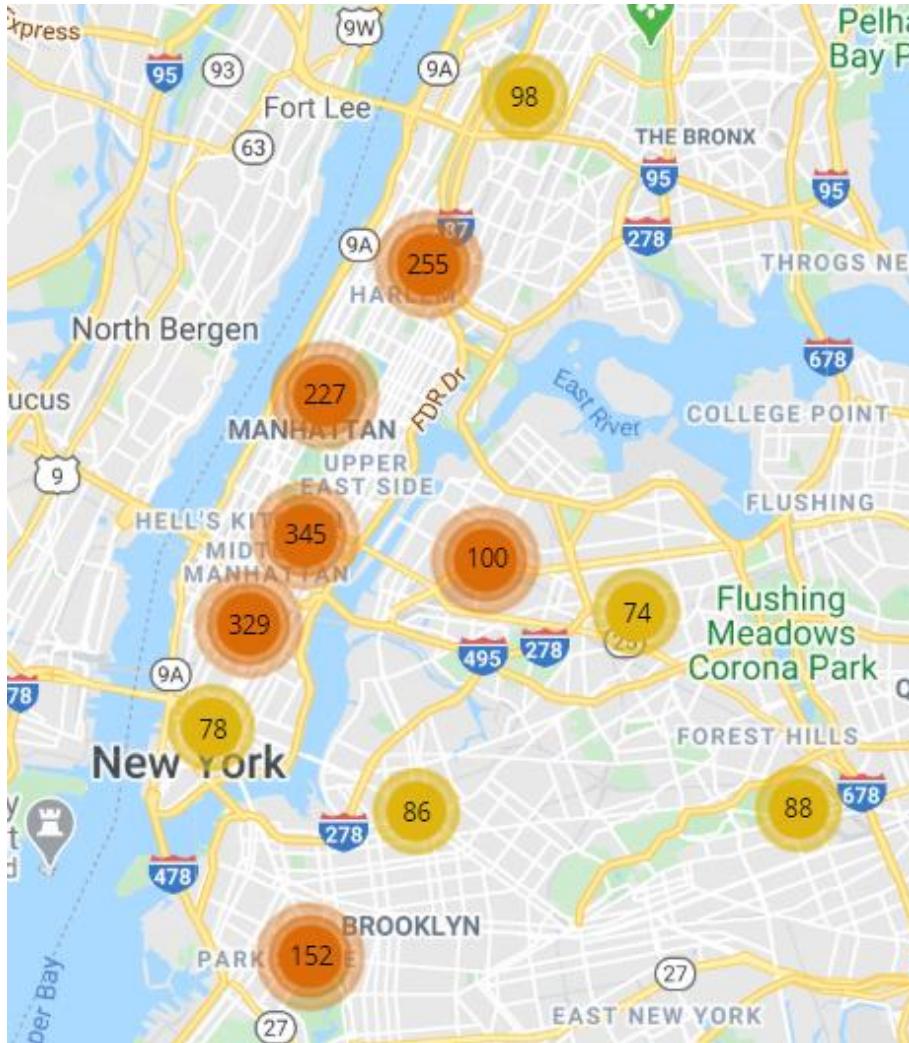
- Bridge digital divide through a suite of technological and AI solutions to reach as many patients as possible

- Voice Recognition and Multi-Lingual

    - Top 3 Most Common Languages

        - Spanish (41M)

        - Chinese (3.5M)

        - Tagalog (1.7M)

- By leveraging the power of IBM Watson, MSK can provide a state-of-the-art virtual assistant that connects to its large knowledge base

City hotspot kiosks (LinkNYC)

Persona 2: Amy

Amy's Story

- Born, raised, and lived entire life in Nebraska

- 63 years old

- Retired from an administrative position in the public school system

- Becomes aware of genetic risk of breast cancer through word-of-mouth

- Most comfortable getting healthcare information in person and through physical materials

Rural Healthcare Disparities

Percentage of total U.S. population

19.3%
rural

80.7%
urban

Physicians per 100,000 people

39.8
rural

53.5
urban

53% of rural Americans lack access to the FCC's internet bandwidth benchmark speed

Specialists per 100,000 people

30
rural

263
urban

Sources: Association of American Medical Colleges; National Rural Health Association

MSK ⊕ ON**Call**

Messages | 👤

What would you like to understand? 🔍 | Symptoms | Treatments | Staying Healthy | For Families

Cancer A-Z 🔊

ASK

Search by cancer

Bladder Cancer	Leukemia	Pancreatic Cancer
Breast Cancer	Liver Cancer	Prostate Cancer
Colon and Rectal Cancer	Lung Cancer	Thyroid Cancer
Endometrial Cancer	Melanoma	
Kidney Cancer	Non-Hodgkin Lymphoma	
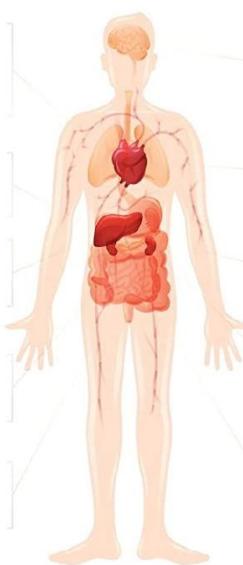
OTHER CANCERS

Search by symptom

Breast changes	Skin changes
Bladder changes	Swelling or lumps
Trouble urinating	Weight gain or weight loss
Bleeding or bruising	
Bowel changes	
Cough or hoarseness	
Eating problems	
Fatigue	
Fever	
Heartburn or indigestion	
Nausea and vomiting	
Mouth changes	
Neurological problems	
Seizures	

OTHER SYMPTOMS

Search by body part

A-Z for:

Patients
Doctors
Survivors
Family
Kids
Students
Donors

A-Z Dictionary

Search by tag

FAQ's

Chat with us

Supermarket kiosks
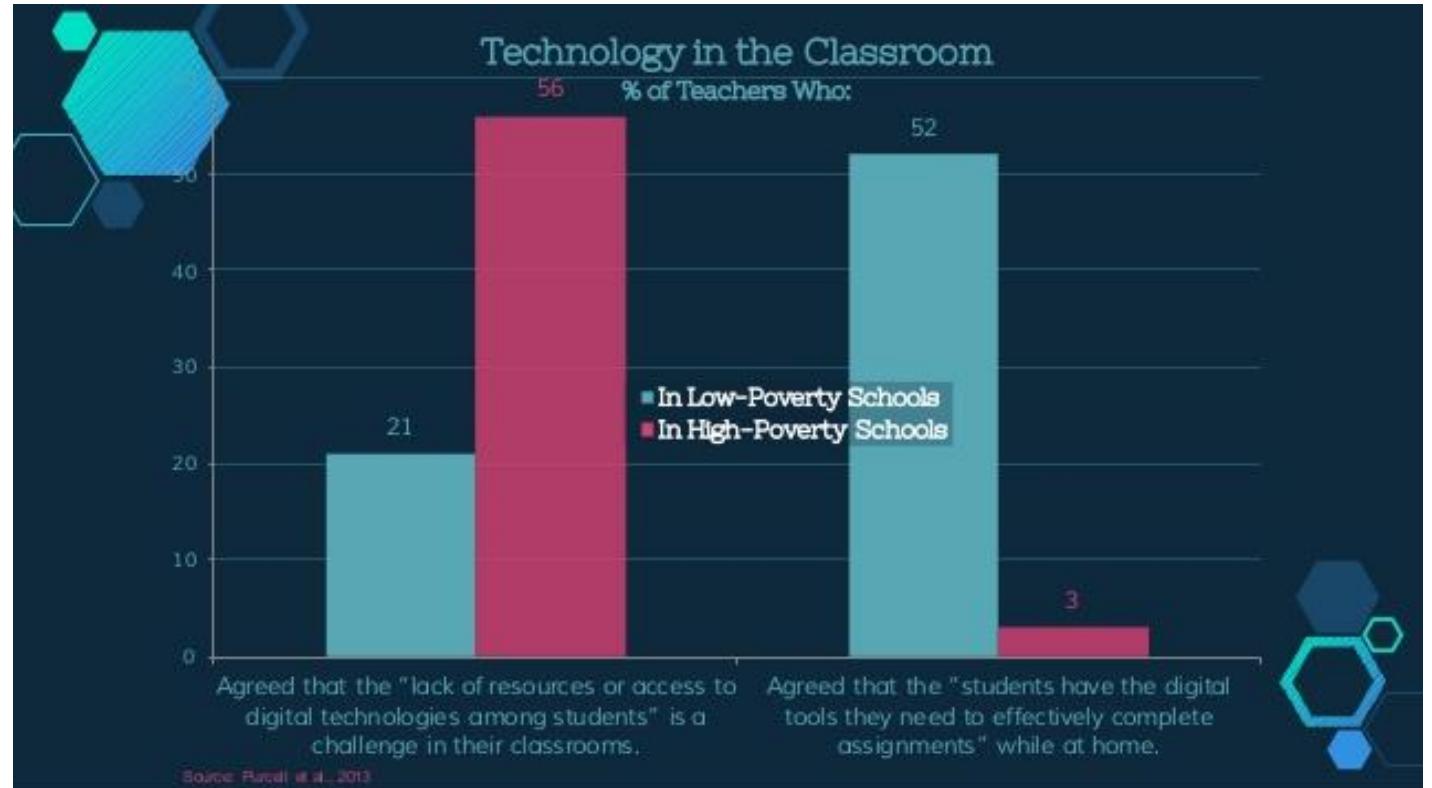
Community kiosks

Persona 3: Sara

Sara's Story

- 9-year-old girl

- Her mom just got diagnosed with cancer

- Doesn't know much about what cancer is

- Attends an under-resourced school

- Has a low reading level causing most websites to be confusing

"Every year around 0.3% of all families with children under the age of 18 years encounter parental cancer, and 3.1% of minors and 8.4% of YAs have a parent who has been diagnosed with cancer."
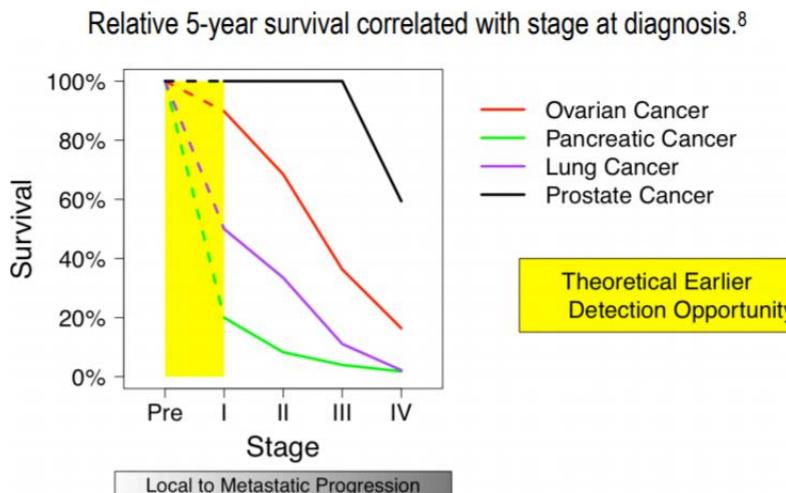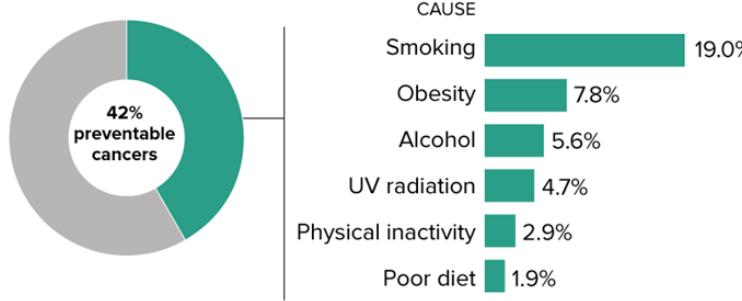
How can we provide programs and resources for the next generation?

Preventable cancers

More than 40 percent of cancer cases can be prevented, the American Cancer Society finds in a new report. Here is a list of things people can change and their share of cancer cases:

42% preventable cancers

CAUSE	
Smoking	19.0%
Obesity	7.8%
Alcohol	5.6%
UV radiation	4.7%
Physical inactivity	2.9%
Poor diet	1.9%

Relative 5-year survival correlated with stage at diagnosis.[8]

- Ovarian Cancer
- Pancreatic Cancer
- Lung Cancer
- Prostate Cancer

Theoretical Earlier Detection Opportunity

Local to Metastatic Progression

- Education and early detection are incredibly important tools in combating cancer.

  - Explaining cancer to children can be difficult and challenging

- MSK seeks to **"educate, promote science, and explain cancer in a way that can be understood by a layperson."**

  - Infographics and videos

  - Learning objectives and quizzes

  - Interactive chatbot

  - Links to other articles and further reading

  - Tiered education features

MSK ⊕ ONCall

Messages 👤

What would you like to understand? 🔍

SYMPTOMS

TREATMENTS

STAYING HEALTHY

FOR FAMILIES

ASK

Cancer A-Z   MSK Research   Site Options   Further Links

📑 BOOKMARKS

MSK ⊕ ONCall

Messages

ASK

Our educational resources

What can you do to support family members with cancer?
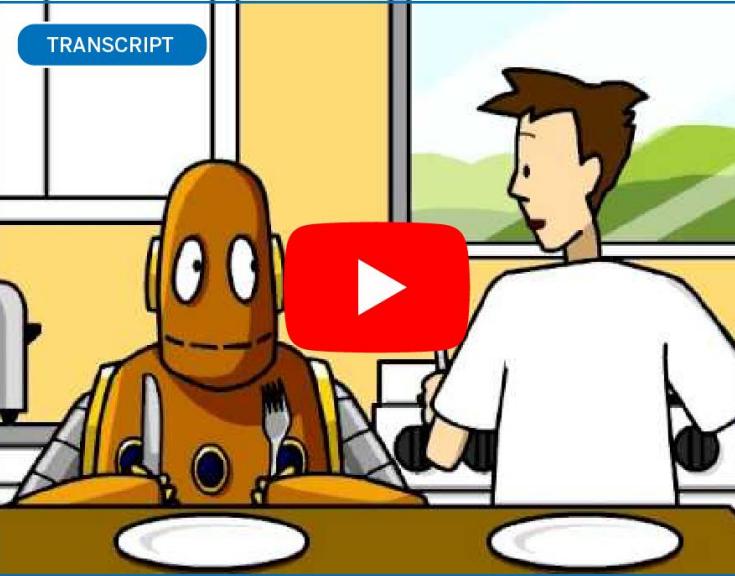
Join the Learners program!

Featured this week: 🔊

What is nutrition?

Why is nutrition so important for cancer patients?

Read more about nutritional programs for cancer patients here.

TRANSCRIPT

MSK ⊕ ON**Call**

✉ Messages   ⊛

🎤 | What would you like to understand? 🔍 | | Return to main site | | For Kids | | For Teens | | For Adults |
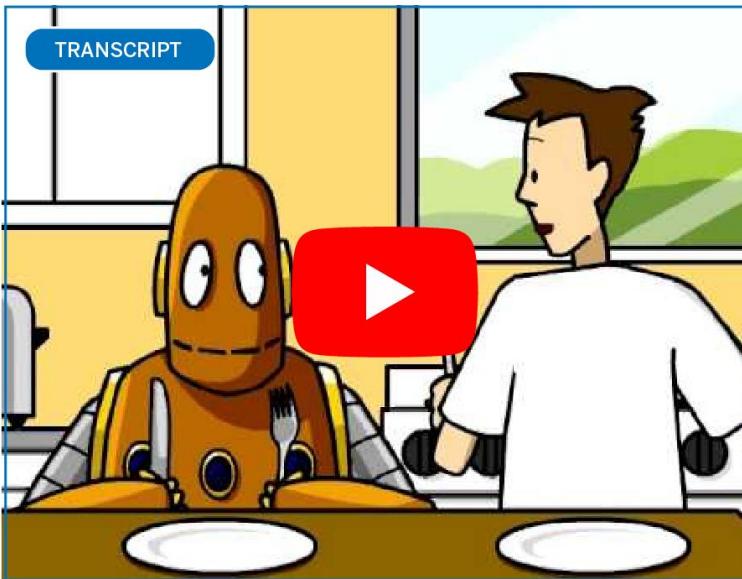
Featured this week: 🔊

What is nutrition?

Why is nutrition so important for cancer patients?

Read more about nutritional programs for cancer patients here.

TRANSCRIPT

▶

Challenge yourself: Take our weekly quiz!

★ **155 pts**

You are a: **level 3 beginner**. Keep learning!

Explore videos by topic

Cancer basics	Side effects
Symptoms	Facts & myths about cancer
Treatments	
Keeping healthy	Living with cancer
Checking for cancer	Cancer statistics

Cancer A-Z   MSK Research   Site Options   Further Links   📑 BOOKMARKS

Lessons

Welcome to biology!

The science of biology

✎

Water and life

✎

The science of biology

Learn

▶ The scientific method

🗋 The scientific method

🗋 Controlled experiments

Practice

✎ **The scientific method and experimental design**

4 questions   **Practice**

Water and life

Learn

▶ Importance of water for life

🗋 Lesson summary: Water and life

Practice

✎ **Structure of water and hydrogen bonding**

4 questions   **Practice**

About this unit

The scientific method and experimental design

Poison ivy is a weed that produces an oil which causes skin rashes.

Scientists want to perform an experiment to see if poison ivy grows taller when exposed to more carbon dioxide.

How should the control group in this experiment be treated?

Choose 1 answer:

(A) The control group should have plants growing at higher oxygen levels.

(B) The control group should have plants growing at different carbon dioxide levels.

(C) The control group should have plants growing in different amounts of water.

(D) The control group should have plants growing at normal carbon dioxide level.

Do 4 problems ○ ○ ○ ○

Check
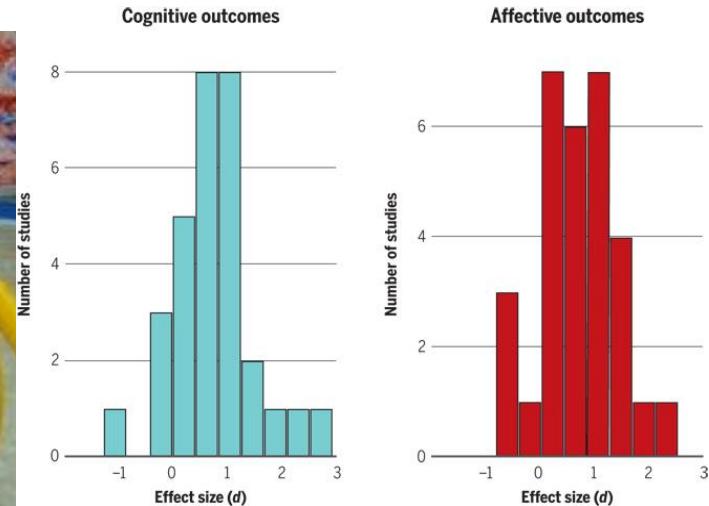
About this unit
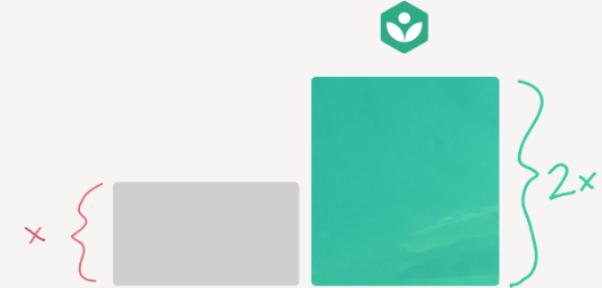
What does investing in the next generation look like?

- Use **robots** in school districts to supplement cancer education

  - Remote and disadvantaged school districts (South Korean model)

  - Games, videos, resources found on the ONCall page.

- **Khan Academy** model for self-education

  - Tiered education model for different learning levels

  - Presence in school districts, provide an effective and educational long-term experience

Cognitive outcomes

Number of studies

Effect size (d)

Affective outcomes

Number of studies

Effect size (d)

Over twice as likely to meet grade-level standards

Students who used Khan Academy for 30 minutes a week were over twice as likely to meet grade-level math standards. These findings hold true across ethnicity, family income level, and English-language learner status.

2x
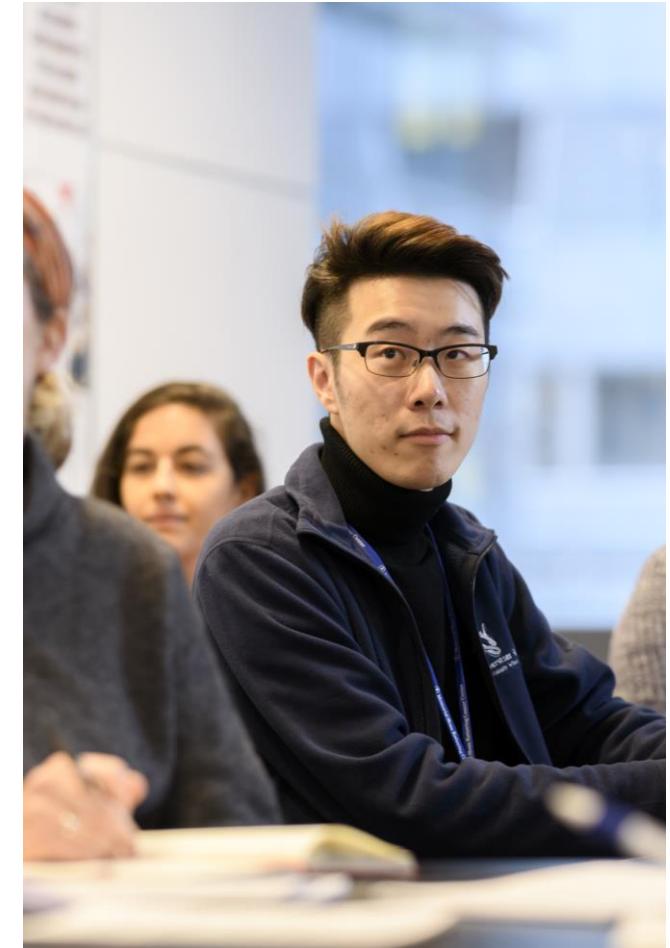
The Long Haul

MSK's Social Impact

Integrating the Knowledgebase into Society

How do the above solutions help shape MSK's **long-term image** as **the most accessible cancer knowledge center**?
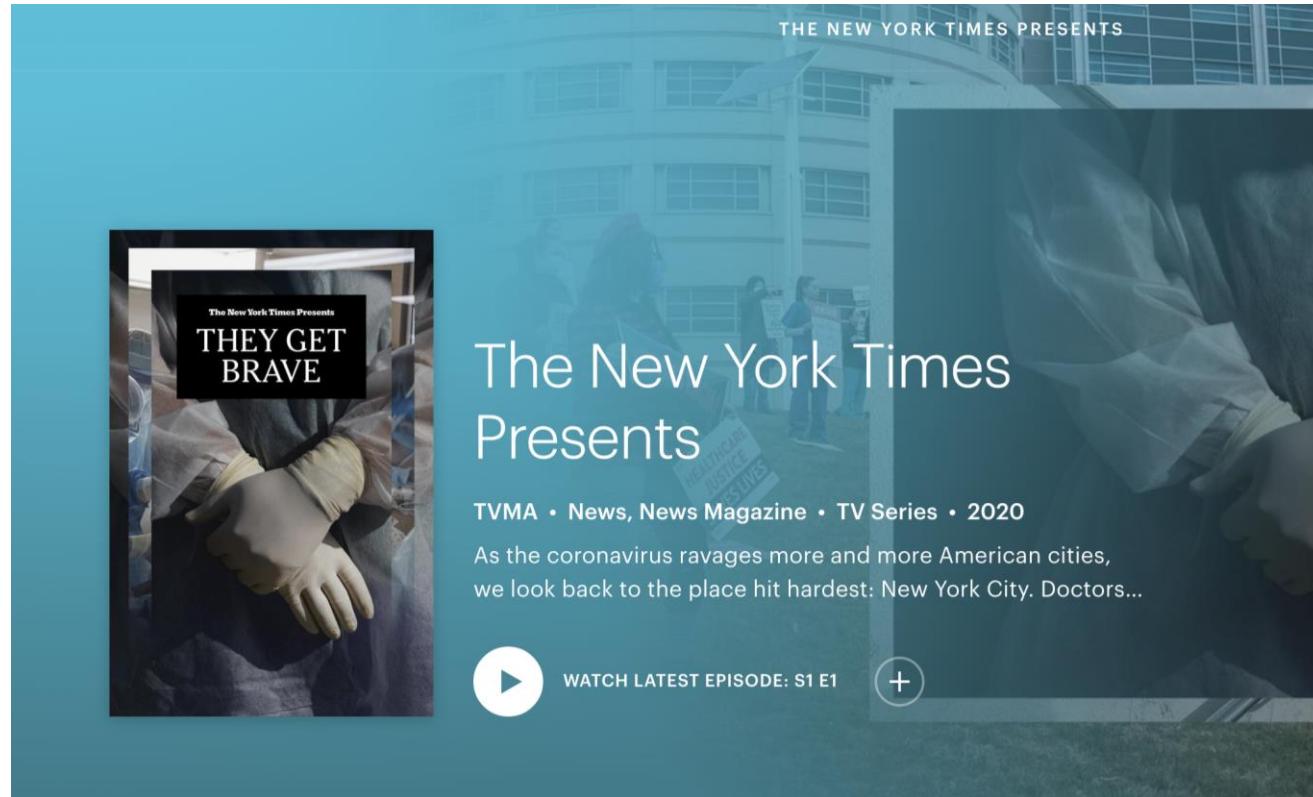
What else can MSK do to perform **community outreach** and use the knowledge base to its **fullest potential**?

MSK in Popular Media

Doing More with More

- Media partnerships (beyond social media)
  - **Increase brand awareness**
  - Educate the public
  - Widen sphere of outreach by working with screenwriters and publishers

- Industry examples:
  - Planned Parenthood's Office of Arts and Entertainment Engagement
  - *The New York Times Presents*...
  - Podcasts, radios, movies, shows, etc.

Physical Outreach

Doing More with More
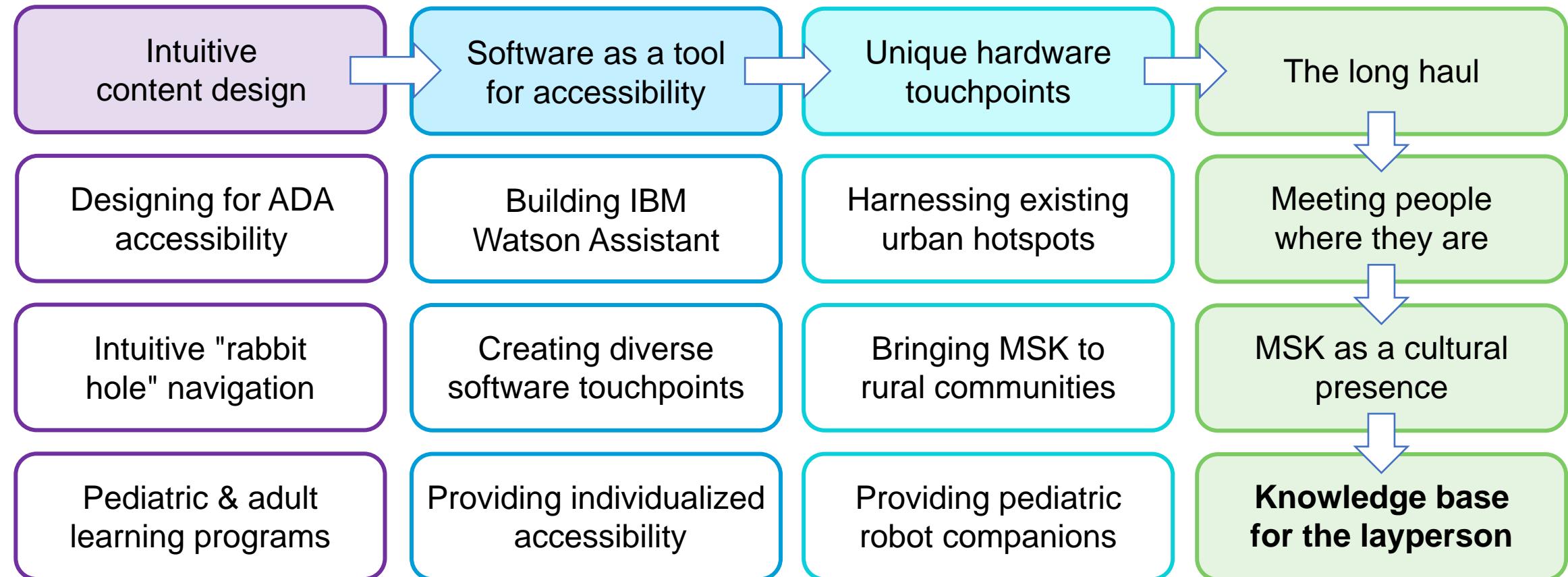
- Community centers, libraries, physician's offices with MSK print materials

- Expanding public transit advertising beyond NYC area through QR codes

- Eye-catching statistics that will resonate personally with a given population

How do we reach the "long haul"?

Mapping the journey forward

What is feasible for MSK today? What are steps we need to take to reach the "long haul"?

Intuitive content design	→	Software as a tool for accessibility	→	Unique hardware touchpoints	→	The long haul
Designing for ADA accessibility		Building IBM Watson Assistant		Harnessing existing urban hotspots		Meeting people where they are
Intuitive "rabbit hole" navigation		Creating diverse software touchpoints		Bringing MSK to rural communities		MSK as a cultural presence
Pediatric & adult learning programs		Providing individualized accessibility		Providing pediatric robot companions		**Knowledge base for the layperson**

Turning **vision** into **action**

Memorial Sloan Kettering Cancer Center
1884

DigITs
DIGITAL, INFORMATICS, TECHNOLOGY

Q&A

Appendices

Appendix A: Population Research and Demography
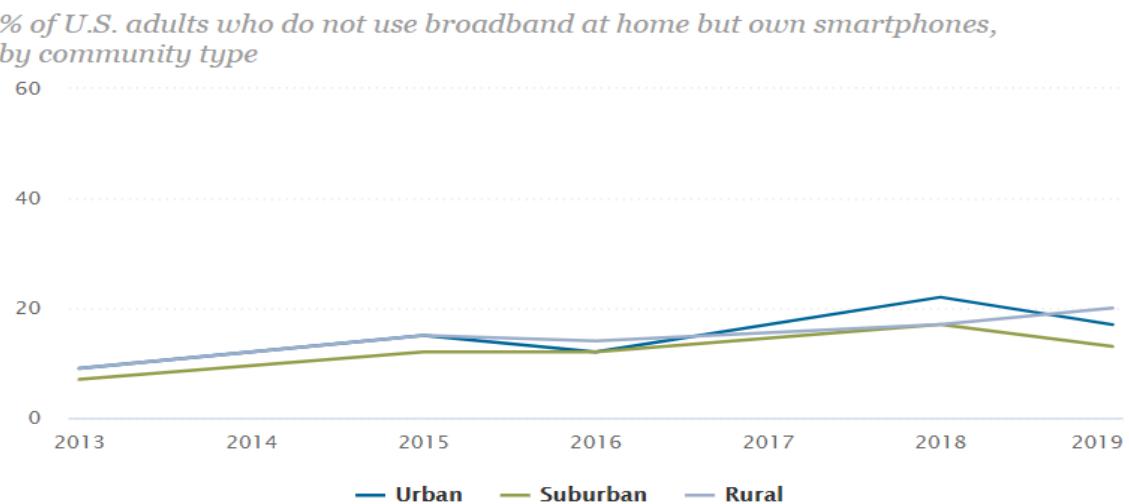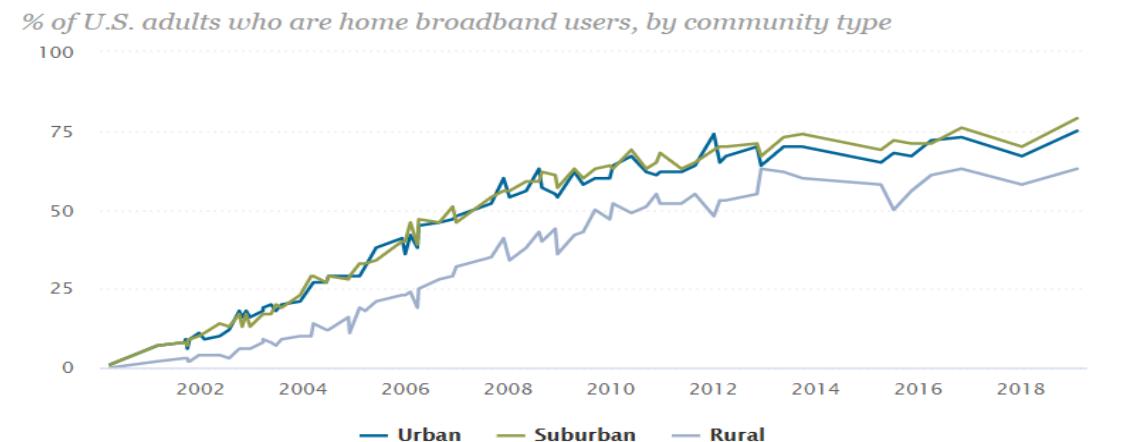
Internet Access Figures

Figure A1 (Pew Research Center, 2018)**:**
https://www.pewresearch.org/internet/fact-sheet/internet-broadband/
Demonstrates home broadband ownership is higher in suburban areas (79%) than urban and rural communities (75% and 63%, respectively). This informs our thinking of targeting hardware outreach (I.e. kiosks) towards these populations.

Figure A2 (Pew Research Center, 2018)**:**
https://www.pewresearch.org/internet/fact-sheet/internet-broadband/
Demonstrates smartphone dependency is higher in rural and urban populations (20% and 17% respectively) than suburban areas (13%).

% of U.S. adults who are home broadband users, by community type

— Urban   — Suburban   — Rural

% of U.S. adults who do not use broadband at home but own smartphones, by community type

— Urban   — Suburban   — Rural
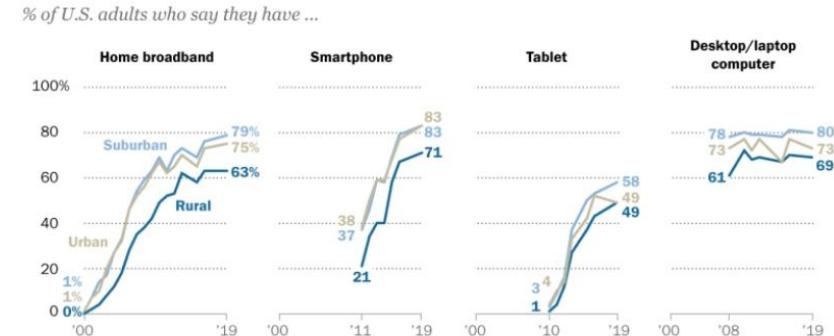
More on Internet Access

Figure A3 (Pew Research Center, 2019):
https://www.pewresearch.org/fact-tank/2019/05/31/digital-gap-between-rural-and-nonrural-america-persists/
Demonstrates home Wi-Fi and device ownership is considerably lower in rural communities.

Rural Americans have consistently lower levels of broadband adoption
% of U.S. adults who say they have …

Note: Respondents who did not give an answer are not shown.
Source: Survey conducted Jan. 8-Feb. 7, 2019. Trend data from other Pew Research Center surveys.
PEW RESEARCH CENTER
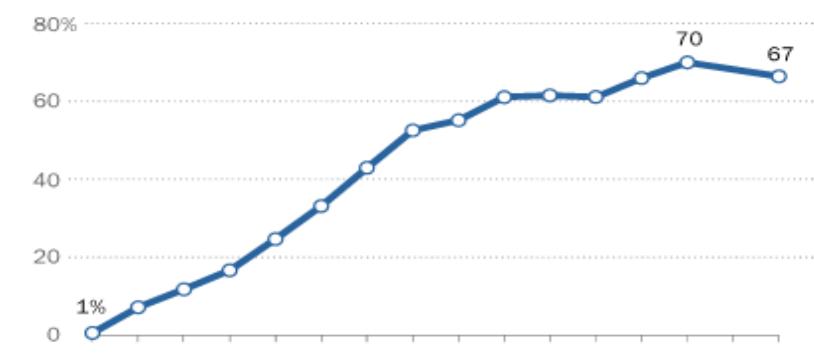
Figure A4 (Pew Research Center, 2015):
https://www.pewresearch.org/internet/2015/12/21/home-broadband-2015/
Nearly a third of Americans do not have broadband access, while roughly two-thirds (69%) of Americans claim that not having a home high-speed internet connection is a *major disadvantage* in getting health information or accessing other key information. Using smartphones and other platforms are important in reaching these consumers.

Home broadband use has plateaued
% of adults who are home broadband users

Source: Pew Research Center surveys
PEW RESEARCH CENTER

Cancer Incidence

Figure A5 (CDC, 2017): https://www.cdc.gov/media/releases/2017/p0706-rural-cancer-deaths.html
CDC studies reveals rural communities face higher death rates for certain cancers (lung, colorectal, prostate, and cervical).

- Death rates were higher in rural areas (180 deaths per 100,000 persons) compared with urban areas (158 deaths per 100,000 persons). Cancer deaths in rural areas decreased at a slower pace, increasing the differences between rural and urban areas.

- While overall cancer incidence rates were somewhat lower in rural areas (442 cases per 100,000 persons) than in urban areas (457 cases per 100,000 persons), incidence rates were higher in rural areas for several cancers, including those related to tobacco use such as lung cancer and those that can be prevented by cancer screening such as colorectal and cervical cancers.

- While rural areas have lower incidence of cancer than urban areas, they have higher cancer death rates. The differences in death rates between rural and urban areas are increasing over time.

Cancer Prevention Measures

Figure A6 (CDC, 2019): https://www.cdc.gov/pcd/issues/2019/18_0446.htm

Data from a CDC study showing skin-cancer prevention behaviors amongst agricultural and construction workers. Sun-protection behavior score was calculated by using factors such as length of sun exposure, use of sunscreen and shade-seeking, and number of sunburns that were received. Numbers of workers are given as percentages.

Sun-protection behavior score	Farming, Fishing, and Forestry (n = 250)	Construction Workers (n=1,208)
3.0–4.0	12.2 (7.2–20.0)[c]	5.1 (3.4–7.4)[c]
2.0–2.9	33.0 (26.3–40.6)	17.6 (14.8–20.9)
1.0–1.9	37.0 (28.5–46.4)	47.7 (43.8–51.6)
0–0.9	17.8 (12.7–24.3)[c]	29.6 (26.0–33.6)

Socioeconomic Status and Survival Rates
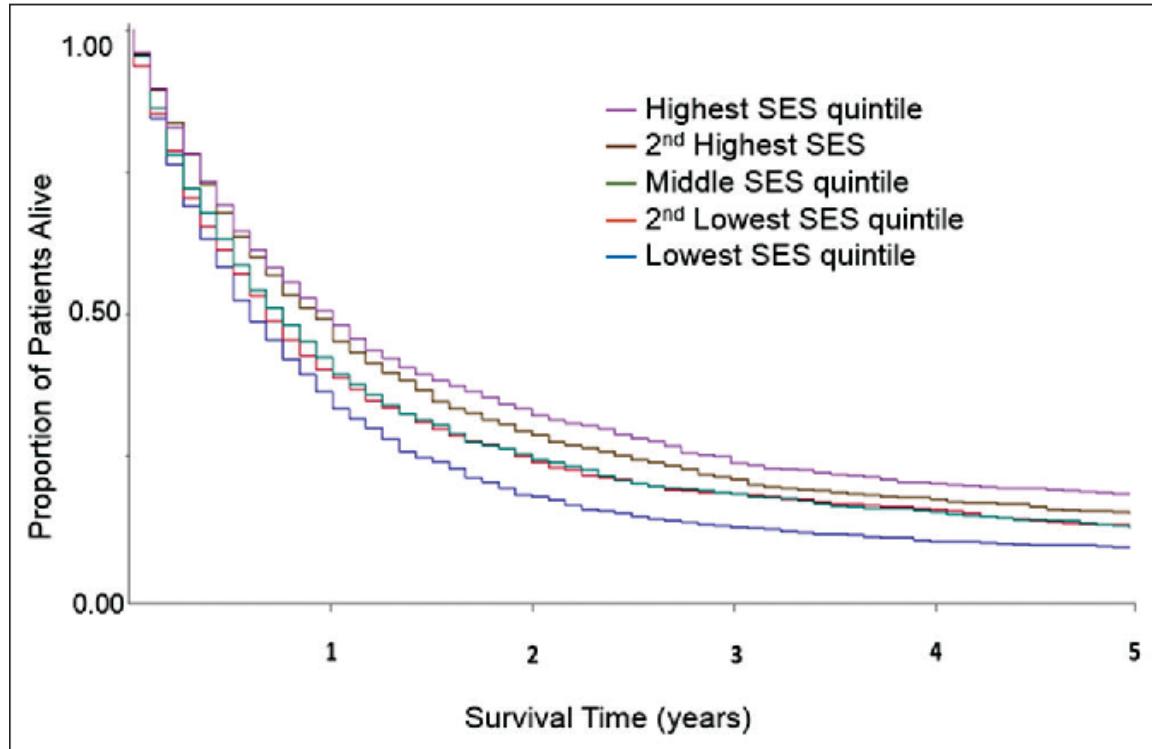
Figure 3: Univariate overall survival by socioeconomic status in patients with esophageal cancer in all stages (n = 6976; P < 0.0001). Data from California Cancer Registry 2004–2010 with follow-up through December 31, 2012

Figure A7 (Journal of Carcinogenesis, 2017) https://www.semanticscholar.org/paper/The-impact-of-gender%2C-race%2C-socioeconomic-status%2C-A-Tran-Taylor/871ce7bab3b4e7a4bbac84ed170af13c65731c09

Study linking higher income and socioeconomic status (SES) to increased proportion of patients alive after treatment.

Appendix B: Current examples of content design

SIGN IN   SUBSCRIBE

WebMD

HEALTH
A-Z

DRUGS &
SUPPLEMENTS

LIVING
HEALTHY

FAMILY &
PREGNANCY

NEWS &
EXPERTS

SEARCH

Doctors Most Likely to Get COVID-19 Vaccine When Available

News: Misinformation on Coronavirus Spreading Like Wildfire
More: Hydroxychloroquine No Cure for COVID-19

Coronavirus in Context

Dr. Arturo Holmes II: How Scrubs
Protect Against Discrimination

Dr. Phil Talks About Parenting
During This Pandemic

Kenneth Cole on Destigmatizing
Mental Health

Cancer Helpline

📞 800.227.2345   💬 Live Chat   ✉ Sign Up For Email

American Cancer Society®

GIVE IN HONOR & MEMORIAL

❤ DONATE

CANCER A-Z   STAY HEALTHY   TREATMENT & SUPPORT   NEWS   OUR RESEARCH   GET INVOLVED   OUR PARTNERS   ABOUT US   🔍

Help prevent six cancers with the HPV vaccine.

PROTECT YOUR CHILD

LATEST NEWS

Coronavirus and Cancer

Start Cervical Cancer Screening

Join our Hashtag Challenge

Give in Honor or Memory

NIH〉**NATIONAL CANCER INSTITUTE**

Español

NCI is the nation's leader in cancer research

🔍
Find a Clinical Trial

SWOG   ALLIANCE   CANADIAN NETWORK

MAYO CLINIC

Search Mayo Clinic

Request an Appointment
Find a Doctor
Find a Job
Give Now

Log in to Patient Account

English

PATIENT CARE & HEALTH INFO | DEPARTMENTS & CENTERS | RESEARCH | EDUCATION | FOR MEDICAL PROFESSIONALS | PRODUCTS & SERVICES | GIVING TO MAYO CLINIC

Departments and Centers

Cancer Center

> **We're welcoming patients at Mayo Clinic**
> See our safety precautions in response to COVID-19.
>
> Request an appointment.

Why Choose Mayo Clinic for Cancer Treatment

Show transcript ⌄

Overview

More than 150,000 people with cancer come to Mayo Clinic each year. They find experts with extensive experience in the diagnosis and treatment of virtually every kind of cancer and the resources to provide excellent care tailored to their needs. Mayo Clinic doctors and researchers solve the most serious and complex medical questions, one person at a time. U.S. News & World Report consistently ranks Mayo Clinic among the top hospitals for cancer in the nation.

The Mayo Clinic Cancer Center is designated by the National Cancer Institute as a comprehensive cancer center. This means the clinic's renowned physicians, researchers and scientists carry out team-based, patient-centered research to develop the latest technologies and treatments to address unmet patient needs. As a result, people who come to the clinic for cancer care have access to hundreds of clinical trials in all phases.

Mayo Clinic researchers share what they learn with other members of the National Comprehensive Cancer Network, a not-for-profit alliance of leading cancer centers dedicated to improving the quality, effectiveness and efficiency of care for cancer patients.

Appointments

Mayo Clinic accepts appointments in Arizona, Florida and Minnesota and at Mayo Clinic Health System sites.

Request an Appointment

Patient care

Request an appointment

Contact Mayo Clinic by telephone or

Cancer: An Overview

Know what cancer signs and symptoms to

Cancer treatment at Mayo Clinic

December 24, 2019 / Sports Health & Fitness

Lumps and Bumps on Your Body: When You Should Worry

Not every bump is worth losing sleep over

HEALTH LIBRARY

SARCOMA

Overview

Diagnosis and Tests

Management and Treatment

Finding a new lump or bump on your body would give most of us pause. After all, a lump can, in rare cases, mean cancer. But not every bump or lump should cause concern or worry.

The good news is that a majority of these lumps are harmless and not a cause for concern. A number of skin or medical conditions can cause lumps and bumps to appear on the surface or just below the skin.

When not to worry

Lumps that are not a cause for concern have some distinctive characteristics.

One major marker is if you can connect the lump's appearance to a specific trauma or activity, says orthopedic surgeon Nathan W. Mesko, MD. Athletes of all levels experience the occasional bump as a result of exercise, training, competition or other physical activity.

In that case, we recommend you follow the basic RICE method of rest, ice, compression and elevation," Dr. Mesko says. "If, over time, the lump or swelling improves, that's a reassuring sign that it is harmless and nothing to worry about."

Not-so-serious lumps usually are:

- Soft.
- Mobile, meaning it moves and changes form when you

When more investigation is needed

In rare cases, an unexplained lump, bump or swelling can be a sign of a more serious issue beneath the skin.

Bumps that are cancerous are typically large, hard, painless to the touch and appear spontaneously. The mass will grow in size steadily over the weeks and months. Cancerous lumps that can be felt from the outside of your body can appear in the breast, testicle, or neck, but also in the arms and legs.

One type of cancerous lump that can form almost anywhere in the body is called adult soft tissue sarcoma. The soft tissues of the body include the muscles, tendons (the bands of fiber that connect muscles to bones), fat, blood vessels, lymph vessels, nerves and the tissues around joints.

Most frequently, though, adult soft tissue sarcoma develops in the legs, arms, chest or the area behind the abdomen called the retroperitoneum, says oncologist Dale Shepard, MD, PhD.

"Adult soft tissue sarcoma is a disease in which malignant cells form in the soft tissues of the body," he says. "In the early stages, it rarely causes symptoms because the tumors often are located deep in the tissue."

Soft tissue sarcomas can grow to be quite large before causing symptoms because they often are embedded deep in the body, Dr. Shepard says.

Most commonly, soft tissue sarcomas feel like masses or bumps, which may be painful. If the tumor is in the abdomen, it may produce nausea or a sensation of fullness as well as pain, he says.

Adult soft tissue sarcoma is rare. Among adults, they represent less than 1% of all cancers, Dr. Shepard says.

It's important to talk with your doctor about any lumps that are larger than two inches (about the size of a golf ball), grow larger, or are painful regardless of their location.

"Tell your doctor about new lumps or other symptoms that cannot be explained or that don't go away in a few weeks," Dr. Shepard says.

Appendix C: IBM Watson and smart assistants

Conversational Interface: Background

Digital transformation of the patient/physician experience

Harnessing AI to reduce physician burnout
AI advancements can help reduce redundant work

- **General questions**

  - What are common side effects of Leukeran? Are they dangerous?
  - My doctor said I have low blood pressure. What does that mean?
  - I'm filling out a form. What does "medical record number" mean?

- **MSK questions**

  - Can I have visitors come in tomorrow at 5 p.m.?
  - Should I fast before tomorrow's surgery? Can I eat after my surgery?
  - Is this blood test covered by my insurance?

- **Patient-specific questions**

  - What were the results of my lab test? How long until they come back?
  - What immunizations do I have? Can I get a PDF of my history?
  - When is my next appointment?
  - Can I check my payment record?

For every **1** hour with a patient, physicians spend **2** at the computer.

More than **half** of physicians reported feeling burnt out.

Paperwork costs the health industry (conservatively) **$4.6 billion** annually.

Source

Conversational Interface: Cancer SOTA

Current advancements of chatbots in the cancer landscape

A Chatbot Versus Physicians to Provide Information for Patients With Breast Cancer

- "A total of 142 patients were included and randomized into two groups of 71. They were all female with a mean age of 42 years (SD 19). The success rates (as defined by a score >3) was **69% (49/71) in the chatbot group** versus 64% (46/71) in the physicians group. The binomial test showed the **noninferiority** ($P<.001$) of the chatbot's answers."

- Conclusion: "Artificial conversational agents may save patients with minor health concerns from a visit to the doctor. This could **allow clinicians to spend more time to treat patients** who need a consultation the most."

  ➢ **Chatbots can accurately relay information and reduce physician burnout**
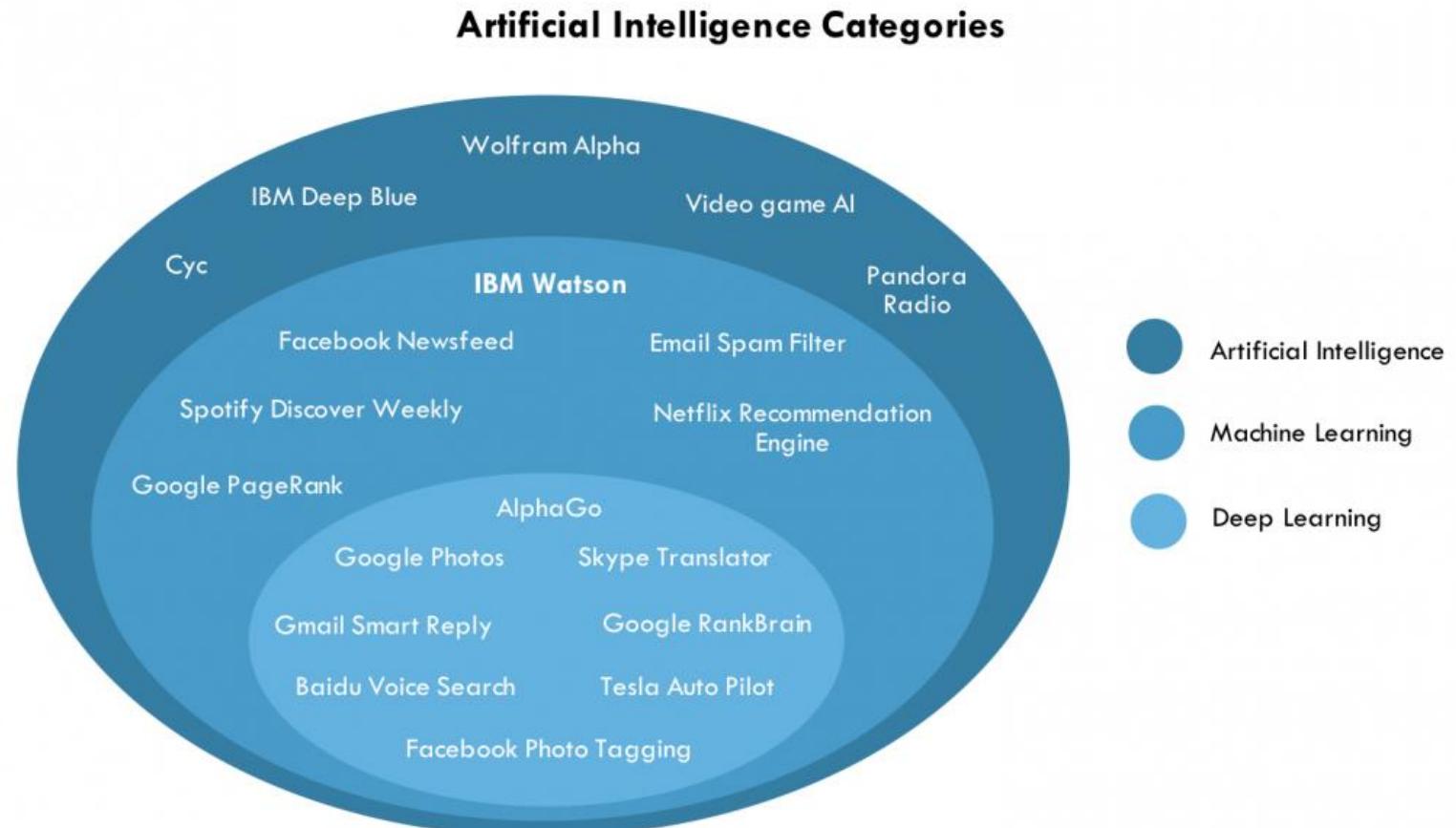
One-Year Prospective Study of Conversations Between Patients With Breast Cancer and a Chatbot

- "A total of 4737 patients were included. Results showed that an average of 132,970 messages exchanged per month was observed between patients and the chatbot, Vik … Patients regularly left **positive comments** and **recommended** Vik to their friends. The **overall satisfaction was 93.95%** (900/958). When asked what Vik meant to them and what Vik brought them, 88.00% (943/958) said that Vik **provided them with support** and helped them **track their treatment** effectively.

- Conclusion: "It is possible to obtain **support** through a chatbot since Vik improved the **medication adherence rate** of patients with breast cancer."

  ➢ **Chatbots are effective at improving patient medication adherence and supporting patients emotionally** Source

Conversational Interface: IBM Watson

Digital transformation of the patient/physician experience

Artificial Intelligence Categories

Source: ARK Investment Management LLC

BankBot

I can help you schedule an appointment with one of our bankers.

Which date would be best for you? We need 24 hours notice for an appointment, the earliest would be tomorrow.

I can do tomorrow!

Great, Sat, Jun 13, 2020.

What time would you like to meet with our banker?

I can help you find a credit card to suit your needs. We have credit cards to build credit, provide rewards, and help you save money. What are you looking for most in a credit card?

Low interest rates

We have several credit cards with low interest and no fees.

Are you interested in rewards?

I can help you with credit card payments.

One moment while I retrieve a list of accounts.

Please select which credit card account you'd like to pay.

Card # 5624   Card # 5893   Card # 9225

Conversational Interface: IBM Watson
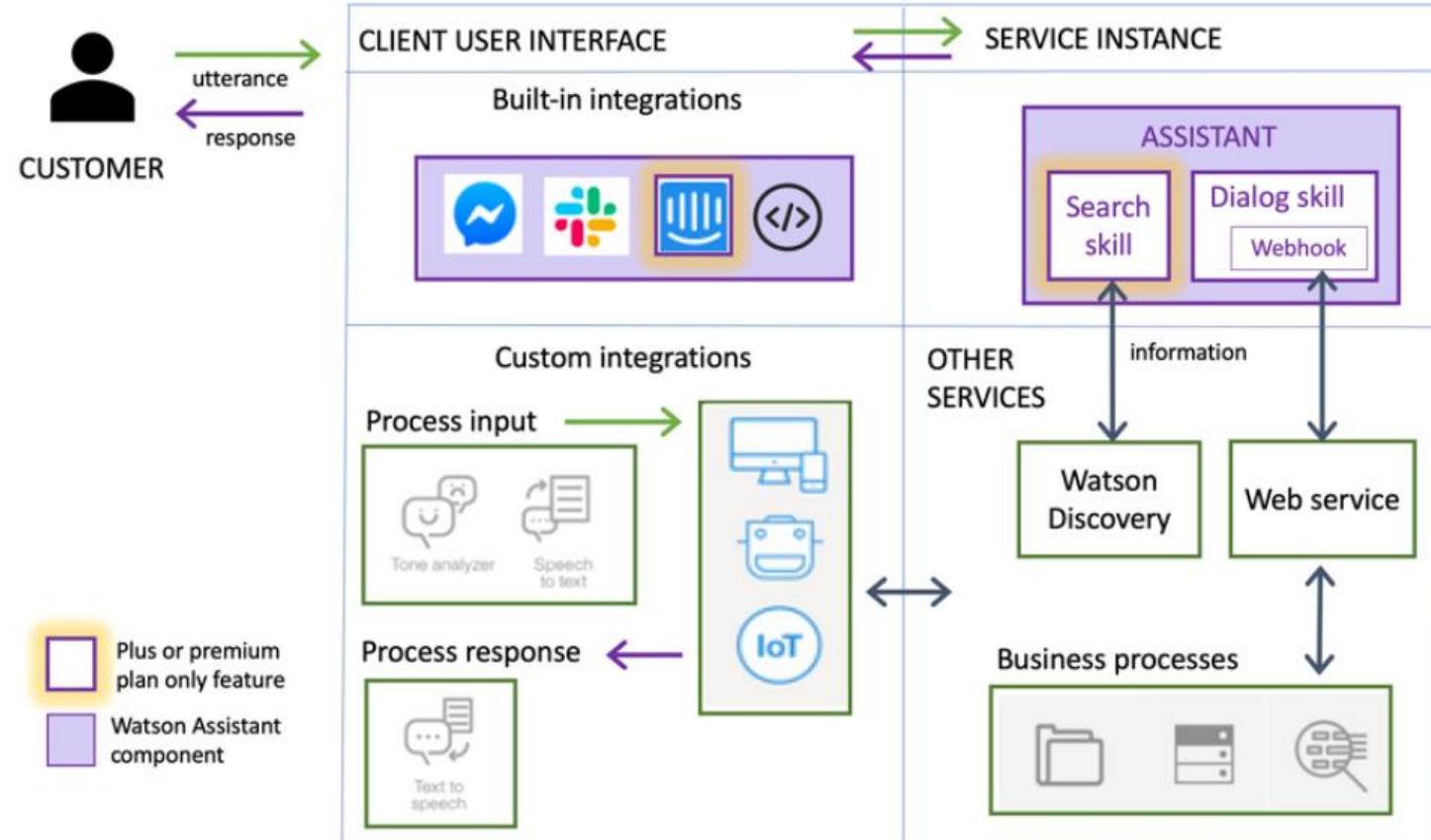
Digital transformation of the patient/physician experience

- IBM Watson **Assistant**
  - Build, test, and deploy a bot or virtual agent across mobile devices, messaging platforms, or even on a physical robot
- IBM Watson **Discovery**
  - A cognitive search and content analytics engine for applications to identify patterns, trends, and actionable insights
- IBM Watson **Natural Language Understanding**
  - Analyze text to extract meta-data from content such as concepts, entities, keywords, categories, sentiment, emotion, relations, and semantic roles, using natural language understanding
- IBM Watson **Tone Analyzer**
  - Uses linguistic analysis to detect communication tones in written text
- **Node.js**
  - An asynchronous event driven JavaScript runtime, designed to build scalable applications

Source

Conversational Interface: IBM Watson Assistant

Digital transformation of the patient/physician experience

Figure 2: A typical approach used when deploying Watson Assistant

Source

- **Intents**
- **Entities**
  - System entities
- **Dialogues**
  - Condition
  - Response
  - Slots

Appendix D: Kiosks

Information on LinkNYC

Features

- ☐ Free to user; open to public
- ☐ Multilingual support
- ☐ High-speed, encrypted WiFi
  - ○ 'Gigabit' WiFi: over 100x faster than most public internet connections
  - ○ For certain devices (some Apple devices), ability to connect to a private network
  - ○ 'LinkNYC Free Wi-Fi': open network relying on server-based SSL security (secure links)
- ☐ Phone calls to anywhere in USA
  - ○ Volume adjustable mid-call
  - ○ Button for 911
- ☐ Device charging
  - ○ 2 USB outlets below headphone jack
  - ○ Connected directly to power source; cannot exchange data
- ☐ Tablet for maps & city services
  - ○ Allows user to search for addresses, offers directions
  - ○ Easy access to City Services (alternate side parking, construction schedules, register for IDNYC)
  - ○ Voting information
- ☐ Sessions end after 30 seconds of idle time

Information on LinkNYC

Stats / Figures

- Currently 1779 active Links (as of July 7 2020)
- 8,461,839 subscribers as of 12/30/2019
- 2,251,215,052 cumulative sessions as of 12/30/2019

Finances

- Funded entirely through advertisers, partnerships, and sponsorships
  - Generates millions for the City of New York
  - Able to target audiences using *anonymous* (nothing identifiable) information about how many users are connected to a certain Link at a given time
  - Local or large-scale advertisements
- Projected cost from 2014-2022: 200 million (250 in reality)
- Expected number of kiosks: 7500
- Estimated cost per unit: $25,000-$30,000 ($140,000 in reality)
  - Does not include maintenance, utility, financing costs
- Assuming kiosks are built at a constant rate, each one would need to produce $6,400 in revenue to break even

Benefits

- Millions of NYC-ers don't have access to high-speed WiFi
- Creates 100+ jobs
- 21.3 million calls, 8.7 million users as of March 04 2020
- Provides voting information

Soofa

Soofa

- Boston start-up, seen in ATL Las Vegas, soon Miami-Dade
- Funded through local advertising, sponsors like Ford, T-Mobile
- Fully solar-powered, wirelessly connected
  - Sustainable, self-sufficient, only requires "4 bolts in the ground"
- Focuses on equal geographic distribution

Local Business	Community Influencer	Enterprise
Best suited for small businesses and organizations who want to reach a defined audience.	Best suited for businesses and organizations that want to maximize their reach to an audience.	Best suited for businesses and organizations who want to reach a large targeted audience with a strategic campaign.
TRY FOR FREE	TRY FOR FREE	CONTACT US
$99 per month*	$499 per month*	Custom Pricing

Kiosk Market Trends

ARTICLE

2020 Kiosk Market Census Report: Record growth continues

The kiosk industry posted its third consecutive year of double-digit growth in 2019, according to the newly-released 2020 Kiosk Market Census Report. Kiosk sales jumped 17.9% in 2019, closely matching the growth rates of the previous two years, boosted by rising consumer acceptance of self-service technology.

Kiosk Market Trends

COMMENTARY

Kiosks help keep brick and mortar stores relevant as e-commerce expands

Interactive kiosks offer retailers a tool for allowing customers to join the e-commerce experience with in-store purchasing by allowing shop to shop for both the physical and online product offerings.

"Community Kiosks"

"Community Kiosks"

Who has home broadband

As is true of internet adoption more broadly, home broadband adoption varies across demographic groups. Racial minorities, older adults, rural residents, and those with lower levels of education and income are less likely to have broadband service at home.

AGE   RACE   GENDER   INCOME   EDUCATION   COMMUNITY

Chart   Data   Share   Embed

% of U.S. adults who are home broadband users, by race

— White   — Black   — Hispanic

Who has home broadband

As is true of internet adoption more broadly, home broadband adoption varies across demographic groups. Racial minorities, older adults, rural residents, and those with lower levels of education and income are less likely to have broadband service at home.

AGE   RACE   GENDER   INCOME   EDUCATION   COMMUNITY
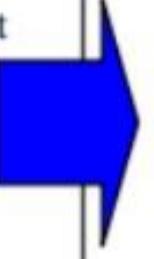
Chart   Data   Share   Embed

% of U.S. adults who are home broadband users, by income

— Less than $30,000   — $30,000–$49,999   — $50,000–$74,999   — $75,000+

Appendix E: Competition

WebMD

Figure 3: WebMD Value Offering and Revenue Streams

WebMD's Services	WebMD Sources of Revenue
• Health news for the public • Medical news for physicians • Create/maintain current medical reference content • Medical imagery, graphics, and animation • Interface design • Interactive applications • Communities • Live web events • User Experience • E-commerce • Clinical informatics	• *Subscription arrangements* (sponsorships, content syndication & carriage fees) • *Administrative services* (transaction fees) • *Products & Services* (Development / consulting / IT management services and software licenses) • *Advertising revenues* • *E-commerce revenues*

(Source: www.WebMD.com)
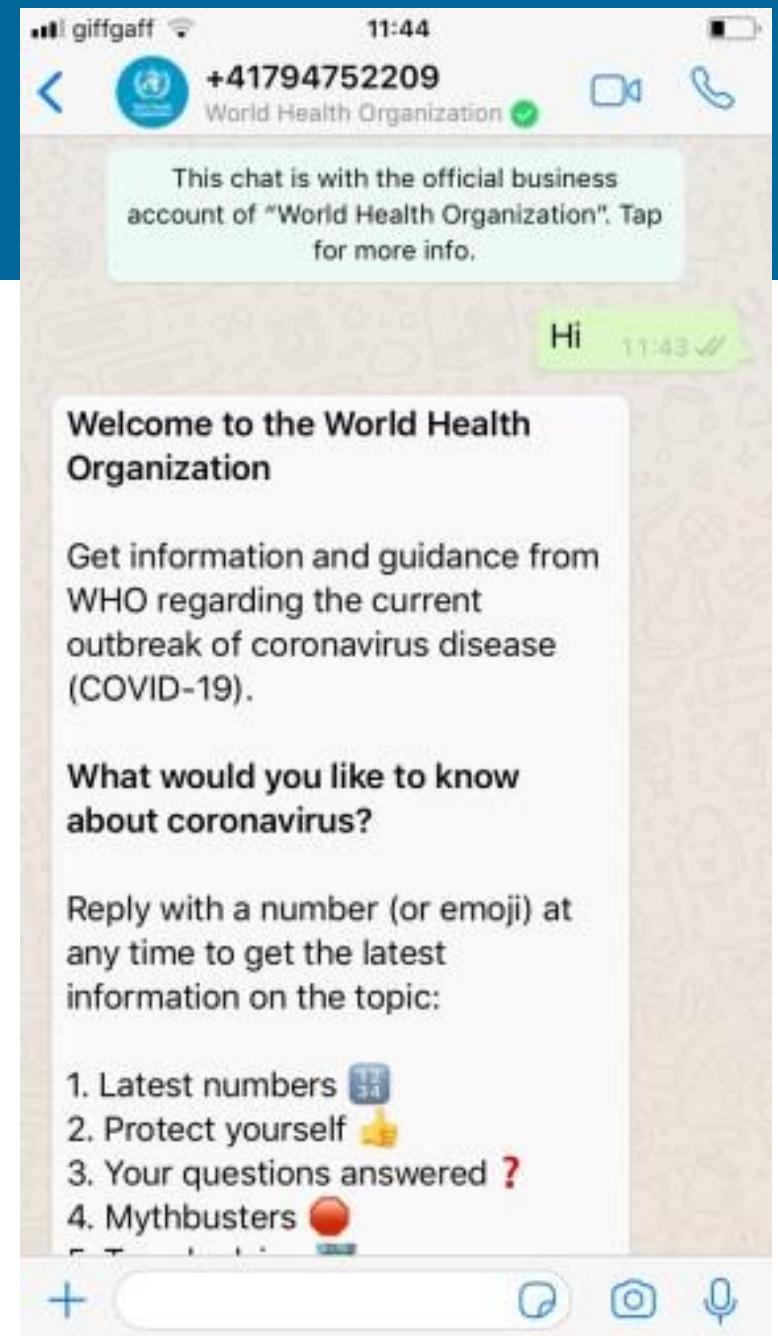
Chatbots

Voice-based interactions:
- Alexa
- Google Home
- Siri
- Google Duplex
- Alexa Skills

Text-based messengers:
- Florence (getflorence.co.uk)
- Molly (sense.ly)
- Lark (lark.com)
- Koko (itskoko.com)
- Replica - A personal AI companion / friend

Appendix F: Designing Accessible Websites

Readability levels and web-safe fonts

| Formula	What It Measures	How Each Can Best Be Used
Grade equivalent score: represents a student's ability level in comparison to students who were in the specific test's norming group		
Flesch Reading Ease Flesch-Kinkaid Grade Level	• syllables per word and words per sentence	• appropriate for grades 3 to 12
Fry Readability Graph		• appropriate for elementary through college
Gunning Fog Score	• words per sentence and complex words (three or more syllables)	• often used for health care material and general business publications
SMOG Index	• complex words (three or more syllables)	• often used for health care material
Coleman Liau Index	• characters per word and words per sentence	• appropriate for grade 4 to college
Spache	• words per sentence and unfamiliar words (words not in Familiar Word List)	• appropriate for grades 1 to 3• highlights difficult words that need to be shortened/simplified
Dale-Chall	• words per sentence and unfamiliar words (words not in Familiar Word List)	• appropriate for grade 4 to 12 highlights difficult words that need to be shortened/simplified
Lexile measure: represents a student's level on a developmental scale of reading ability. Matches student with text at whatever level the student is reading.		
Lexile	• words per sentence and words against a frequency list– sentence length carries more weight than word frequency	• appropriate when working on texts with defined literacy levels

https://blog.catchthesun.net/2016/03/ways-to-lower-the-reading-level/

https://www.hostinger.com/tutorials/best-html-web-fonts

What is a "Web Safe Font"?

Simply put, this term is used to describe a font that is universally installed across all devices. Since they are stored locally, your website should load faster when you use a web-safe font.

This will ultimately affect SEO as page loading speed is one of the factors taken into account when ranking pages on the SERP.

That's why we recommend using a web-safe font – to make sure your readers can view content easily and your website's performance is not negatively impacted.

Keep in mind that there are alternatives to website safe fonts, which usually share the same characteristics as popular typefaces. For example, the alternatives for the Sans Serif font like Helvetica are Acumin and Univers.

But unlike their web-safe counterparts, alternative fonts are often not prepackaged on all OS. That being said, you may want to use one of them because it may seem that a popular font is overused. Just remember that you might sacrifice the speed of your website in exchange.

Some favorites:
1. Arial
2. Times New Roman
3. Helvetica
4. Times
5. Courier New

Readability in Healthcare

How Do We Get There? Assessment of Readability

Go to: ⌄

There are a variety of methods available to assess the readability of written materials. Ever since the introduction of various readability formulas during the early half of the twentieth century [31], these diagnostic tools have been widely adopted in areas ranging from insurance and legal documents to military manuals. However, there is no consensus as to which readability formula is best suited for assessing patient education materials. Some of the readability assessment tools used in the healthcare setting include the Flesch Reading Ease scale [22], Flesch-Kincaid Grade [22], Fry Readability Graph [11], McLaughlin's SMOG grading [40], Gunning Fog Index [22], Dale-Chall Readability formula [19], and Suitability Assessment of Materials [18] (Table 1). In general, it is preferable to use more than one readability method to improve the validity of the results. While some readability formulas are validated against various tests of comprehension, the most common being McCall-Crabbs criterion [31], there is no gold standard readability test. Furthermore, readability formulas use different comprehension levels to compute grade level. The Flesch Reading Ease (FRE) score, the earliest of the commonly used tools to assess readability, gives a score on a scale ranging from 0–100, with 0 being unreadable and 100 being most readable [22]. It is based on the average number of syllables per word and the average number of words per sentence. The Flesch-Kincaid grade is the most widely used tool to assess readability [2, 12]. It is a modified version of FRE scale. The Fry Readability Graph is favored by some experts, including the CDC, since it requires only three 100-word samples from different parts of the text instead of the entire document and the average number of syllables is noted. The results are then plotted on a graph, generating the grade level of readability [11]. This readability assessment tool is simple and can be applied manually without the need for computers and software. It is particularly well suited for lengthy patient education materials and can also be applied to Spanish text. Originally developed by McLaughlin in 1969, the SMOG formula is recommended by the National Cancer Institute [40]. This readability assessment tool is based on the number of polysyllabic (containing more than two syllables) words in a sample of 30 consecutive sentences. SMOG scores are one to two grades higher than results attained using some of the other readability formulas since it is based on 100% comprehension ability compared to a lower percentage. For instance, if a particular material has SMOG readability grade of 6, it means it will be comprehensible to all individuals with sixth-grade reading skills [31]. The Gunning Fog index is based on the average words per sentence and the percentage of polysyllable words [22]. The New Dale-Chall Readability formula was developed specifically for evaluating health education materials and has the highest validity when tested for reader comprehension [19, 50]. This formula calculates readability using not only the sentence structure but also the vocabulary noting the percentage of unfamiliar words in a written passage based on 3000
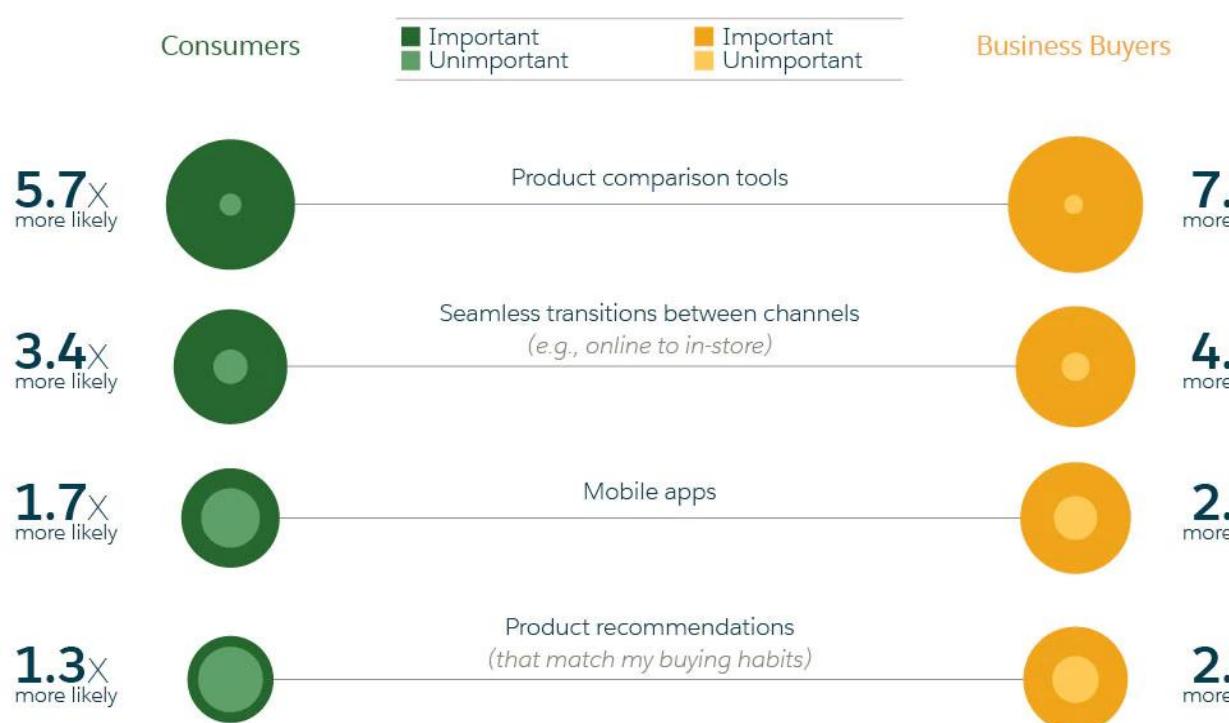
More work needs to be done to see what scale is the best to use—
but it really comes down to testing the site on users and seeing how they are absorbing and engaging with our content

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3049622/#:~:text=The%20Flesch%20Reading%20Ease%20(FRE,number%20of%20words%20per%20sentence.

Integrated touchpoints

When They Buy, Customers Seek Ease, Seamlessness, and Consultants
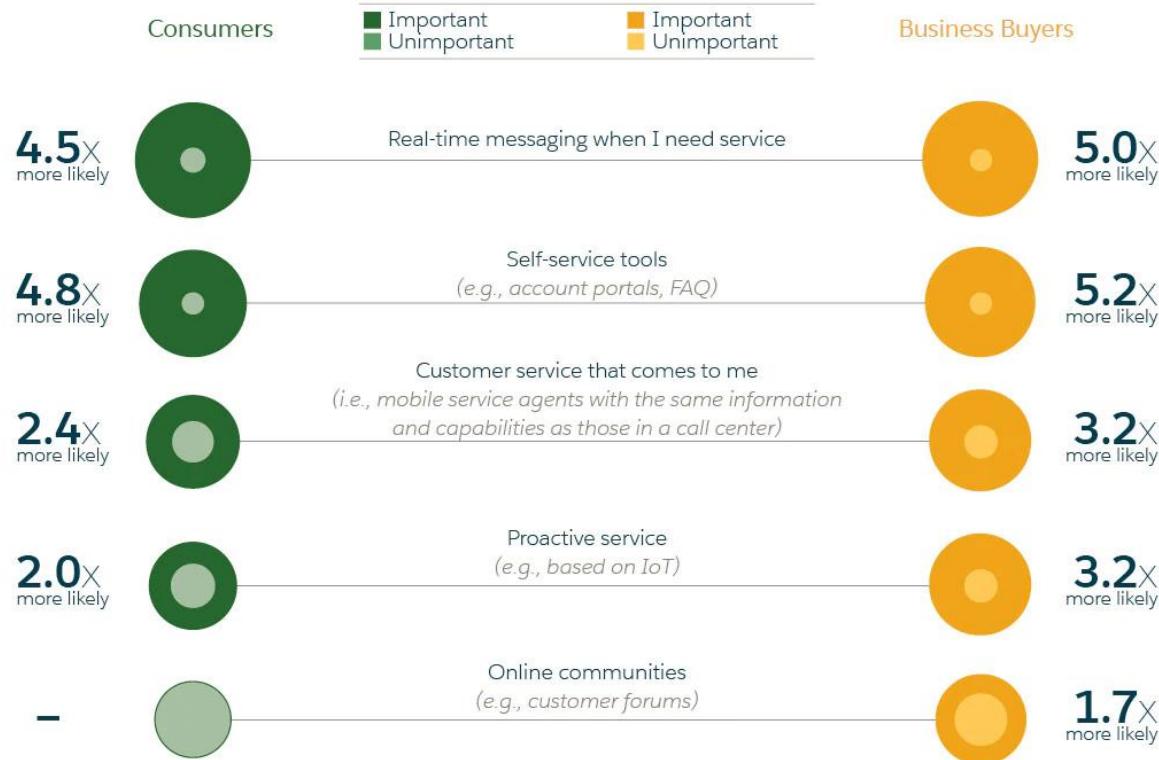
Likelihood of Customers Rating Each Quality as Important vs. Unimportant

Consumers

■ Important
■ Unimportant
■ Important
■ Unimportant

Business Buyers

Consumers		Business Buyers
5.7x more likely	Product comparison tools	**7.1**x more likely
3.4x more likely	Seamless transitions between channels (e.g., online to in-store)	**4.4**x more likely
1.7x more likely	Mobile apps	**2.5**x more likely
1.3x more likely	Product recommendations (that match my buying habits)	**2.3**x more likely

Respondents were not required to rate a quality as important or unimportant.
Data is based off respondents who elected to rate a quality as such.
Not a complete list. See "State of the Connected Customer" report for more.

After They Buy, Customers Seek Service Beyond the Call Center

Likelihood of Customers Rating Each Quality as Important vs. Unimportant

Consumers

■ Important
■ Unimportant
■ Important
■ Unimportant

Business Buyers

Consumers		Business Buyers
4.5x more likely	Real-time messaging when I need service	**5.0**x more likely
4.8x more likely	Self-service tools (e.g., account portals, FAQ)	**5.2**x more likely
2.4x more likely	Customer service that comes to me (i.e., mobile service agents with the same information and capabilities as those in a call center)	**3.2**x more likely
2.0x more likely	Proactive service (e.g., based on IoT)	**3.2**x more likely
–	Online communities (e.g., customer forums)	**1.7**x more likely

Respondents were not required to rate a quality as important or unimportant.
Data is based off respondents who elected to rate a quality as such.
Not a complete list. See "State of the Connected Customer" report for more.

How we created personas

Table 2.

Sample of Interview Questions Used With Patients.

What do you experience as the most common barriers or challenges to getting seen in the clinic when needed?

What approaches have you found to be helpful in getting you in to see a provider more quickly or easily?

What approaches does your clinic use to help patients like you get patients seen more quickly?

When you [or your child] get ill and what kind of information do you feel you need to decide whether to go into the ER, or wait to be seen in the clinic?

Was there any time during the past 12 months when you put off getting medical care you thought you (your child) needed?

Have you ever had a time when you were unable to make an appointment?

Do you use technology in any way to get health information?

What sorts of technology do you currently use/would you like to use to help schedule clinic appointments?

If you could (wave your magic wand and) change one thing about your current clinic's access to care or care experience, what would it be?

Abbreviation: ER, emergency room.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5846905/
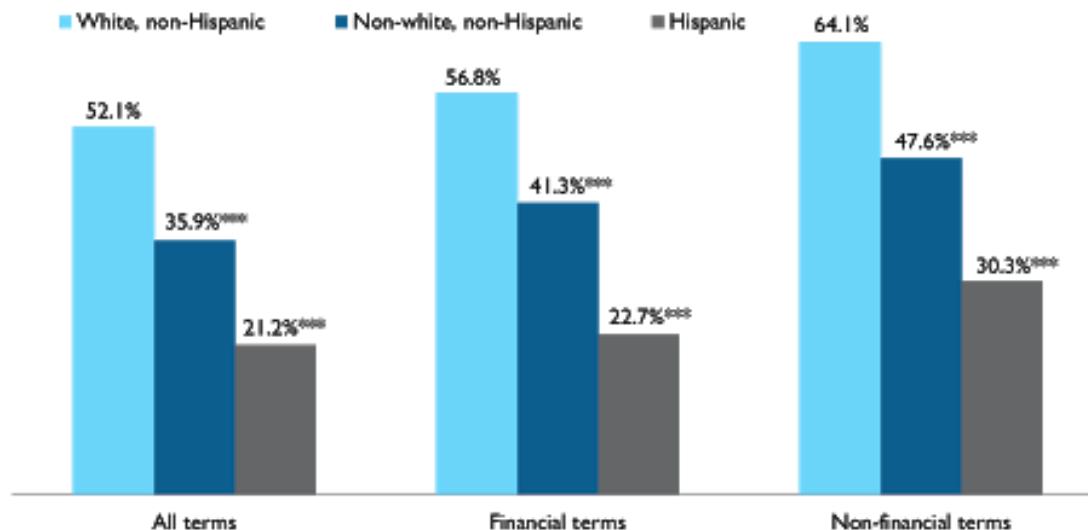
- **Online Health Portal**: Jim has low vision and must zoom in to 200% in order to read text on his laptop. Unfortunately, when Jim zooms in on his doctor's portal, it's nearly impossible to read the results of his most recent blood tests.
- **Tablets and kiosks**: Monique is blind and frequents the walk-in clinic in her neighborhood for minor medical issues. The clinic recently upgraded their systems and now uses iPads to check in patients and collect information about their reason for visiting. Monique tries to turn on VoiceOver like she does on her personal iPad, but the speakers have been muted. She must fill out this information with the help of one of the medical assistants.
- **Insurance websites**: Jorge gets migraines triggered by bright light. He uses "dark mode" on his laptop and Android smartphone so the colors are reversed and there isn't bright white on the screen. Jorge needs to find a urologist. He tries to search his insurance website for one that takes his plan, but in dark mode, the contrast is so poor that he can't read anything. He doesn't want to have to call the 800 number and talk to a stranger about his medical needs, but he can't do it online.
- **Appointment scheduling**: Eileen uses voice-command software because arthritis makes it too painful to type or use a mouse. Unfortunately, her doctor's website does not accept her voice commands when she tries to pick a date and time for her next appointment.
- **Medical devices**: Arjun has sleep apnea which is managed via a CPAP machine. However, the screen on the device is too small for him to read. Since he lives alone, anytime he needs to adjust the humidity level on his machine, he needs to ask his Meals on Wheels delivery person to help.

"Level access"

Appendix G: Health literacy & accessibility

Health literacy by race

Figure 1. Confidence in Understanding Key Health Insurance Terms Among Racial and Ethnic Groups

- White, non-Hispanic
- Non-white, non-Hispanic
- Hispanic

All terms: 52.1%, 35.9%***, 21.2%***
Financial terms: 56.8%, 41.3%***, 22.7%***
Non-financial terms: 64.1%, 47.6%***, 30.3%***

Source: Health Reform Monitoring Survey, quarter 2 2013.
Notes: Financial terms include premium, deductible, co-payments, coinsurance, and maximum annual out-of-pocket spending. Nonfinancial terms include provider network, covered services, annual limits on services, and excluded services.
*** Estimate differs significantly from the white, non-Hispanic group at the 0.01 level, using a two-tailed test. No estimates differed significantly at the 0.10/0.05 levels.

Figure G1 (Health Reform Monitoring Survey, 2013)

http://hrms.urban.org/briefs/literacy-by-race.html

Due to socioeconomic disparities and language barriers, it is disproportionately harder for Hispanic Americans to understand health insurance terms that are vital to their care. This lack of health literacy has implications that disproportionately and detrimentally affects Hispanic groups in seeking and utilizing healthcare systems.