Stanford MEDICINE | Center for Digital Health

ROCK HEALTH

Digital Health Consumer Adoption Report 2020

How COVID-19 accelerated digital health beyond its years

INSIGHTS YOU WILL LEARN IN THIS REPORT

- COVID-19's impact on consumer adoption of digital health tools and services
- Which demographic groups were most likely to use various modalities of telemedicine in 2020 compared to previous years
- How consumers' data-sharing preferences changed depending on stakeholder and type of health data shared

Digital Health Consumer Adoption Report 2020

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EXECUTIVE SUMMARY

The COVID-19 pandemic and ensuing healthcare delivery crisis kicked the digital health ecosystem into high gear. Stay-at-home orders, physical distancing guidelines, and closures of outpatient healthcare services encouraged millions of Americans to seek telemedicine care. For the first time, digital health solutions were not simply an enhancement, but rather a necessity in healthcare delivery.

Rock Health and the Stanford Center for Digital Health together produced this Digital Health Consumer Adoption report to understand how consumer behavior in 2020 compared to the five prior years of data that we have collected. With so much in flux, this year's analysis puts a particular lens on how adoption of different digital health tools differed based on consumer demographics during the early stages of the pandemic.

During the five years leading up to 2020, adoption of digital health steadily climbed. The pandemic accelerated adoption even further and the climb continued. However, the rate of change in adoption differed by technology and by subgroup. Telemedicine adoption, for example, increased most among subgroups which were (in prior years) already relatively "high" adopters—younger, higher-income, and more highly educated.

Though not a universal finding, some of the 2020 data suggest that the pandemic acted more to reinforce and accelerate underlying trends rather than to draw in new consumer subgroups as digital health users. The implications of these nuanced findings are crucial for startup entrepreneurs, consumers, clinicians, corporate leaders, and policy makers alike, as the industry continues to innovate and iterate through the ongoing pandemic.

The pandemic that ensued in 2020 makes the timing of this year's survey particularly relevant. These data were collected between September 4, 2020 and October 2, 2020, seven months after COVID-19 was declared a national emergency on March 13, 2020. This survey is a snapshot in time that reflects consumer behavior during a period of rapid change. Therefore, unlike data from prior years, we believe that 2020 is unlikely to represent a point on a linear trajectory or continuous trend line. Rather, the adoption trend in future periods may follow more of a step response path in which a period of overshoot is followed by a new, higher equilibrium that is below the initial "impulse" delivered by COVID-19. Nonetheless, it is an indicator of the reach of digital health during a time of exceptional healthcare and societal strain.

Alongside our analysis of the 2020 survey data, we believe that the regulatory environment and ongoing pandemic response will support an equilibrium of digital health adoption that is lower than the peak observed once the pandemic first hit, but higher than pre-pandemic levels. The possibility of sustained regulatory reform, in particular, supports a higher post-pandemic equilibrium level. In early 2020, CMS's Emergency Declaration Waivers provided financial incentives that rapidly catalyzed the use of telemedicine. Figure 1 shows that telehealth visits made up 14% of baseline total outpatient visits at peak adoption in mid-April 2020. The percentage of telehealth visits leveled off around 6-7% as of October 2020, but remained substantially greater than the pre-pandemic level of 0.1%. Our survey data suggest that the level of consumer satisfaction with telehealth in particular will make it an attractive alternative for some demographic subgroups even after in-person care once again becomes a safe option. In the near term, a second round of stay-at-home orders, a sluggish vaccine rollout, and fears about traditional healthcare sites are likely to further reinforce use of telemedicine and a range of other digital health tools.

FIGURE 1[1]

OUTPATIENT HEALTHCARE UTILIZATION

February 16, 2020 – October 4, 2020

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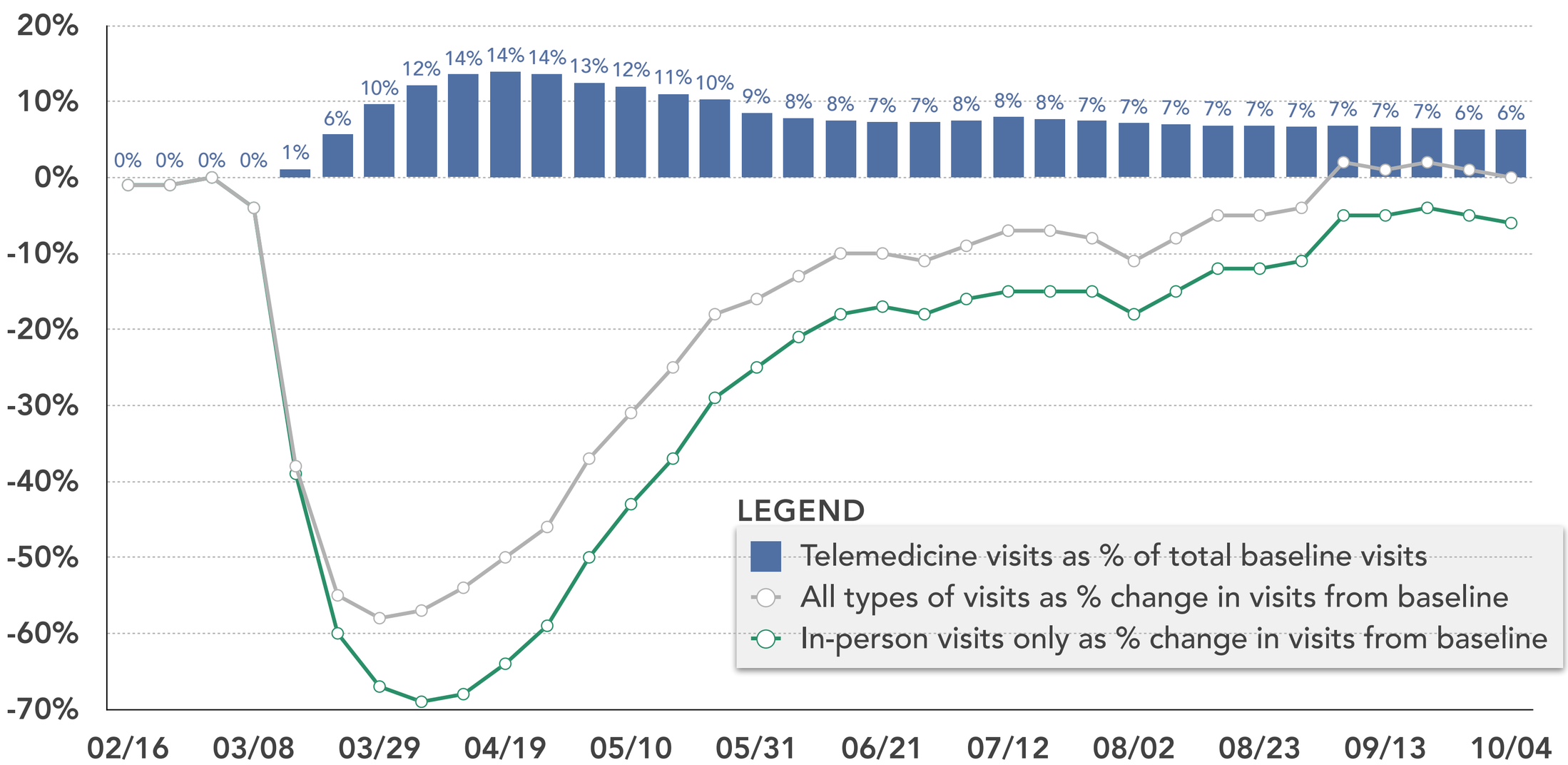


Note: Data are presented as a percentage change in the number of visits in a given week from the baseline week (March 1–7).
Source: Ateev Mehrotra et al., "*The Impact of the COVID-19 Pandemic on Outpatient Care: Visits Return to Prepandemic Levels, but Not for All Providers and Patients*," (Commonwealth Fund, Oct. 2020).

This white paper explores the four questions outlined below.

Theme #1: How has telemedicine adoption changed? *Telemedicine use before and during the pandemic.*

Theme #2: Who still hasn't adopted telemedicine? *Barriers to accessing telemedicine abound more than expected.*

Theme #3: How are consumers using digital health tracking tools differently during COVID-19? *Unpacking the trends in health tracking and wearable use.*

Theme #4: How have consumers' data-sharing preferences changed during the pandemic? *A look at consumer trust and willingness to share health data.*

Here are our key findings:

1. **How has telemedicine adoption changed?** *Telemedicine use before and during the pandemic.*

- **More consumers used live video telemedicine than ever before.** After leveling off between 2018 and 2019, adoption of live video care increased 11% (from 32% to 43%) in 2020, indicating the significant and swift shift to live video.
- **Telemedicine is not reaching new demographic populations in large numbers (yet).** The most likely users of telemedicine in 2020 remained consistent with past years: higher-income earners, middle-aged adults (aged 35-54), highly educated, and those with chronic conditions.
- **People are highly satisfied with telemedicine—but this may just be relief to have an avenue of care during the pandemic.** Satisfaction with live video visits was higher than in previous years, but may have been bolstered by the lack of a viable (or safe) alternative for an in-person visit.
- **Use of non-video forms of telemedicine is down.** Alongside the massive increase in reported live video use, fewer consumers reported using other forms of telemedicine (e.g., live phone visits, text messaging, and email) than in past years. A driving factor in the year-over-year reduction in non-video telemedicine may be the reduction in healthcare utilization across-the-board. That is, consumers used substantially less healthcare overall (both in person and via telemedicine), lowering the number of consumers who reported using telemedicine in our survey.
- **The future of tech-enabled care models may not be reflected in how consumers are currently using telemedicine.** During 2020, the most common reason for accessing telemedicine was a medical emergency, and the most common channel was through a patient's own doctor/clinician. We see these as COVID-19-necessitated behaviors, but they are not the contours of how we envision telemedicine best serving patients in the future when tech-enabled care models are proactive, continuous, and outcomes-oriented.

2. **Who still hasn't adopted telemedicine?** *Barriers to accessing telemedicine abound more than expected.*

- **Those not using telemedicine prefer in-person care.** While a majority of respondents (70%) used at least one channel of telemedicine (i.e., live video, live phone, text, email, app, pic or video message), 30% of respondents reported not accessing any form of telemedicine. Most of this group reported their preference is still to discuss health in person. Still, this represents a large untapped consumer market with opportunities for startups, investors, and healthcare enterprises to further explore how to meet this population's needs, particularly in the context of hybrid care models that integrate ongoing tech-based support with the in-person care people know and trust—and with the potential for very favorably improving healthcare engagement and clinical outcomes.
- **There is still no good data as to whether this delay in care affected health outcomes.** Though out of the scope of this survey, we are eager to see research on the short- and long-term health impacts of the underutilization of care in 2020.

Key findings continued:

3. **How are consumers using digital health tracking tools differently during COVID-19?**
   Unpacking the trends in health tracking and wearable use.

   - **More consumers reported use of digital trackers and wearables.** Wearable ownership and use were both up in 2020, jumping up 10 percentage points from 33% in 2019 to 43% in 2020, after not growing at all between 2018 and 2019. Emerging spaces such as women's health—for fertility and menstrual tracking—may have contributed to the proliferation of digital tracking: 83% of women who track their fertility and 67% of those tracking their menstrual cycle used digital methods. The consumer groups most likely to track their health digitally were under 55 years old, respondents with chronic conditions, higher income earners, and urban respondents.
   - **Wearable use is still low in select subgroups.** Despite overall wearable ownership soaring, there were subgroups with lower rates of ownership: rural adults, those making less than $75K annually, adults aged over 55, women, and those without bachelor or graduate degrees. Similar to findings among telemedicine, the data points to a digital divide that continues to favor adoption among suburban, higher-income, highly educated adults. At the risk of further exacerbating this divide (and associated health disparities), policy makers and innovators alike must address barriers to technology and internet access, as well as build solutions that account for segmented preferences and trust.

4. **How have consumers' data-sharing preferences changed during the pandemic?**
   A look at consumer trust and willingness to share health data.

   - **Consumers (still) do not equally trust everyone with their data.** Willingness to share personal healthcare data remains largely unchanged from previous years. In some instances, consumers are more likely to be willing to share their COVID-19 results than other personal health information. For example, about double the number of respondents were willing to share their COVID-19 results rather than their health data with the government and their employer.

METHODOLOGY

Since 2015, Rock Health has annually surveyed 4,000 US adults to track consumer adoption of digital health technologies. As in the past, Rock Health and the Stanford Center for Digital Health collaborated to analyze the survey data and produce this Digital Health Consumer Adoption white paper. In 2020, the sample size was nearly doubled to allow for deeper subgroup analysis and a greater ability to examine changes in consumer behavior in light of the pandemic.

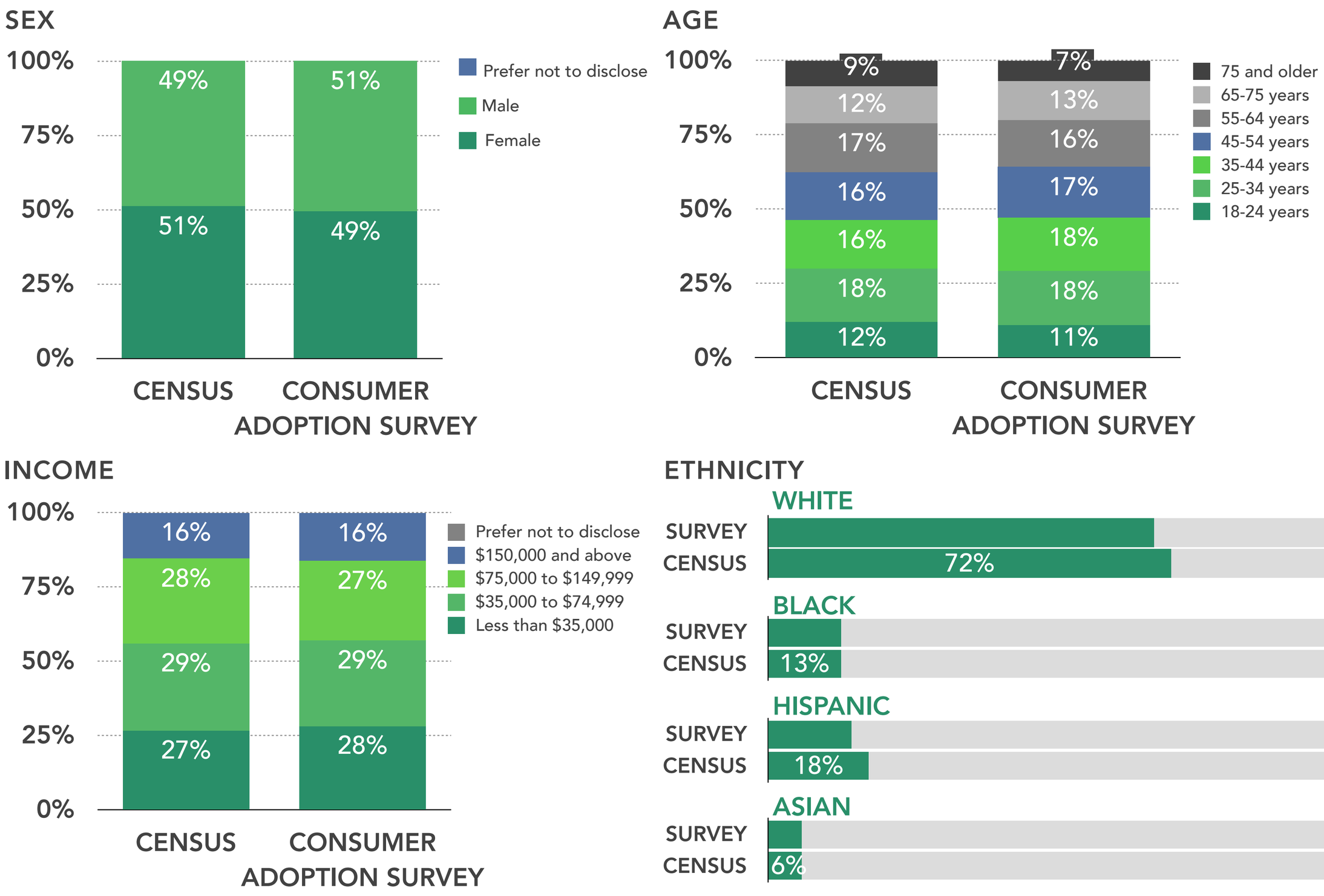
A survey of 7,980 US adults was conducted by Toluna USA, Inc. between September 4, 2020 and October 2, 2020. Respondents used their personal desktop, laptop, smartphone, or tablet to complete the survey, which was in English. Survey respondents were selected from Toluna's network of members, who receive "points" that can be redeemed for rewards such as gift cards for participating in surveys (Toluna does not disclose the value of each "point"). Toluna targeted respondents based on member profiles to obtain a sample representative of US Census demographics (e.g., gender, age, geographic region, race, and income). The median interview duration was 13 minutes. The survey included questions about respondents' health profile, demographics, adoption of digital health tools, sentiment about digital health technology, and COVID-specific questions (e.g., seeking and sharing test results, delaying care, interest in potential vaccines).

As seen in Figure 2, our survey population closely matched Census demographics. This report relies on historical comparisons to prior consumer adoption survey data from 2015 to 2019 using a similar methodology as the 2020 survey, with some exceptions noted throughout the white paper to rephrase some questions for clarity and the addition of COVID-19-related questions. Survey respondents are referred to as "respondents" or "consumers" throughout this report.

FIGURE 2

SURVEY RESPONDENT DEMOGRAPHICS

2020



Source: Rock Health Digital Health Consumer Adoption Survey (n_{2020} = 7,980). US Census. Note: Question for sex - Survey: "what is your biological sex (ie what sex were you assigned at birth)?" Responses: Male, Female, Prefer not to disclose. Census: "what is person's sex?" Responses: Male, Female.

Rock Health and the Stanford Center for Digital Health analyzed this de-identified survey dataset to identify patterns, trends, and insights in consumer adoption of digital health solutions. For statistical analyses, we used logistic regression to determine the association between a primary predictor and outcome of interest, controlling for covariates (i.e., confounders) in multivariate regression analysis. Individuals with missing information on the use of digital health technology were excluded. Covariates included age, race, biological sex, area, region, insurance type, income, educational attainment, chronic disease/condition, doctors' visit in a year, and health status. For all analyses, p-values were two-sided, with those less than 0.05 considered statistically significant. Statistical analyses were conducted using STATA version 12.0 (Stata Corp, College Station, Texas).

These survey data have important limitations. The data is cross-sectional and relies on self-reported respondent data, which is subject to recall bias. Although the sample size is large, we cannot rule out sampling bias. For example, respondents completed the survey using a desktop, laptop, smartphone, or tablet, spoke English, and were willing to complete a moderate-length survey. As a result, 93% of survey respondents answered that they own a smartphone, compared to 81% of all Americans. In addition, 96% of respondents answered that they had reliable internet access, compared to 90% of all Americans who use the internet. Those willing to participate could be more engaged in their healthcare or digital technology compared to those who declined. We did not survey the same participants year after year, so trends reflect shifts in the population rather than in specific individuals.

INTRODUCTION

Digital health use in 2020 was a reflection of consumers' responses to the coronavirus pandemic:

- The quick pivot by providers to offer remote care yielded a significant uptick in use of live video telemedicine, with 43% of respondents reporting that they had a video visit (compared to 32% in 2019).

- Wearable use was up in 2020, with 43% of all respondents reporting that they owned a wearable (up from 33% in 2019). Chronic condition management could be driving this uptick, with many (66%) of those who started using a wearable for the first time during COVID-19 using it to manage a diagnosed health condition, and 51% of all wearable owners using their wearable to manage a diagnosed health condition (up from 28% of wearable owners in 2019).

- Over half of respondents tracked a health metric (e.g., weight, heart rate, blood pressure) using a digital tracker, up 12 percentage points from 2019.

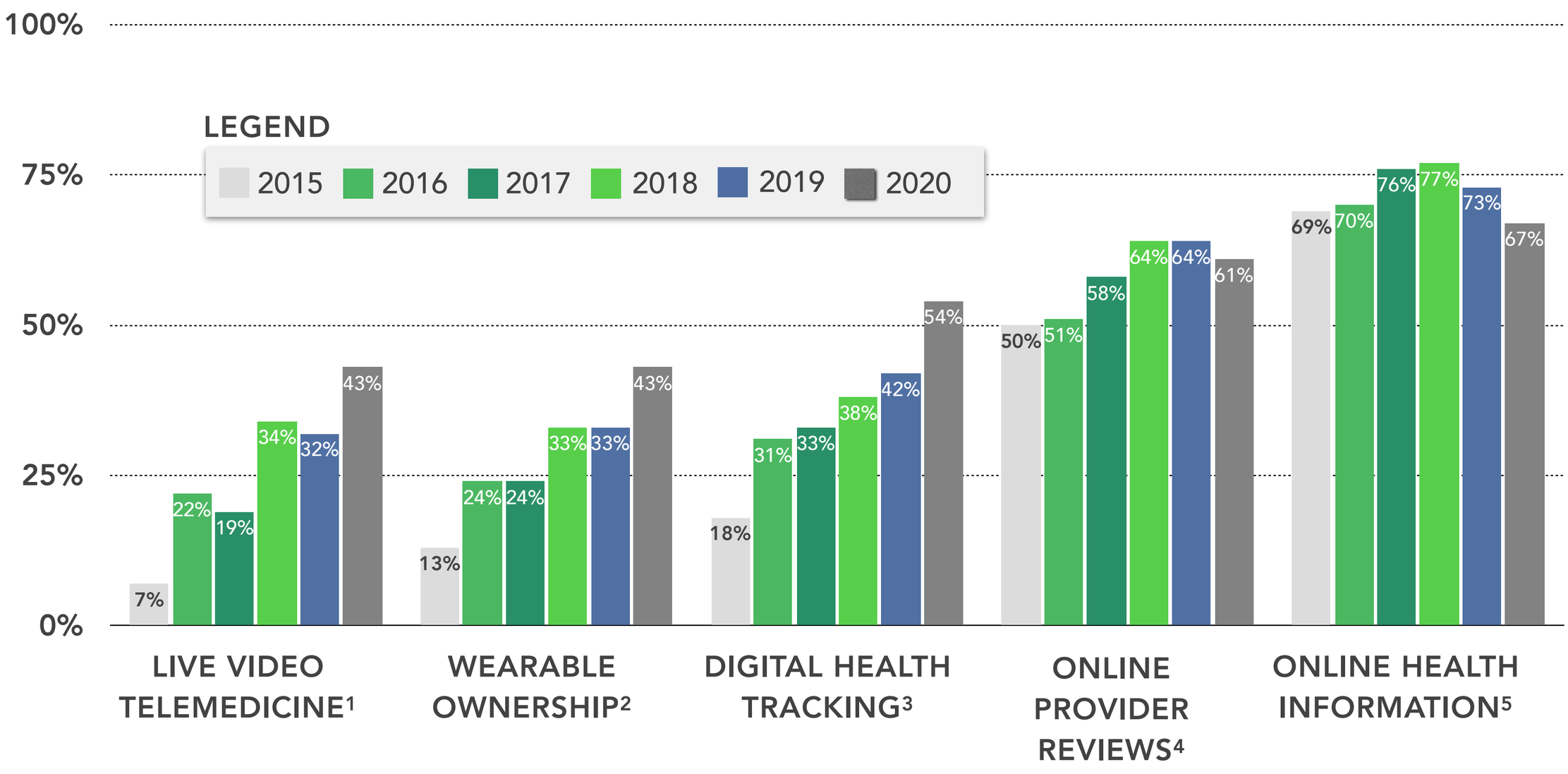
- Sixty percent of respondents searched for provider reviews online, which is a slightly smaller percentage than in 2019 and may reflect the overall reduction in healthcare utilization brought about by the pandemic.

- The majority of respondents continue to search online for health information—on symptoms, treatments, medications—though a slightly smaller percentage of respondents reported doing so (67% in 2020 versus 73% in 2019).

FIGURE 3[2]

ADOPTION OF DIGITAL HEALTH TOOLS

2015–2020



Overall, digital health solutions played a crucial role in enabling care at a distance in 2020. Necessity was the mother of adoption, particularly around telemedicine and remote health tracking. However, while more consumers used wearables to track health metrics, it is unclear how well healthcare systems have adapted to this shift in consumer interest in tracking health data, and it is unknown how much patient-generated data is being integrated into healthcare and disease management. While uncertainty remains regarding the long-term impact on adoption, the heightened use of and visibility of digital health solutions offers an opportunity for innovators to prove to consumers that technology can be an enabler throughout their wellness and healthcare journeys.

What follows is an analysis of four key themes emerging in 2020.

[1] Survey question 2015-2019: When, if ever, have you received medical care or advice from a healthcare professional (e.g., doctor, nurse, therapist) through the following means: Live video call on a mobile phone, tablet, or computer (not YouTube or other educational/information web videos)? Responses: In the last 12 months, More than 12 months ago; Survey question 2020: Have you received medical care or advice from a doctor or other clinician through the following types of virtual care (i.e., live video)? Response: Yes.
[2] Survey question 2015-2020: Do you own a wearable device or smart watch (note: this excludes smartphones) that helps you track your health? This could include number of steps/exercise, sleep, heart rate, or blood pressure. Response: Yes.
[3] Survey question 2015-2020: How do you currently record the following: Weight, Heart rate, Blood pressure, Medications, Physical activity (steps, exercise, etc.), Food/diet, Sleep, Blood sugar, Other?
Responses: With a wearable, Connected device (e.g., smart scale, glucometer) or in an app that doesn't connect to a wearable, In a digital journal or log.
[4] Survey question 2015-2020: Have you used a mobile app or website to find any of the following?
Responses: A specific physician or nurse practitioner, An in-home caregiver including private duty nurses, A hospital or clinic, A pharmacy, A nursing home or long-term care facility, A physical therapist, A psychologist, therapist or counselor, An integrative and or lifestyle medicine practitioner.
[5] Survey question 2015-2019: When, if ever, have you searched for any of the following using a website or mobile app: Information about prescription drugs and/or side effects, A diagnosis based on your symptoms, Treatment options based on your diagnosis? Responses: In the last 12 months, More than 12 months ago; Survey question 2020: Have you searched for any of the following using a website or mobile app: Information about prescription drugs and/or side effects, A diagnosis based on your symptoms, Treatment options based on your diagnosis? Response: Yes.

Source: Rock Health Digital Health Consumer Adoption Survey (n2020 = 7,980; n2019 = 4,000; n2018 = 4,000; n2017 = 3,997; n2016 = 4,015; n2015 = 4,017).

How has telemedicine adoption changed?

Telemedicine use before and during the pandemic

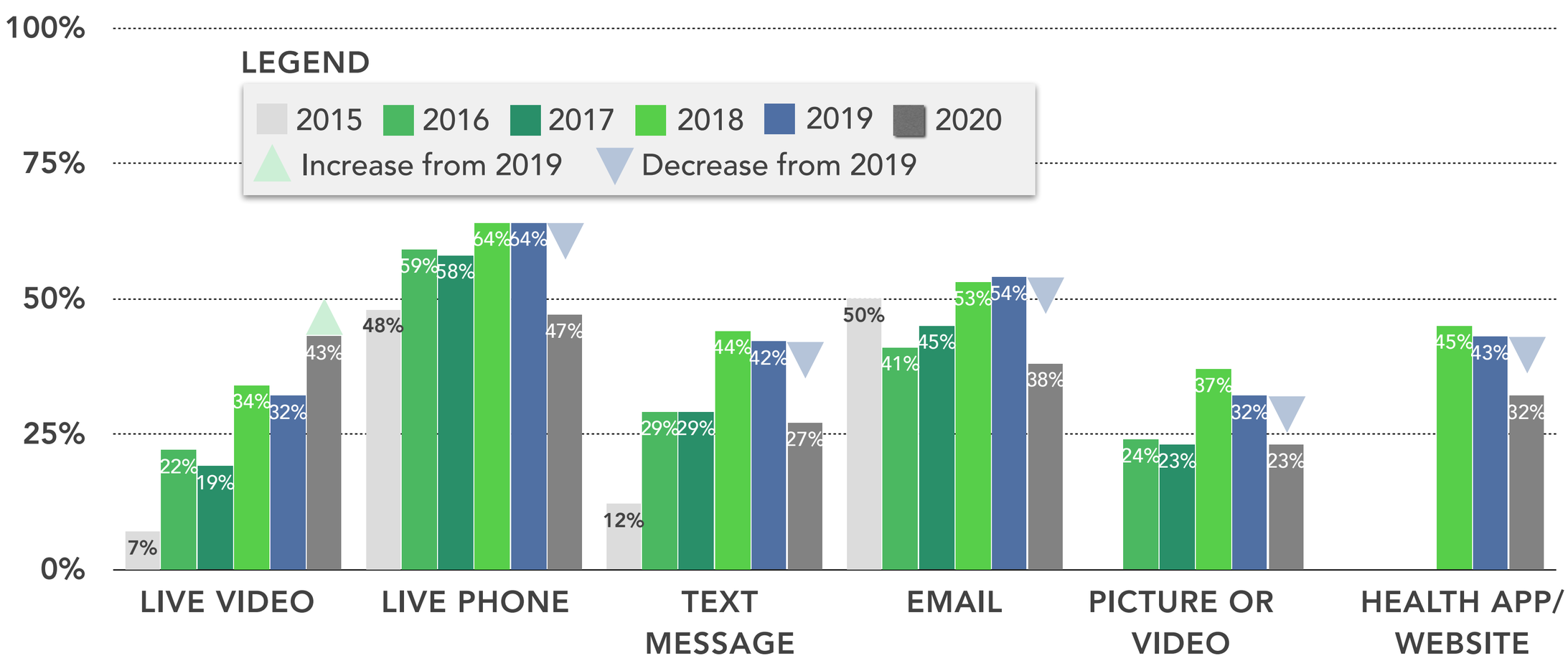
ADOPTION OF LIVE VIDEO VISITS JUMPED IN 2020, WHILE OTHER TELEMEDICINE USE TAPERED

Live video telemedicine visits hit a high water mark in 2020, with 43% adoption among respondents, an 11 percentage point increase from 2019. Simultaneously, use of non-video telemedicine channels (e.g., live phone, text messaging, email) was down from 2019. The data on telemedicine adoption in 2020 points in two different directions: up for live video, down for everything else.

FIGURE 4

TELEMEDICINE ADOPTION BY CHANNEL

2015–2020; up for video, down for everything else



This finding (i.e., consumer utilization of some forms of telemedicine *fell* during the early stages of the pandemic) is initially surprising, particularly in light of widely reported *increases* of telemedicine utilization among providers. We propose that a Will Rogers phenomenon led to this outcome. Importantly, overall healthcare utilization declined dramatically in the early part of 2020: utilization hit a low point in late March with 60% fewer visits[3] completed than during the same period the prior year. The CDC's June 2020 survey results reported an estimated 41% of US adults delayed or avoided medical care including urgent or emergent care (12%) and routine care (31%). Our data corroborate this trend: 42% of respondents reported delaying *necessary* medical care during COVID-19 that they would have normally sought.[4]

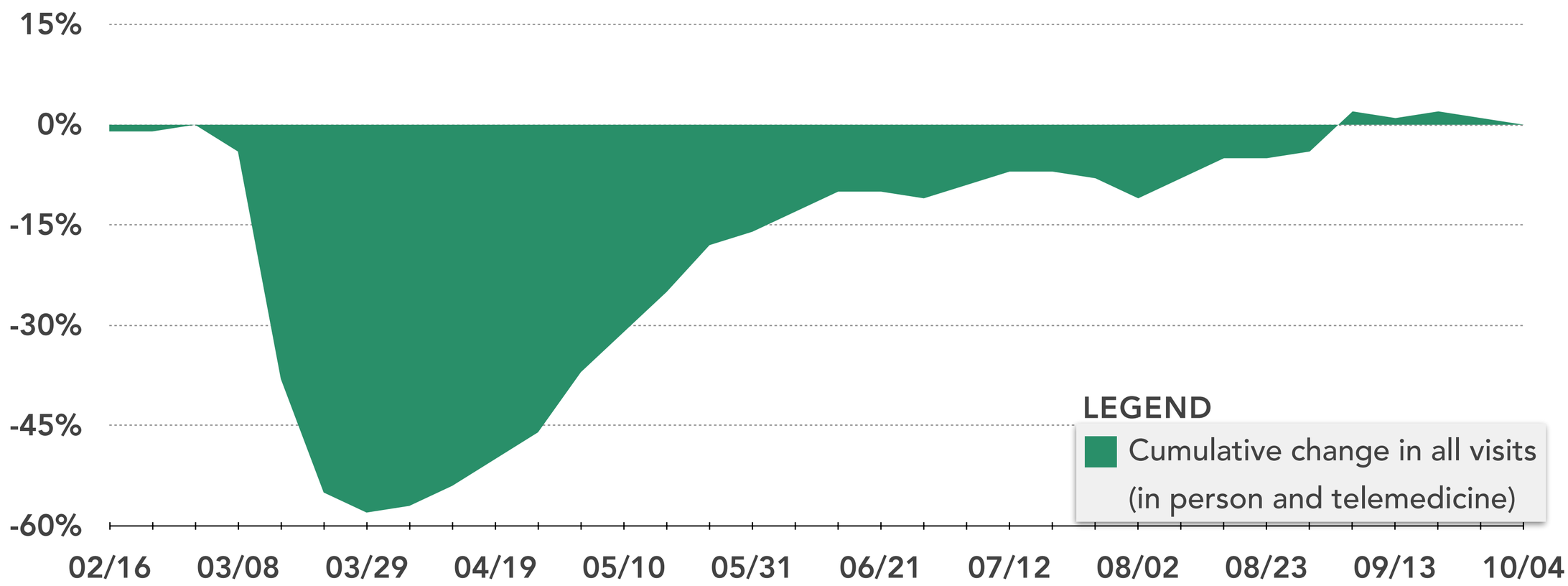
Given that a substantially lower proportion of US adults sought care *of any kind* in early 2020, we would expect that a lower number of US adults utilized each form of care, including care delivered via telemedicine during that same timeframe. Put in context, a decline in utilization of telemedicine broadly is to be expected, and the surprising result in our data is therefore the dramatic *increase* in use of live-video telemedicine.

We note that this observation (i.e., that fewer consumers used telemedicine in mid 2020 than in 2019) may appear to contradict widely reported,

FIGURE 5

PERCENT CHANGE IN VISITS FROM BASELINE

February 16, 2020 – October 4, 2020



Note: Data are presented as a percentage change in the number of visits in a given week from the baseline week (March 1–7).
Source: Ateev Mehrotra et al., *The Impact of the COVID-19 Pandemic on Outpatient Care: Visits Return to Prepandemic Levels, but Not for All Providers and Patients (Commonwealth Fund, Oct. 2020).*

Amidst the decline in overall healthcare utilization, adoption of live-video telemedicine increased, driven by public health guidance, stay-at-home orders, and CMS's relaxed federal restrictions on telemedicine, including out-of-state licensures, reimbursement guidance, and originating site requirements.

The CDC reported a dramatic 154% increase in telehealth visits during the last week of March 2020 compared with the same period in 2019. CMS reported another 34.5M telehealth encounters delivered in March 2020 through June 2020 for Medicare and CHIP beneficiaries, representing an astounding 2,632% increase compared to the same timeframe in 2019.[5] According to research from The Commonwealth Fund, telehealth visits across all payer types made up 14% of baseline total outpatient visits at peak adoption in mid-April. The percentage of telehealth visits leveled off around 6-7% as of October 4, 2020 (see figure 1) which is still substantially greater than the pre-pandemic percentage of 0.1%. All of these sources align with what consumers reported to us about their adoption behavior in 2020 across segments of telemedicine and relative to prior years.

increased rates of telemedicine utilization among healthcare providers. Because our survey is a sample of consumers—and not providers—we use a different denominator (i.e., consumers), allowing for both observations to be true at the same time. That is, both in-person and all visits overall dropped in 2020, but in-person visits dropped by a larger percentage than all visits (see Figure 1, Outpatient Healthcare Utilization), meaning the percentage of visits that were conducted via telemedicine rose. At the same time, because a substantially smaller number of consumers overall sought care, a likewise smaller number of consumers utilized telemedicine than in prior years.

In addition to point-in-time utilization data, the survey also enabled us to more deeply understand this surge: Who is adopting telemedicine in 2020 relative to previous adopters? Why are they using telemedicine? Are they satisfied with the care? All of these analyses offer signals as to where the pendulum will ultimately settle on a more durable equilibrium.

We examine four components that underpin and drive Theme 1, changes in telemedicine adoption, below:

At the end of Theme 1, we offer Rock Health's perspective on what we think is to come—our "prescription" for the future of telemedicine.

COMPONENT #1: Telemedicine user profiles in 2020 versus 2019

TELEMEDICINE USE IS CONCENTRATED AMONG YOUNGER, HIGHER-INCOME, AND HIGHLY EDUCATED CONSUMERS, AS WELL AS THOSE LIVING WITH A CHRONIC CONDITION

Overall, the data shows that despite the fluctuations in telemedicine use, there are few significant differences between telemedicine users in 2020 and telemedicine users in 2019.[6]

- **Health status and utilization are linked to telemedicine utilization.** Seventy-eight percent of respondents with at least one chronic condition were telemedicine users in 2020, compared to 56% of those without a chronic condition.[7] Furthermore, 87% of high healthcare utilizers (6+ doctor visits in a year) were telemedicine users, compared to 77% of moderate utilizers (2-5 visits in a year) and 55% of low utilizers (0-1 doctor visits in a year). In addition, 82% of respondents with four or more prescriptions used telemedicine, compared to 76% of those with 1-3 prescriptions and 50% of those with no prescriptions.[8]

- **35- to 54-year-olds are the most likely adopters of telemedicine.**[9] Seventy-eight percent of respondents aged 35 to 54 were telemedicine users in 2020. 18- to 34-year-olds were the next highest utilizers at 73% in 2020, which was a drop from being the highest utilizers in 2019 at 80% adoption. Fifty-nine percent of respondents 55 and older used telemedicine. Overall, these numbers didn't change dramatically from 2019, with the exception of those 55 and older, which dropped from 71% utilization in 2019 to 59% utilization in 2020.

- **In 2020, men were more likely to use telemedicine than women.**[10] A higher percentage of men used telemedicine in 2020 compared to women and nonbinary respondents (74% of men, compared to 66% of women and 67% of nonbinary respondents). These gender differences are a departure from 2019, in which men and women used telemedicine at equal rates (77%).

- **As in 2019, higher-income earners were more likely to adopt telemedicine.**[11] Respondents with incomes of $150K and greater reported using telemedicine more than any other income group (85% of respondents earning $150K or more annually used telemedicine). Comparatively, 65% of those with incomes of $35-75K and 63% of those making less than $35K annually reported telemedicine use. This positive association between telemedicine use and income existed in 2019 as well.

- **Those with higher education were likeliest to use telemedicine.**[12] As in 2019, adoption in 2020 was positively associated with education. In 2020, 86% of respondents with a graduate or professional degree, master's degree, or PhD used telemedicine, compared to 69% of those with an associate's or bachelor's degree, 63% of those with some college without a degree, and 59% of high school graduates or those who did not complete high school.

- **Adoption was highest among those living in urban areas.**[13] Seventy-nine percent of urban respondents reported having used telemedicine in 2020, compared to 67% of suburban and 60% of rural respondents.

- **Of note, telemedicine use did not vary dramatically across different racial and ethnic groups.**[14] Given ongoing health disparities and the disproportionate impact of COVID-19 on communities of color, multiple studies have examined adoption of telemedicine by race. However, they have yielded different conclusions. One study found that at the peak of the pandemic in the nation's hotspot, New York City, Black and Hispanic/Latinx residents were more likely to have a first encounter via the ER or an office visit than telehealth, compared to white residents. Another study from JAMIA found that Black people were significantly more likely to report using telehealth than white people. We hope to see further analysis to assess the accessibility of digital health solutions to populations disproportionately impacted by COVID-19 and other diseases.

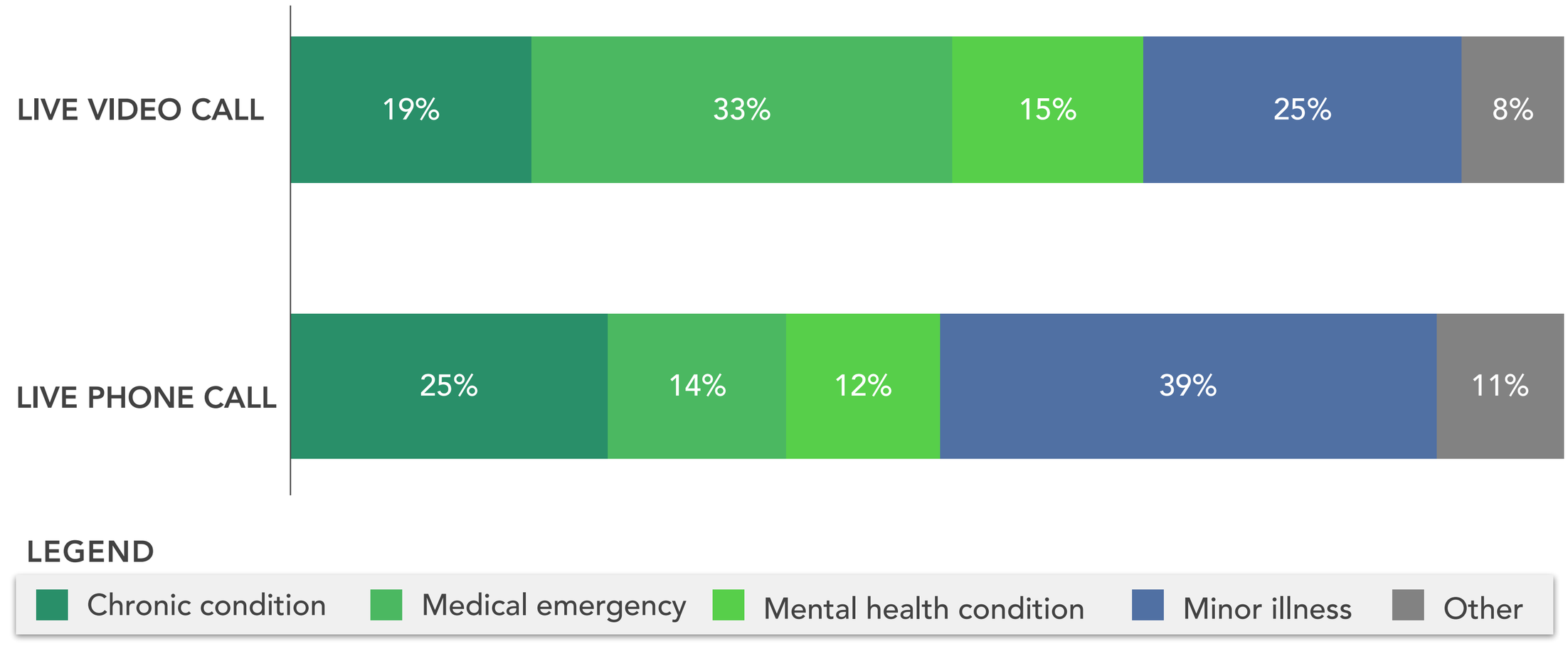
COMPONENT #2: Reasons why telemedicine users sought care in 2020 compared to 2019

TELEMEDICINE USERS ACCESSED LIVE VIDEO AND LIVE PHONE VISITS FOR DIFFERENT REASONS IN 2020

As shown in Figure 6, live video telemedicine users reported accessing visits primarily for a medical emergency (33%) in 2020, followed by minor illness (25%), chronic condition (19%), and mental health condition (15%). An even higher percentage used live video for a medical emergency (41%) in 2019. Comparatively, live phone users in 2020 reported accessing visits due to a minor illness the most (39%), followed by chronic condition (25%) and medical emergency (14%).

FIGURE 6

REASON FOR SEEKING TELEMEDICINE
2020



Note: Reflects data from the survey question: "What was your primary reason for seeking this type(s) of virtual care?"

Among live video telemedicine users with at least one chronic condition, the most common reason for seeking care was for a medical emergency (35% of all live video users), while respondents without a chronic condition mainly sought video care due to a minor illness (38% of all live video users).

COMPONENT #3: Channels used to access telemedicine care

MOST LIVE VIDEO AND PHONE USERS ACCESSED TELEMEDICINE THROUGH THEIR DOCTOR/CLINICIAN (NOT THEIR EMPLOYER, INSURER, OR OTHER CHANNELS)

There are multiple routes for consumers to engage with telemedicine services, whether through an offering from their own physician, health plan, employer, or a direct-to-consumer service that they source themselves. Across 2019 and 2020, the most common path for live video and live phone visits was through a patient's doctor/clinician. The influence of clinicians grew significantly in 2020, as many providers were, for the first time, compelled to offer remote care: 70% of live video telemedicine users and 60% of live phone telemedicine users accessed telemedicine through their doctor in 2020, compared to 50% of live video users and 45% of phone users in 2019. Insurance companies were a distant second. Just 20% of live phone telemedicine users and 13% of live video telemedicine users engaged a service through their insurer.

We also observed variation by age group. While all age groups were most likely to access telemedicine through their doctor/clinician, younger respondents were more likely than older respondents to access telemedicine through a service offered by their insurance company or an independent service.

FIGURE 7

MODE OF TELEMEDICINE ACCESS

2020

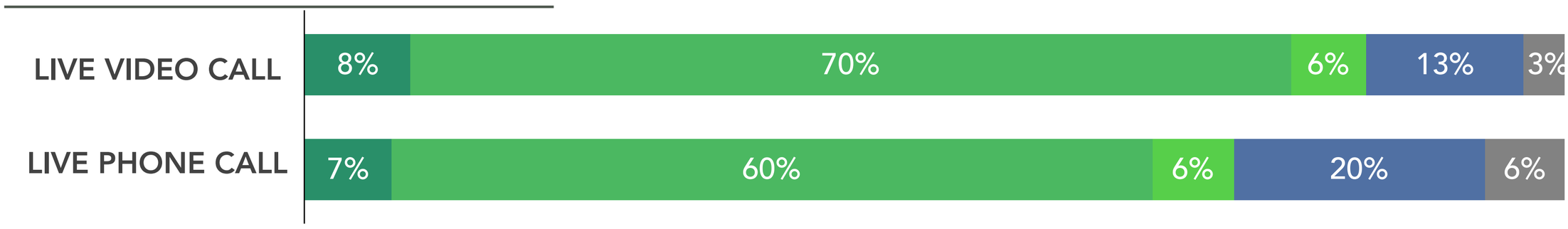
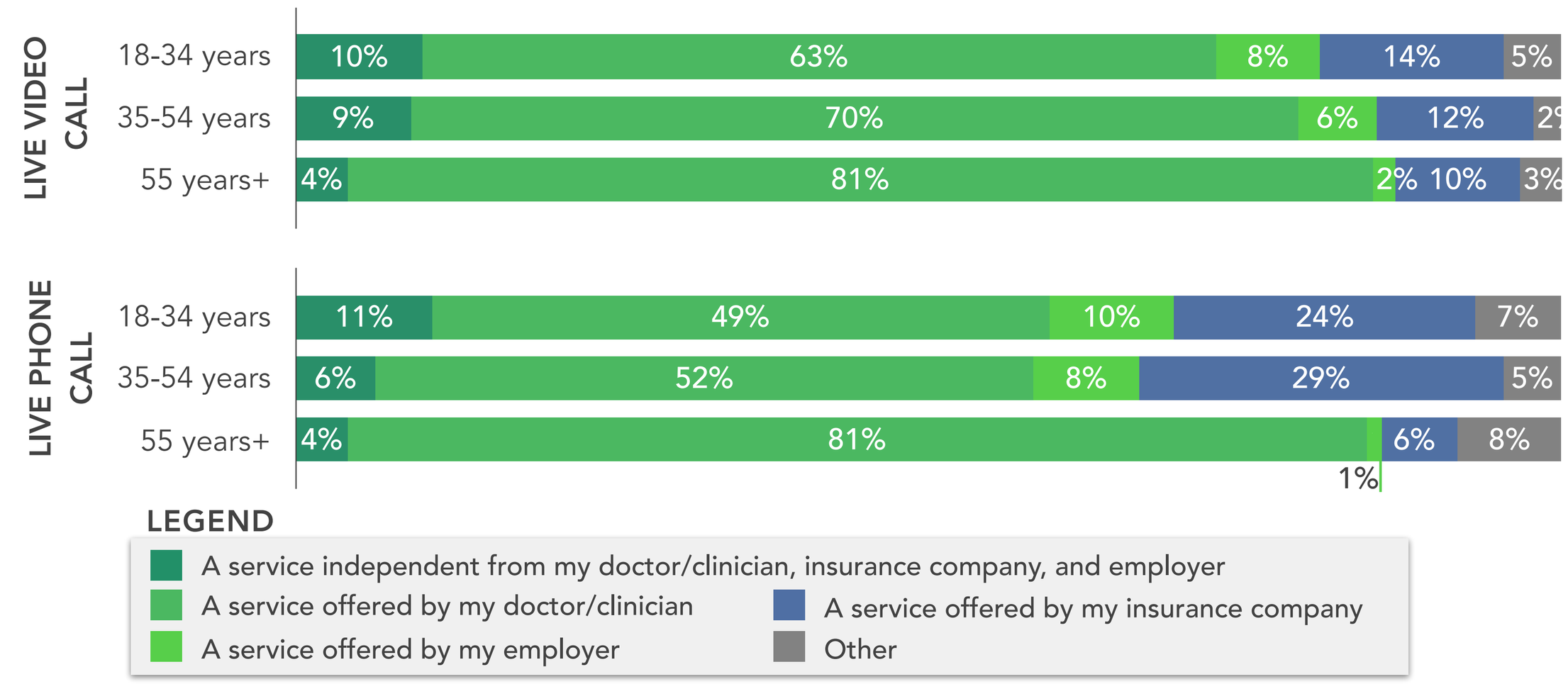


FIGURE 8

MODE OF TELEMEDICINE ACCESS

2020, by age



Note: Reflects data from the survey question: "How was this type(s) of virtual care made available to you?"

COMPONENT #4: Evaluating consumer satisfaction for telemedicine compared to in-person care

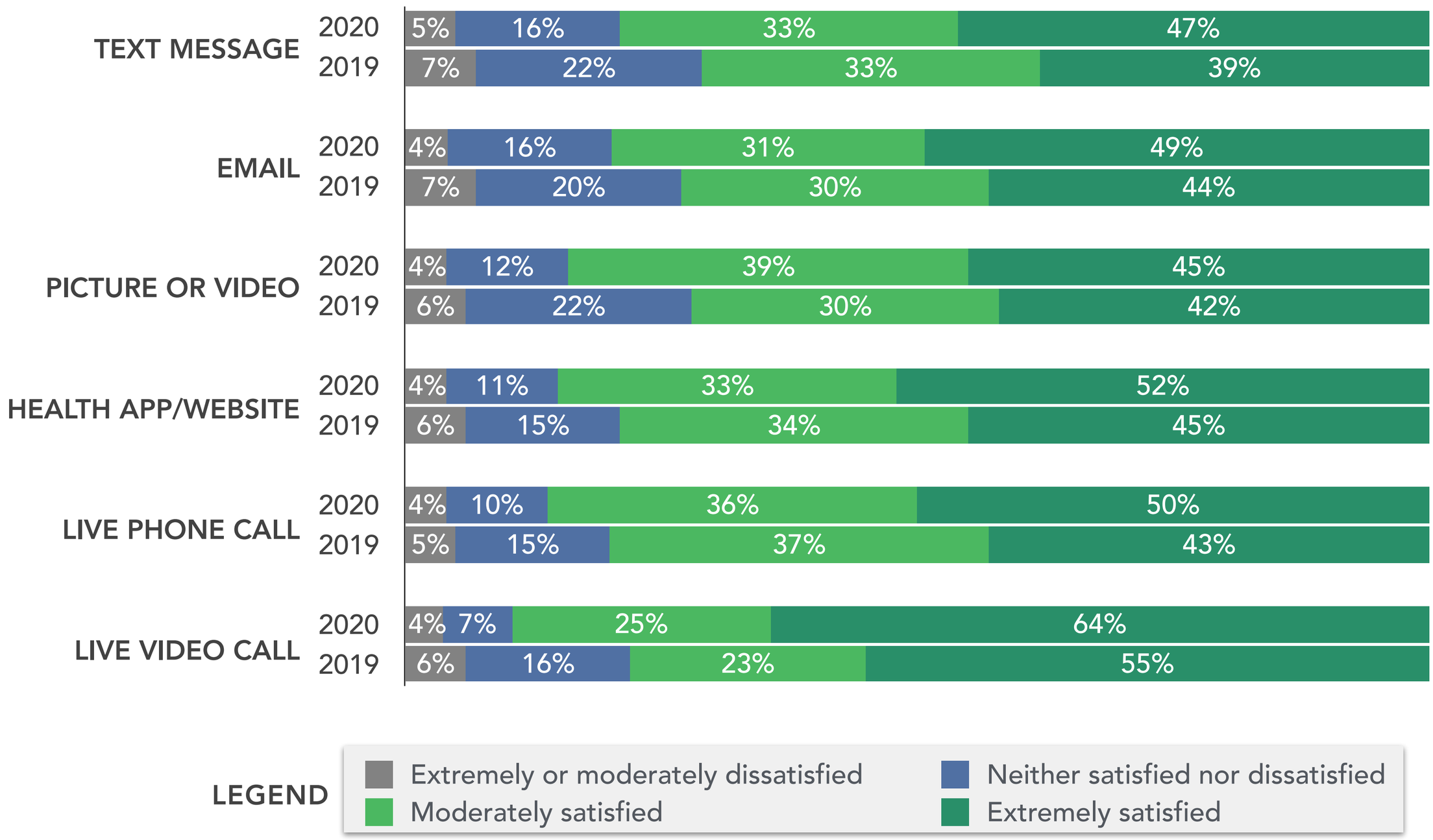
CONSUMERS SHOWED HIGHEST SATISFACTION FOR LIVE VIDEO CALLS, WITH A NINE PERCENTAGE POINT INCREASE IN "EXTREME SATISFACTION" COMPARED TO 2019

In 2020, consumers who used any modality of telemedicine were overwhelmingly satisfied with their experience, and the percentage of respondents extremely or moderately satisfied with their visit was up from 2019 across-the-board. Ninety percent of live video and 86% of live phone users were extremely or moderately satisfied with their visit. Just 4% of live video and phone telemedicine users were dissatisfied.

FIGURE 9

OVERALL SATISFACTION BY MODE OF TELEMEDICINE

2019–2020



Note: Reflects data from the survey question: "How satisfied or dissatisfied were you with this type(s) of virtual care?"

CONSUMERS REPORTED A PREFERENCE FOR TELEMEDICINE CARE OVER IN-PERSON CARE IN 2020

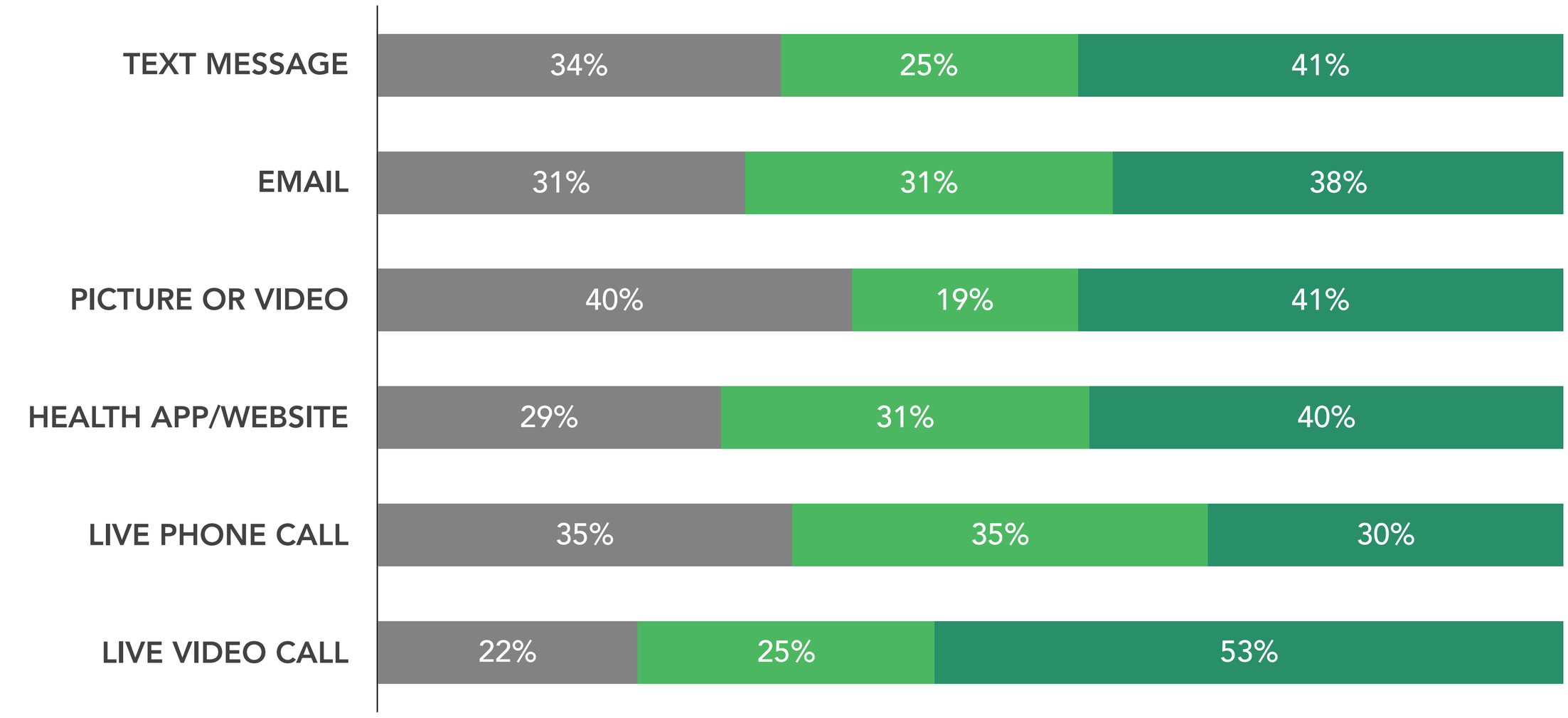
The survey also asked telemedicine users how their telemedicine visit experience compared to previous in-person care visits.

As shown in Figure 10, across nearly all telemedicine modalities—with the exception of phone visits—consumers were most likely to be more satisfied with their virtual interaction. Satisfaction was highest for live video visits, followed by text message and picture or video. Still, 19-34% of respondents were less satisfied with their virtual interaction compared to a previous in-person interaction, depending on the modality.

FIGURE 10

SATISFACTION COMPARED TO PAST IN-PERSON INTERACTION BY MODE OF TELEMEDICINE

2020



LEGEND

- I was less satisfied with my virtual interaction(s) than past in-person interactions.
- I was equally as satisfied with my virtual interaction(s) as with past in-person interactions.
- I was more satisfied with my virtual interaction(s) than past in-person interactions.

Note: Reflects data from the survey question: "How did this type(s) of virtual care compare to your past in-person care experiences?"

Subgroup analysis revealed some differences in telemedicine satisfaction. In multivariate regression analysis, young and middle-aged adults had higher odds of being satisfied with both video and phone telemedicine visits (each age group up to 55 had higher odds of satisfaction for video visits, and each age group up to 75 had higher odds of satisfaction for phone visits).[15] Living in an urban area was associated with higher satisfaction for video visits, but not phone visits.[16] The odds of being satisfied with both video and phone visits increased significantly with income.[17] While a higher percentage of men reported being satisfied with both live video and phone visits, regression analysis did not reveal any statistical association between gender and satisfaction.

Finally, a higher percentage of white respondents were more satisfied with their live video visit than non-white respondents, but a higher percentage of non-white respondents were more satisfied with their phone visit than white respondents. White ethnicity was associated with higher satisfaction for video and phone visits as compared to non-whites in univariate analysis, but these associations were no longer significant in covariate adjusted analysis.[18] However, given the well-documented differences in how people of color access, experience, and receive healthcare as compared to white respondents, it will be important to further explore and address variations or biases embedded in telehealth care delivery.

We hope these differences in subgroup satisfaction motivate entrepreneurs and intrapreneurs to closely examine how they are building products. Our data suggest several questions innovators can consider that are likely to drive satisfaction (and, therefore, the successful adoption of telemedical services): Who are we building for? Why might certain groups feel less engaged with telemedicine, or particular channels of telemedicine? Are we offering context-specific and culturally competent care to specific populations?

These data also suggest multiple interpretations for innovators to consider. For instance, high satisfaction levels in 2020 may be a function of the circumstances created by the pandemic. If a person in need of care cannot access in-person care—due to office closures or fear of contracting COVID-19—then it follows that the virtual alternative would be preferable to no care. Under this interpretation, satisfaction could be a barometer of relief, rather than preference. This interpretation would suggest that satisfaction will fall once consumers are able to return to in person visits and feel comfortable doing so.

On the other hand, high satisfaction in 2020 may presage a fundamental shift in consumer preference to virtual care models. Perhaps consumers value elements of virtual care—accessibility, efficiency, affordability—above and beyond their in-person experience. This interpretation suggests that the higher levels of live video telemedicine adoption in 2020 could translate into sustained and perhaps even increased use over time, as satisfied adopters share their experiences with family and friends.

Our best guess is that both of these factors are at play. Consumers adjusted to virtual visits when it was necessary—but they then shifted partly back to in-person care when it became widely available again. As such, consumers demonstrated they still prefer in-person care to telemedicine, even if they report being satisfied with the latter. However, we do think that new telemedicine users—patients and providers alike—likely had some transformative experiences that will influence future behavior. If government and commercial reimbursement of telemedicine continues to make virtual visits accessible and affordable, we anticipate some patients and providers will see it as a preferable alternative to some types of in-person visits.

Prescriptions for the future: A look ahead for telemedicine

During 2020, more consumers used live video telemedicine than ever before. The most common reason was for a medical emergency, and the most common channel was through a patient's own doctor/clinician. COVID-19 necessitated these changes in consumer behavior. But in observing market shifts beyond just the survey data set (a lagging indicator of innovation), we at Rock Health and Stanford's Center for Digital Health foresee shifts in how telemedicine will serve consumers in the future:

- **Telemedicine must shift from a transactional model to a continuous virtual care model.** The bulk of telemedicine adoption in 2020 resembled the traditional synchronous, reactive, and episodic patient-provider care model. New innovations offer the possibility of "full-stack" services that are proactive, continuous, and better positioned to match limited provider supply to demand. We speculate that the adoption of transactional care tools in 2020 will create a more receptive market for full-stack healthcare and believe a move in this direction will yield a better patient and provider virtual care experience.

- **Telemedicine needs to seek a different kind of customer.** Admittedly, it is alarming that a third of video visits were for a medical emergency. At-home care has limitations, among them dealing with many types of medical emergencies. Given satisfaction rates, it is clear that video telemedicine played a critical stop-gap measure for consumers with a medical emergency, and respondents seeking video care for medical emergencies were more satisfied with their care than video users overall. Ninety-six percent of those who sought video telemedicine for medical emergencies were moderately or extremely satisfied with their care, and 83% were more satisfied with their video visit than with their past in-person care, both metrics exceeding satisfaction for video visits overall (90% moderately or extremely satisfied with their care and 53% more satisfied than with past in-person care). But, particularly as health plans and retail organizations become increasingly sophisticated in their virtual care offerings, it's important to build for the type of utilization that is appropriate and financially sustainable—which likely means building for chronic conditions and lower acuity care.

- **New care models are disintermediating the patient-provider relationship.** Although most telemedicine visits in 2020 were with one's existing doctor/clinician, other models are emerging. As providers invest in virtual offerings that support current care models, they are increasingly competing against direct-to-consumer and other digital health startups, retail offerings, and employer- and health plan–funded telemedicine options. The opportunity for consumers to access care outside of their existing provider relationships is growing. Many consumers will prefer their existing physician, but our 2020 data reinforced the degree to which younger consumers are more likely than their older counterparts to access telemedicine outside of their provider: The next generation of healthcare consumers is rapidly going digital.

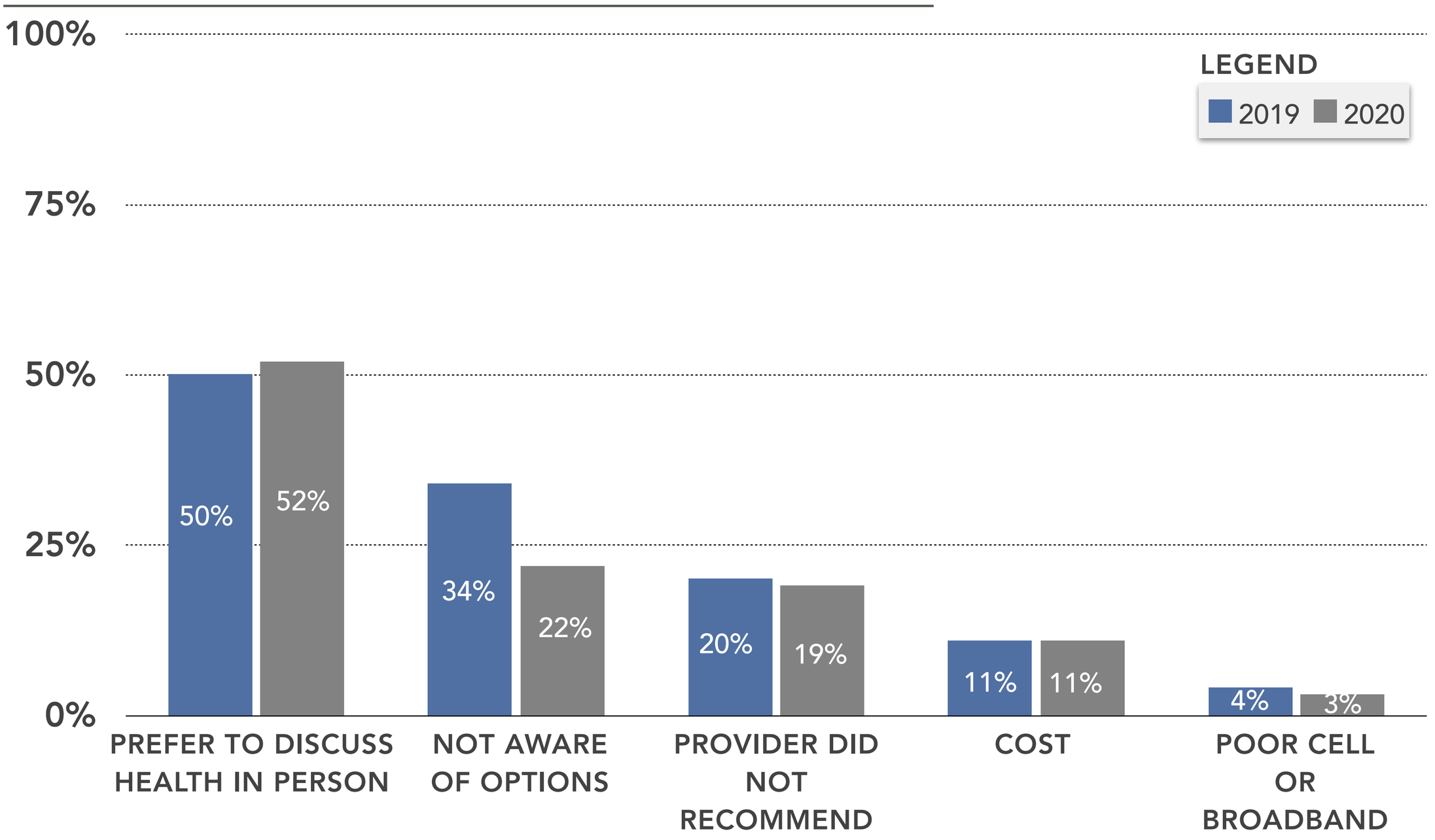
Who still hasn't adopted telemedicine? *Barriers to accessing telemedicine care abound more than expected*

A THIRD OF CONSUMERS DID NOT USE TELEMEDICINE IN 2020

Despite unprecedented increases in live video telemedicine use in 2020, 30% of respondents reported not using any form of telemedicine, compared to 23% in 2019. As seen in Figure 11, 52% of respondents who did not access telemedicine said it was due to a preference to discuss health in person. Fewer of these respondents in 2020 reported not being aware of telemedicine options compared to 2019 (22% versus 34%), perhaps a function of messaging from public health officials, healthcare providers, and payers. Data also showed that a third of providers were still not offering telemedicine as of September 2020, which causes a significant barrier to access for patients.

FIGURE 11

REASONS WHY RESPONDENTS DID NOT ACCESS TELEMEDICINE
2019–2020



Note: Numbers do not add up to 100% as respondents could choose multiple responses. Reflects data from the survey question: "What is your reason for never accessing virtual care from a healthcare professional?"

Telemedicine non-users tended to be:

- **Women:** In 2020, more women reported not accessing telemedicine compared to men (34% and 26% respectively). This difference is new—in 2019, there were no meaningful differences across gender.[19]

- **Older:** In regression analysis, older respondents were significantly less likely to use telemedicine. In 2020, 41% of 55 and older respondents reported never using telemedicine (29% in 2019), compared to 22% of 35- to 54-year-olds (also 22% in 2019) and 27% of consumers aged 18-34 (20% in 2019).[20]

- **Lower income:** Lower-income respondents were more likely to report not using telemedicine in both 2019 and 2020, compared to higher-income earners.[21]

- **Rural:** The odds of not using telemedicine is highest among rural respondents, compared to suburban and urban respondents. Forty percent of all rural respondents reported not using telemedicine in 2020 (29% in 2019), compared to 33% of suburban respondents (24% in 2019), and 21% of urban respondents (20% in 2019).[22]

- **No prescriptions:** Those who reported having no prescriptions were most likely not to use telemedicine (50%) versus respondents on 1-3 prescriptions (24%) and respondents taking four or more medications (18%).[23]

- **Hispanic respondents:** The odds of not using telemedicine was highest for Hispanics in both univariate and multivariate regression analysis.[24]

Despite increased flexibilities around telemedicine, including eliminated cost-sharing in many cases, there is still a sizable untapped market for digital health adoption. Subgroup analyses reveal important insight on why some of the groups outlined above are currently non-users, and hints directionally at how innovators may better design for them:

- Older respondents were more likely to not access care due to a preference for in-person care, while cost for this group was less important. Comparatively, younger respondents (aged 18-34) reported that their top reason for not using telemedicine was not being aware of options.

- A higher percentage of white respondents did not seek telemedicine because they prefer to discuss health in person, while a higher percentage of non-white respondents were not aware of telemedicine options.

How are consumers using digital health tracking tools differently during COVID-19? *Unpacking the trends in digital health tracking and wearable use*

DIGITAL HEALTH TRACKING CLIMBED IN 2020, ESPECIALLY AMONG THOSE WITH CHRONIC CONDITIONS

More consumers are using digital tools to track their health data in 2020 than ever before. Eighty-three percent of all respondents tracked their health data in any form (digital or analog), up four percentage points from 2019. And a large majority (65%) of respondents who tracked a health metric in 2020 used digital tools to do so, up 10 percentage points from 2019.

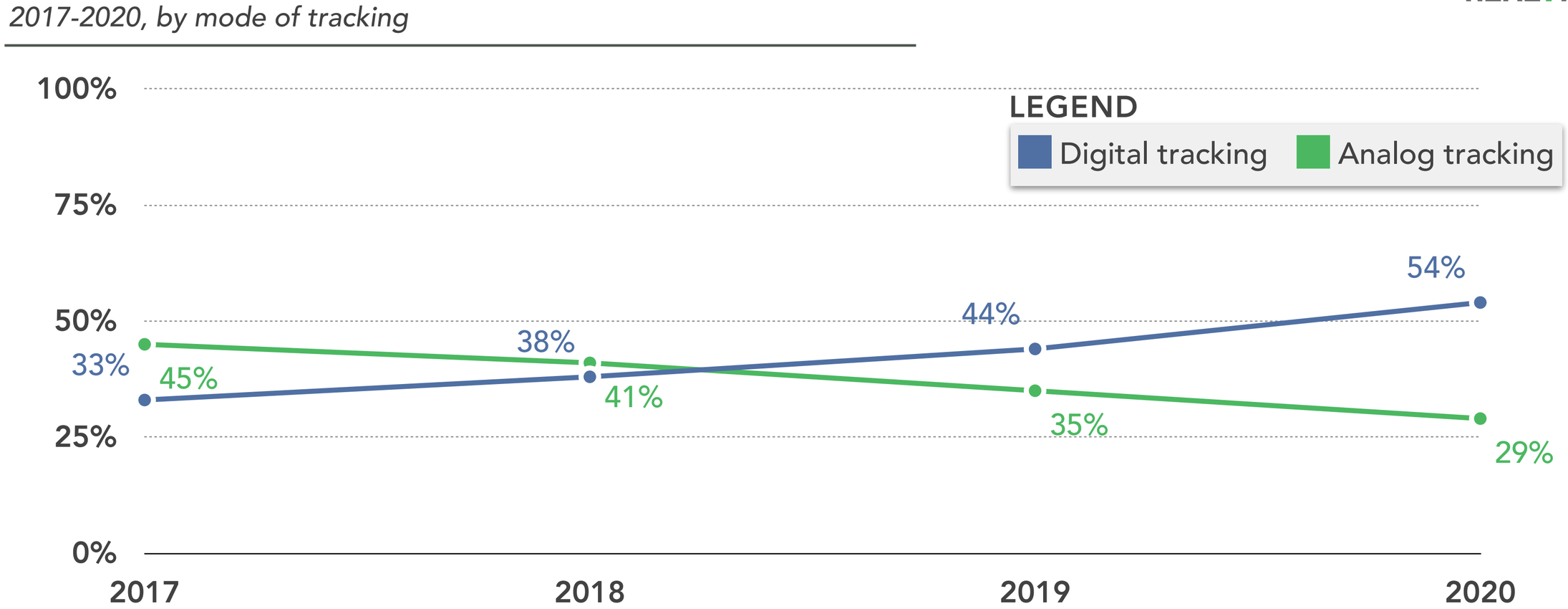
Out of the whole survey population (including non-trackers), 54% of respondents use a digital method to track a health metric, while 29% strictly use analog tracking—demonstrating the deepening adoption of digital tracking.

The health metrics tracked (digitally or analog) by the most respondents were weight (50% of all respondents), medications (33%), blood pressure (32%), food and diet (32%), and physical activity (32%). The health metrics with the greatest portion of digital trackers (here we refer to people who track a health metric as "trackers") were fertility (83% of fertility trackers are tracking digitally), heart rate (75% of heart rate trackers), physical activity (73% of physical activity trackers), and menstrual cycle (67% of menstrual cycle trackers). Across demographic groups, the highest reported rates of digital tracking were among those under 55 years old, those with chronic conditions, higher-income earners, and urban respondents.

FIGURE 12[25]

RESPONDENTS TRACKING AT LEAST ONE HEALTH METRIC

2017-2020, by mode of tracking



Across all health metrics, the chronic condition populations with the highest rates of digital tracking were those with heart disease, diabetes, and obesity. Among respondents with the chronic conditions outlined in Figure 13, the health metrics with the highest rate of digital trackers were heart rate, blood sugar, and blood pressure. For each chronic condition listed in Figure 14, the overall percentage of those tracking specific health metrics (e.g., heart rate, weight) is up compared to 2019, as is the percentage of trackers using digital methods.

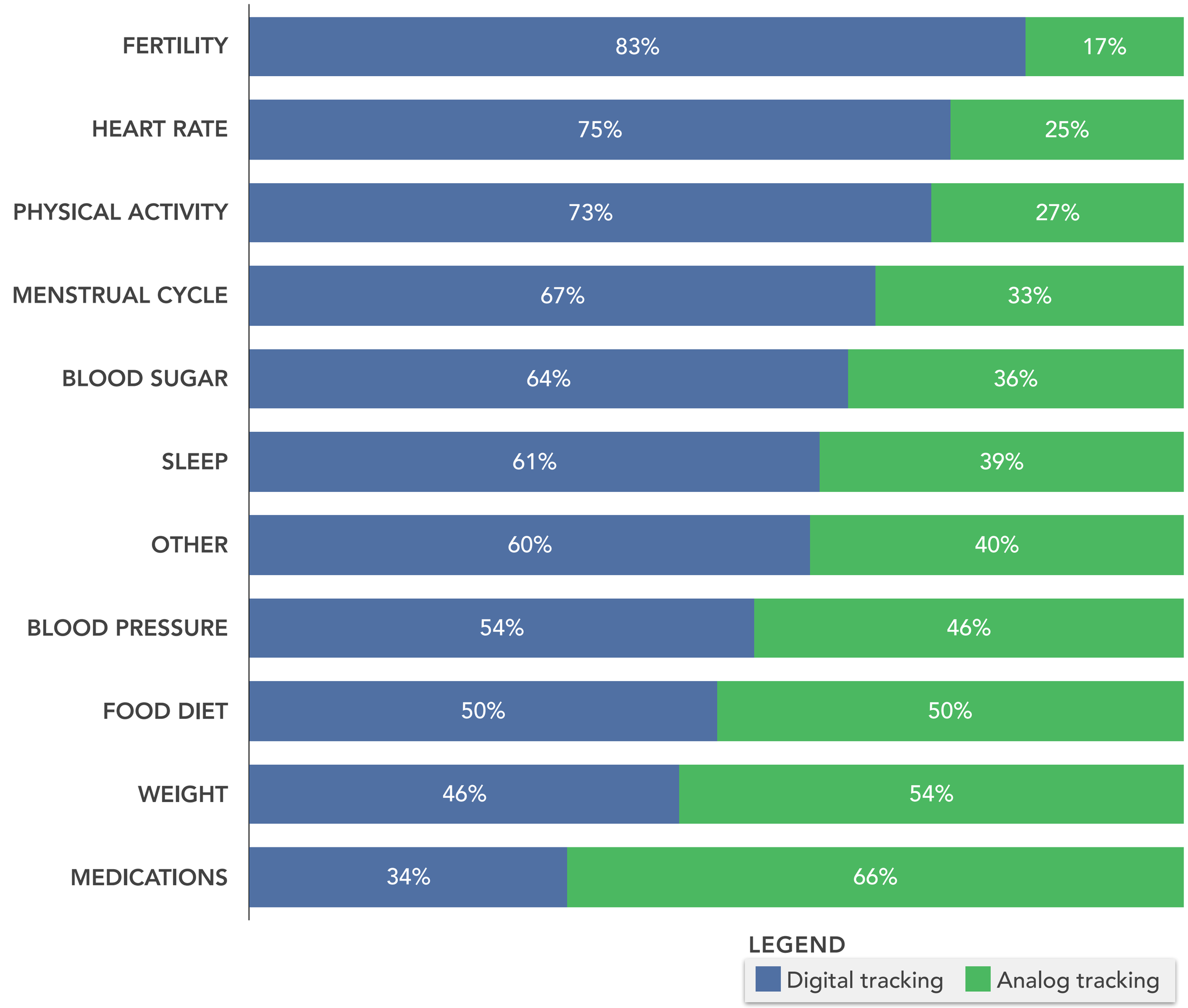
FIGURE 13

TRACKING METHOD BY HEALTH METRIC

2020

Stanford MEDICINE | Center for Digital Health

ROCK HEALTH



Note: Digital tracking defined as in a digital journal or log, with a wearable or connected device (e.g. smart scale, glucometer), or in an app that doesn't connect to a wearable. Analog tracking defined as in your head or in a paper journal or log.

FIGURE 14

HEALTH TRACKING BY HEALTH CONDITION

2020, percent of respondents tracking by analog and digital methods

Stanford MEDICINE | Center for Digital Health | ROCK HEALTH

Note: Digital methods defined as in a digital journal or log, with a wearable or connected device (e.g. smart scale, glucometer), or in an app that doesn't connect to a wearable. Analog methods defined as in your head or in a paper journal or log.
COPD = chronic obstructive pulmonary disease

WEARABLE OWNERSHIP SOARED, BUT USER DEMOGRAPHICS REMAIN LARGELY UNCHANGED FROM 2019

Overall wearable ownership is up 10 percentage points in 2020 compared to 2019, with 43% of consumers owning a wearable in 2020, after a lull in ownership growth. The highest rates of wearable ownership were reported among the same demographics as those reporting high rates of tracking (higher income, urban, under 55, with chronic condition), with the addition of men. Men are adopting wearables at a faster rate than women are. In 2019, almost an equal percentage of men and women reported owning a wearable (35% of men and 32% of women).

However, in 2020, a gap emerged, with 49% of men (an increase of 14 percentage points from 2019) reporting owning a wearable, compared to 36% of women (an increase of 4 percentage points from 2019).

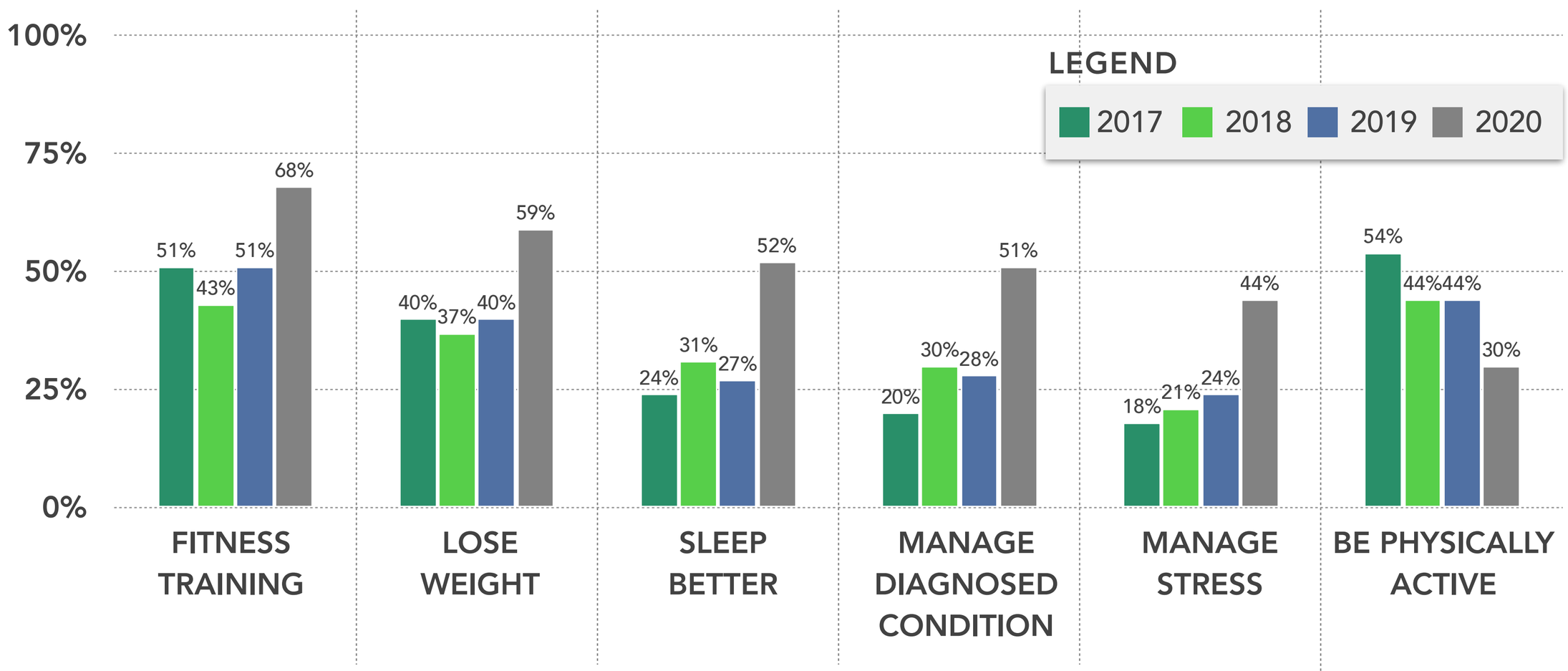
The groups with the lowest rates of wearable ownership are rural, making less than $75K annually, over 55, women, without chronic conditions, and those without bachelor or graduate degrees.[26]

The majority of respondents reported using wearables to become more physically active, track fitness, and lose weight. Notably, the largest increases in reasons for wearable use between 2019 and 2020 were for achieving better sleep and managing a diagnosed condition. During COVID-19, 46% of wearable users started using a wearable for a new purpose. Among those who started using a wearable for a new purpose, the most popular reasons were for managing a diagnosed health condition (66%), fitness training (34%), and becoming more physically active (32%).[27]

FIGURE 15

TOP REASONS FOR WEARABLE USE AND WEARABLE UTILITY

2020, by use case



% RESPONDENTS REPORTING WEARABLE HELPED ACHIEVE THEIR GOAL:

An answer of 4 or 5 for: "To what degree did the wearable device help you achieve your goal(s)? Please rate on a scale of 1=Not helpful, and 5=Extremely helpful)"

FITNESS TRAINING	LOSE WEIGHT	SLEEP BETTER	MANAGE DIAGNOSED CONDITION	MANAGE STRESS	BE PHYSICALLY ACTIVE
74%	69%	68%	74%	72%	76%

DEMOGRAPHIC GROUPS MOST LIKELY TO OWN AND USE WEARABLE CLOSELY FOLLOW TELEMEDICINE USER GROUPS

On a scale of one to five, respondents were asked to rank how helpful their wearable was for achieving each of their distinct goals (one being not helpful to five being extremely helpful). Most respondents reported their wearable helped them achieve their goals, especially those using it to become more physically active, for fitness training, or to manage a diagnosed condition. Overall, respondents felt similarly about how helpful their wearables were in helping them achieve their goals as they did in 2019.

WEARABLE OWNERSHIP SOARED IN 2020, BUT IT IS TOO SOON TO KNOW IF IT WILL STICK

Fifty-five percent of respondents who owned a wearable in 2020 stopped using it for one or more purposes (though they may continue using it for another purpose). 35- to 54-year-olds, men, urban respondents, higher-income individuals, and those with chronic conditions stopped using their wearables at higher percentages, which aligned with 2019 trends as well.[28] However, on average, these same groups were using their wearables for more purposes, so that could be contributing to the high stoppage rate. Perhaps the more ubiquitous nature of wearables carries an inevitability that some consumers will lose interest or stop use, but these numbers suggest that innovators have not yet provided ongoing, long-term value from wearables to sustain use and prevent high dropoff rates. Yet, it's a space innovators continue to make big bets on, with the biggest move coming from Amazon launching its fitness band.

WEARABLES: INTEGRATING HEALTH DATA INTO CONSUMERS' CARE PLANS

Wearables and health tracking have become an increasing part of consumers' connected lifestyles, through smart watches, phones, and apps. They offer opportunities for self-tracking and health management. But on the horizon we see a future in which consumers' interaction with digital health tools are not one-off, but rather are part of holistic, integrated solutions. As mentioned above, a continuous, full-stack virtual care model doesn't just connect patients with providers over telemedicine; it also integrates remote monitoring to understand a patient's progress and proactively flag any issues.

We believe that increases in health tracking and wearable use are paving the way for consumers to embrace more integrated solutions that are increasingly being offered by their plans, employers, and providers. We anticipate that use of tools that we've tracked separately in our survey—telemedicine, digital health tracking, wearables, accessing health information online—will become more closely linked as holistic solutions offer consumers exposure to all of these modalities of care and information. For example, a consumer who has exposure to telemedicine may also, through the same solution, receive a remote monitoring device and have health content delivered to them through an app. Delivering custom, personalized support and care will require a personalization of the toolset, and we're excited to see a lift in consumers' exposure to more types of tools.

THEME #4

How have consumers' data-sharing preferences changed during the pandemic? *A look at consumer trust and willingness to share health data.*

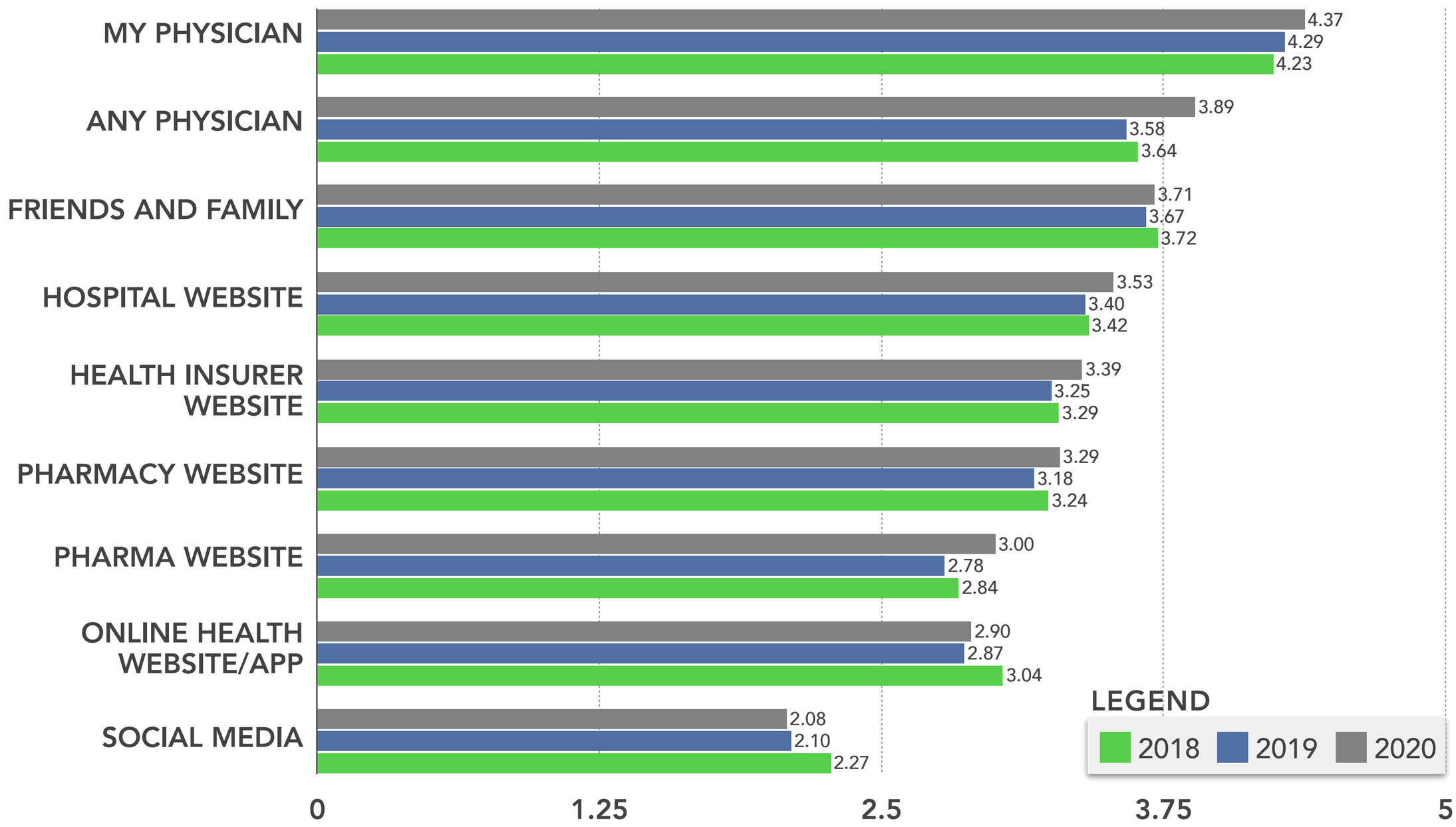
THE MOST TRUSTED ENTITIES FOR HEALTH INFORMATION REMAIN UNCHANGED FROM 2019

Our survey asked respondents to rate their trust in health information received from certain entities. Consumer trust changed little between 2018 and 2019. In 2020, trust crept upward for most entities, with the largest jump for physicians. In 2020, the most trusted entities remained physicians and friends and family. The demographic subgroups with the highest overall trust level were also unchanged in 2020 (under 55-year-olds, men, and respondents who live in urban settings).[29]

FIGURE 16

TRUST IN SOURCES OF HEALTH INFORMATION

2018–2020, on a scale of 1-5 ,with 5 being "trust completely"



CONSUMER WILLINGNESS TO SHARE DATA DEPENDS ON THE TYPE AND RECIPIENT OF THE DATA

As in previous years, consumer willingness to share their health data depended on whom they are sharing it with. In 2020, consumers remained most willing to share their health data with their doctor (72%), health insurer (53%), and family (52%).

In 2020, we also asked respondents specifically about their willingness to share their COVID-19 test results (if they were tested or were to get tested). Respondents' comfort in sharing COVID-19 data followed that of health data generally—consumers were most trusting of their doctor, family, and health insurer.

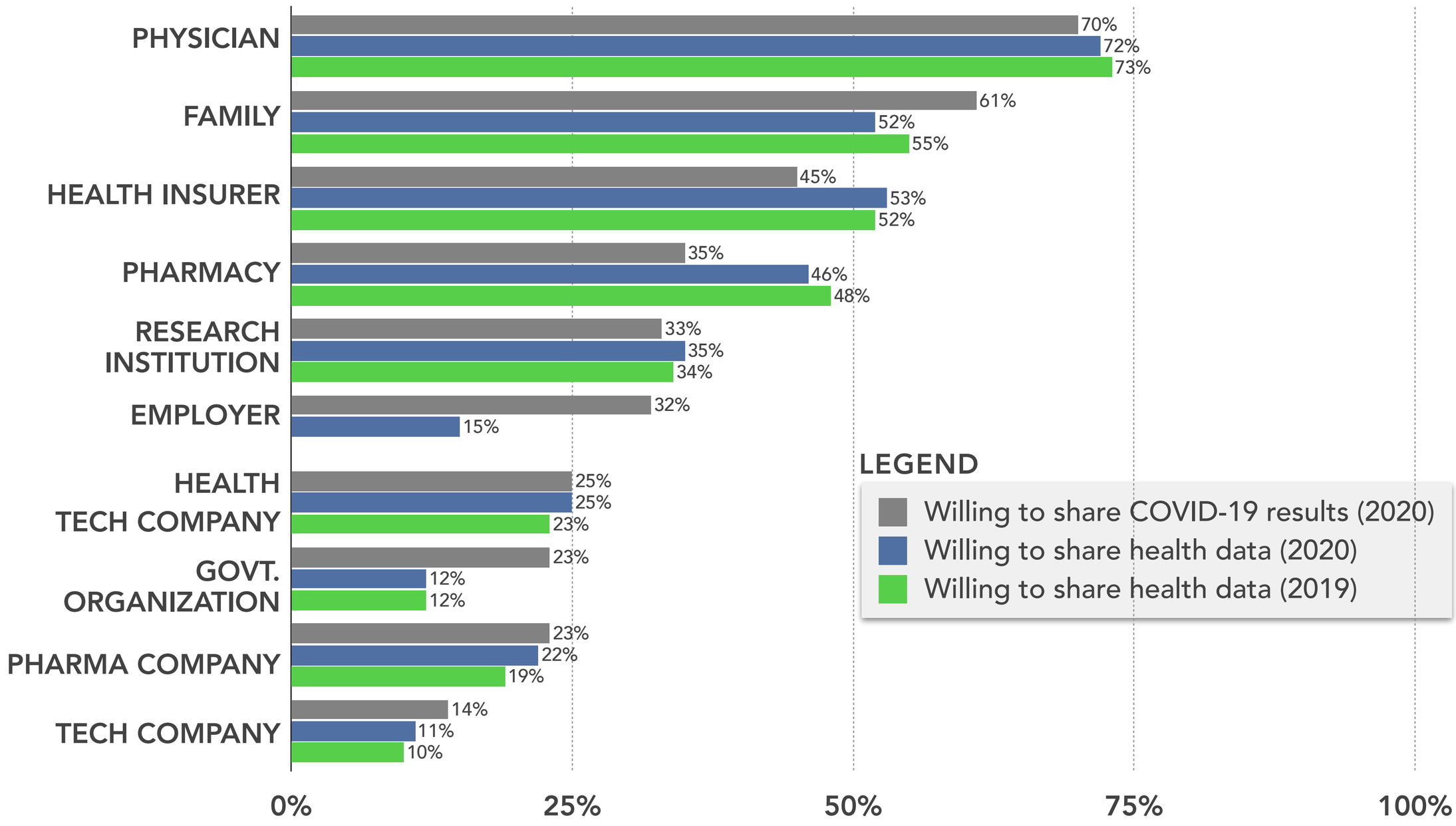
However, respondents revealed some interesting differences between their willingness to share health data generally versus COVID-19 results. Approximately twice the number of consumers were willing to share their COVID-19 results with the government or their employer as compared to their willingness to share general health data with those same entities.

The reverse was true with other entities. For example, respondents were more willing to share their general health than their COVID-19 results with pharmacies and health insurers.

FIGURE 17

WILLINGNESS TO SHARE HEALTH DATA WITH STAKEHOLDER

2019–2020



Survey question: "Please indicate which of the following individuals or organizations you would be willing to share your health information with (e.g., your medical records, test results, prescription drug history, genetic information, and physical activity data) [select all that apply]." "Employer" was not an option as a response in the 2019 survey.

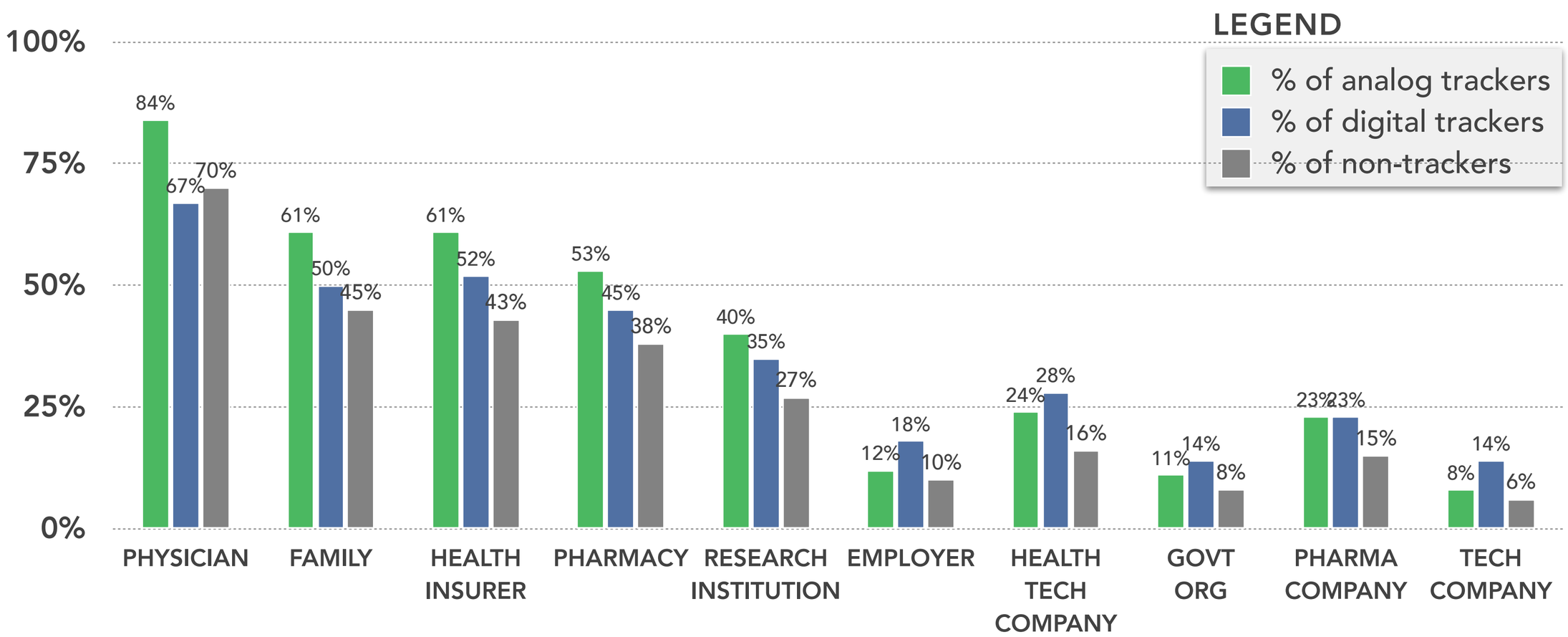
The populations most willing to share their data with physicians were older, higher utilizers (6+ doctor visits in a year), women, rural, and white.[30] There was no consistent trend association with income. When looking at willingness to share health data with healthcare technology companies, we see a different trend. Younger, higher utilizers, men, white, and higher-income consumers were more willing to share health data. Older respondents were less willing than younger consumers to share COVID-19 results with a tech company or a government organization, but more willing to share with physicians, pharmacies, and insurers.[31]

HEALTH TRACKERS (REGARDLESS OF TRACKING METHOD) ARE MORE WILLING TO SHARE THEIR DATA

FIGURE 18

WILLINGNESS TO SHARE HEALTH DATA

2020, by tracking mode



As one may expect, respondents who track (either by analog or digitally) a health metric were more willing to share data than those that do not (+10%). As illustrated in Figure 18, a higher percentage of analog trackers were willing to share their health data with family members, insurance companies, pharmacies, physicians, and research organizations than digital trackers were. However, a higher percentage of digital trackers were willing to share their health data with tech companies, government organizations, healthcare tech companies, and employers.

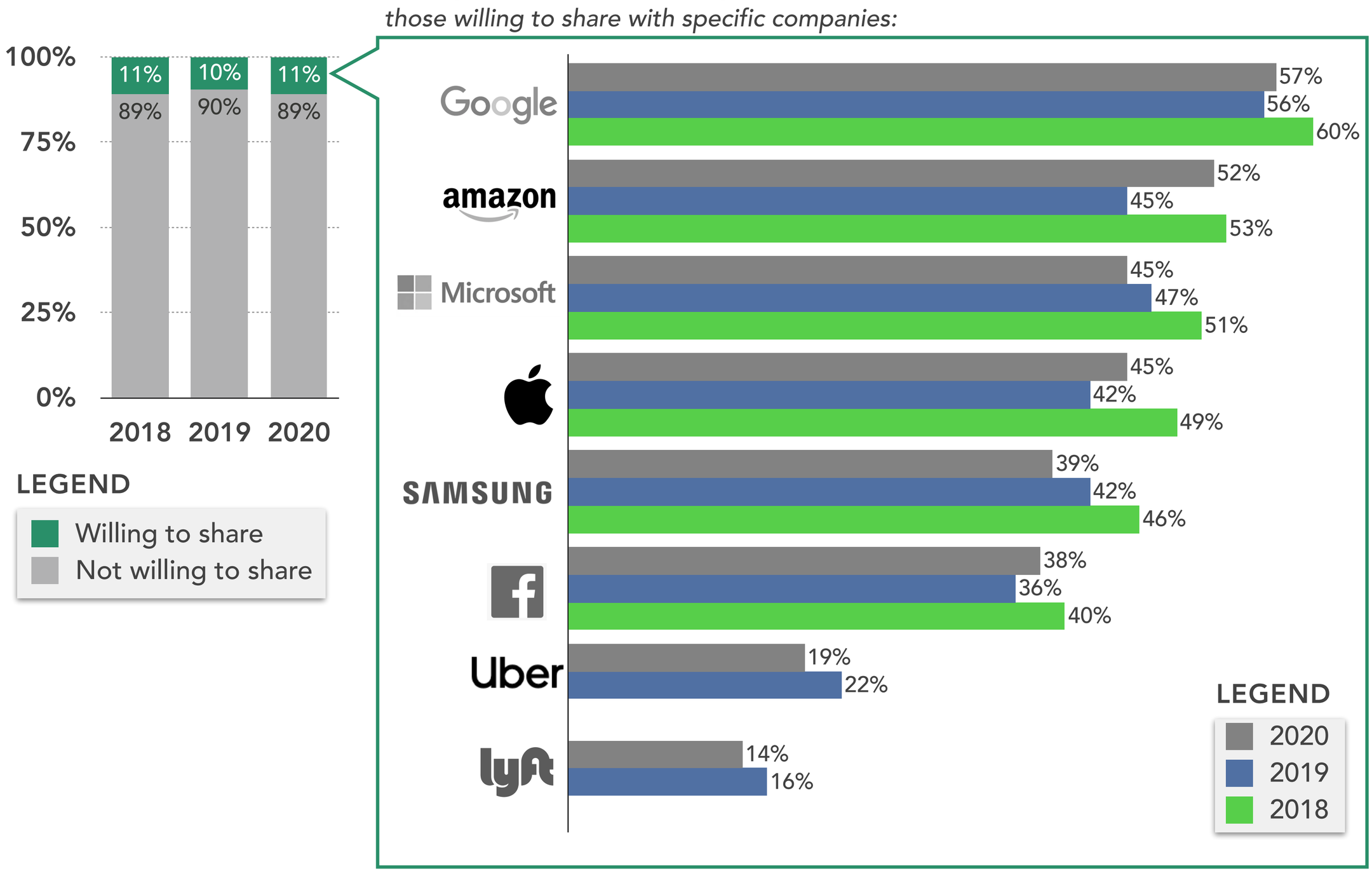
FEW CONSUMERS ARE WILLING TO SHARE THEIR HEALTH DATA WITH TECH COMPANIES—AMONG THAT GROUP, TRUST IN SPECIFIC TECH COMPANIES VARIED SIGNIFICANTLY WITH GOOGLE LEADING THE PACK

As noted in Figure 17, 11% of all respondents reported willingness to share their personal healthcare data with tech companies, a bump after a slight drop from 2018 to 2019. Among those 11% of respondents, we asked which specific tech companies they were willing to share their data with—these results are outlined in Figure 19. Willingness to share with certain companies largely rebounded in 2020 from 2019—namely among Amazon, Apple, and Facebook—but not back to 2018 levels.

FIGURE 19[32]

WILLINGNESS TO SHARE HEALTH DATA WITH TECH COMPANIES

2018–2020



Note: The graph to the left reflects data in response to the survey question: "Please indicate which of the following individuals or organizations you would be willing to share your health information with (e.g., your medical records, test results, prescription drug history, genetic information, and physical activity data) [select all that apply]."

The graph to the right reflects the following data: for respondents that answered "a technology company" to the question "which of the following individuals or organizations would you be willing to share your health information with"), they were asked the follow-up question: "Which of the following technology companies would you be willing to share your health information (e.g., your medical records, test results, prescription drug history, doctor appointment times, genetic information, and physical activity data) with?" Responses: Amazon, Apple, Facebook, Google, IBM, Lyft, Intel, Microsoft, Samsung, Uber, None of these. Lyft and Uber were not included in the 2018 survey response options.

CONCLUSION

Since we began surveying consumers on their digital health adoption in 2015, we have seen a steady uptick in use of telemedicine, wearable ownership and use, online health information, and digital health tracking. In 2020, spurred by COVID-19 taxing the healthcare system, we saw a historical surge in live video telemedicine use amidst the backdrop of an overall reduction in healthcare utilization. The 2020 survey data suggest that consumers more than ever expect technology to be part of their healthcare experience. And, our data show that a significant proportion of consumers currently prefer virtual care to in-person visits and noted very high levels of satisfaction for live video visits in particular. High levels of satisfaction coupled with greater exposure among providers and patients to telemedicine and digital health tracking offer promise for next-generation forms of digital health—full-stack solutions that deliver wraparound, holistic care platforms (Rock Health portfolio companies like Virta, Omada, Vivante, and Brightline) with high patient engagement and experience drivers baked into their offerings.

Despite the dramatic increase in live video use in 2020, there's still room for digital health offerings to reach demographic subgroups that haven't historically engaged in telemedicine care, as opposed to those subgroups (high-income earners, middle-aged adults, and those with higher education) that drove the adoption trend in 2020 and previous years. The 2020 data also exposed other vulnerabilities yet to be tackled in digital health: most consumers are still reluctant to share personal healthcare data with many of the stakeholders building healthcare solutions for them. While the rise of live video telemedicine is a positive signal for a shift to digitally enabled care, it continues to be an expensive form of care that is not quickly or easily scalable.

By surfacing these challenges, we wish to encourage digital health innovators to keep iterating and leaning in to uncover areas where adoption doesn't match the potential for growth. Rock Health hopes to continue to be a part of the movement towards reaching a new equilibrium of integrated, affordable, and scalable use of digital health solutions that support (and reimagine for the better) a consumer's care journey.

Get in touch with Rock Health at research@rockhealth.com and the Stanford Center for Digital Health digitalhealth@stanford.edu.

APPENDIX: DELAYED CARE

Below is an analysis of those who reported delaying medical care. Some demographic groups had a higher propensity to delay medical care than others:[33]

- After adjusting for covariates, the odds of delaying medical care increased significantly in younger respondents.[34] Fifty percent of respondents **aged 35 to 54** reported that they delayed care, compared to 41% of 18- to 34-year-olds and 35% of those aged 55 and over.

- Although more men delayed care during COVID-19 than women did (43% versus 41%), after adjusting for covariates, the odds of delaying medical care are significantly more in **women** (OR:1.33; CI: 1.20-1.47; $p<0.001$) than in men.

- Respondents in the **Northeast** had a higher percentage of delayed care relative to other regions. Forty-eight percent of Northeast respondents reported that they delayed care, followed by those in the West (43%), South (40%), and Midwest (39%). Regression analysis shows that the odds of delaying care are highest in the Northeast region, both in univariate (OR: 1.50; CI: 1.30- 1.73, $p<0.001$) and multivariate regression analyses (OR: 1.23; CI: 1.06-1.44, $p=0.007$).

- Surprisingly—and likely to have the most consequences—respondents **with a chronic condition** delayed care more than those without a chronic condition (48% and 31%, respectively).[35]

- Specifically, 47% of respondents with a **mental health condition** delayed care significantly more compared to 40% of consumers who did not report having a mental health condition.[36]

ENDNOTES

1. **Telemedicine visits:** Data are presented as a percentage where the number of telemedicine visits in a given week is the numerator, and the number of visits in the baseline week (March 1-7) is the denominator. Telemedicine includes both telephone and video visits. **All types of visits vs. in person visits only:** Data are presented as percentage change in number of visits in a given week from baseline week (March 1-7). Source: Ateev Mehrotra et al., Source: Ateev Mehrotra et al., "The Impact of the COVID-19 Pandemic on Outpatient Care: Visits Return to Pre Pandemic Levels, but Not for All Providers and Patients," Commonwealth Fund, Oct. 2020, https://doi.org/10.26099/41xy-9m57.
2. Survey questions 2015-2020:
    1. Survey question 2015-2019: When, if ever, have you received medical care or advice from a healthcare professional (e.g., doctor, nurse, therapist) through the following means: Live video call on a mobile phone, tablet, or computer (not YouTube or other educational/information web videos)? Responses: In the last 12 months, More than 12 months ago; Survey question 2020: Have you received medical care or advice from a doctor or other clinician through the following types of virtual care (i.e., live video)? Response: Yes.
    2. Survey question 2015-2020: Do you own a wearable device or smart watch (note: this excludes smartphones) that helps you track your health? This could include number of steps/exercise, sleep, heart rate, or blood pressure. Response: Yes.
    3. Survey question 2015-2020: How do you currently record the following: Weight, Heart rate, Blood pressure, Medications, Physical activity (steps, exercise, etc.), Food/diet, Sleep, Blood sugar, Other? Responses: With a wearable, Connected device (e.g., smart scale, glucometer) or in an app that doesn't connect to a wearable, In a digital journal or log.
    4. Survey question 2015-2020: Have you used a mobile app or website to find any of the following? Responses: A specific physician or nurse practitioner, An in-home caregiver including private duty nurses, A hospital or clinic, A pharmacy, A nursing home or long-term care facility, A physical therapist, A psychologist, therapist or counselor, An integrative and or lifestyle medicine practitioner.
    5. Survey question 2015-2019: When, if ever, have you searched for any of the following using a website or mobile app: Information about prescription drugs and/or side effects, A diagnosis based on your symptoms, Treatment options based on your diagnosis? Responses: In the last 12 months, More than 12 months ago; Survey question 2020: Have you searched for any of the following using a website or mobile app: Information about prescription drugs and/or side effects, A diagnosis based on your symptoms, Treatment options based on your diagnosis? Response: Yes.

    Source: Rock Health Digital Health Consumer Adoption Survey (n2020 = 7980; n2019 = 4,000; n2018 = 4,000; n2017 = 3,997; n2016 = 4,015; n2015 = 4,017).
3. Ateev Mehrotra et al., The Impact of the COVID-19 Pandemic on Outpatient Care: Visits Return to Prepandemic Levels, but Not for All Providers and Patients (Commonwealth Fund, Oct. 2020). https://doi.org/10.26099/41xy-9m57.
4. For further analysis on those respondents who delayed necessary medical care, please see the Appendix.
5. CDC analyzed deidentified encounter (i.e., visit) data from four of the largest U.S. telehealth providers that offer services in all states: Amwell Medical Group, Boston, Massachusetts; Teladoc Health, Inc., Purchase, New York; MDLIVE, Miramar, Florida; and Doctor on Demand, Inc., San Francisco, California.
6. Telemedicine users are defined as users of at least one of the six modes of telemedicine included in the survey: live video, live phone, text messaging, email, health app/website, picture or video messaging.
7. Compared to those without chronic conditions, those with chronic conditions had statistically significant higher odds of using telemedicine in univariate (OR: 2.76; CI: 2.50-3.05; $p<0.001$) and in covariate-adjusted (OR: 2.54; CI: 2.25-2.86; $p<0.001$) regression analysis.
8. Compared to those with fewer or no doctor's visits/year, those with 6-10 visits/year had statistically significantly higher odds of using telemedicine in univariate (OR: 7.27; CI: 5.71-9.26; $p<0.001$) and multivariate regression analysis (OR: 5.96; CI: 4.57-7.77; $p<0.001$). Likewise, those with 10+ doctor's visits/year had higher odds of telemedicine usage in univariate (OR: 7.37; CI: 5.26-10.35; $p<0.001$) and multivariate regression analysis (OR: 5.83; CI: 4.04-8.39; $p<0.001$).

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9. 35 to 44 year old respondents had significantly higher odds of using telemedicine as compared to other age groups, both in univariate (OR: 2.94; CI: 2.40-3.61; p<0.001) & multivariate regression analysis (OR: 1.45; CI:1.16-1.81; p=0.001). Compared to younger respondents, older respondents had significantly lower odds of using telemedicine in unadjusted and covariate-adjusted (55 to 64 years OR: 0.47; CI: 0.38-0.58; p<0.001; 65 to 74 years OR:0.28 CI: 0.21-0.36; p<0.001 and ≥ 75 years OR: 0.28; CI: 0.21-0.38; p<0.001) analysis.
10. Compared to women, men had significantly greater odds of using telemedicine in univariate regression analysis (OR:1.47; CI:1.33-1.62; p<0.001), but the association is lost in covariate-adjusted analysis. (OR: 1.05; CI: 0.94-1.17, p=0.397).
11. Compared to lower income groups, respondents with annual income of $150,000 to $199,999 had significantly higher odds of using telemedicine in univariate (OR: 3.37; CI: 2.63-4.31; p<0.001) and covariate-adjusted regression analysis (OR:1.70; CI: 1.27-2.27; p<0.001). Likewise, those with an annual income over $200,000 had significantly higher odds of using telemedicine in univariate (OR: 3.92; CI:3.10-4.94; p<0.001) and covariate-adjusted regression analysis (OR:1.67; CI: 1.25-2.22; p=0.001).
12. Those with Master's, PhD, Graduate/Professional degree had significantly higher odds of telemedicine usage as compared to respondents with high school, college, and associate/bachelor's educational attainment, in both univariate and multivariate regression analysis. After controlling for covariates, the associations between Master's, PhD, Graduate/Professional degree and telemedicine usage remained significant and odds were significantly greater than other educational groups (univariate: Master's: OR: 4.92; CI: 3.53-6.87; p<0.001; PhD: OR: 5.94; CI: 3.42-10.32; p<0.001; Graduate/Professional: OR: 4.87; CI: 3.27-7.24; p<0.001 and multivariate: Master's: OR: 2.81; CI: 1.92-4.11; p<0.001; PhD: OR: 3.32; CI:1.82-6.06; p<0.001; Graduate/Professional: OR: 2.65; CI:1.70-4.14; p<0.001).
13. After controlling for covariates, urban and suburban residents as compared to rural residents had significantly higher odds of telemedicine usage. Suburban: univariate OR: 1.36; CI: 1.19-1.54; p<0.001 & multivariate OR: 1.26; CI :1.10-1.45; p=0.001. Urban: univariate OR: 2.47; CI: 2.16-2.84; p<0.001 and multivariate OR: 1.49; CI :1.27-1.74; p<0.001.
14. Telemedicine usage had no significant association with ethnicities except for Hispanics where the odds of telemedicine usage decreased significantly in univariate (OR: 0.84; CI: 0.74-0.96; p=0.009) and covariate-adjusted regression analysis (OR: 0.82; CI: 0.70-0.97; p=0.017).
15. The odds of satisfaction with both live video and live phone were greater for younger respondents as compared to older in both univariate and multivariate regression analysis. The highest odds of satisfaction with live phone call use were found in middle age groups, both in univariate and covariate-adjusted regression analysis (35 to 44 years OR: 2.08; CI:1.43-3.02; p<0.001; 45 to 54 years OR: 2.17; CI: 1.48-3.18; p<0.001 & 55 to 64 years OR: 2.11; CI:1.43-3.12; p<0.001).
16. Compared to rural & suburban respondents, urban respondents had higher satisfaction with video visits in regression analysis. (Univariate OR: 2.39; CI:1.72-3.31; p<0.001; multivariate OR: 1.43; CI:0.99-2.05; p=0.05). Regarding phone visits, urban residents had greater odds of satisfaction in univariate analysis but the association was lost in covariate-adjusted regression analysis (univariate OR:1.61; CI: 1.23-2.11; p<0.001; multivariate OR: 1.29; CI: 0.96-1.73; p=0.09).
17. The odds of satisfaction with using live video were significantly greater in higher-income groups in both univariate and covariate-adjusted regression analysis, with the odds being highest in respondents having ≥ $200,000 annual income in unadjusted analysis (OR:6.31; CI: 3.56-11.16; p<0.001) and after adjusting for covariates (OR: 2.85; CI:1.45-5.59; p=0.002). The odds of satisfaction for live phone call use also increased significantly as income increased, the odds being highest in respondents with annual incomes over $200,000 (univariate: OR: 4.31; CI: 2.71-6.86; p<0.001; multivariate: OR: 2.30; CI:1.32-3.98; p=0.003).
18. Respondents identifying as white had higher odds of satisfaction with live phone call in univariate analysis, but the association was no longer statistically significant in covariate-adjusted regression analysis, while Asian respondents had significantly lower odds of satisfaction in univariate regression analysis (OR: 0.63; CI: 0.45-0.90; p=0.01) with a trend towards lower odds in covariate-adjusted regression analysis (OR: 0.70; CI: 0.48-1.02; p=0.06). Likewise, white respondents had significantly higher odds of satisfaction with live video use in univariate analysis but the association was no longer significant in covariate-adjusted regression analysis.
19. The odds of women not accessing telemedicine were significantly greater in univariate analysis (OR:1.47; CI: 1.34-1.62; p<0.001), but the association was no longer significant in multivariate regression analysis (OR:1.00; CI:90- 1.11; p=0.96).
20. The odds of not using telemedicine were significantly higher in older age groups, both in univariate and multivariate regression analysis (55 to 64 years, univariate: OR: 1.32; CI:1.10-1.58; p=0.002; multivariate: OR: 2.57; CI: 2.07-3.18; p<0.001; 65 to 74 years, univariate: OR:1.48; CI:1.23-1.78; p<0.001; multivariate: OR:4.48; CI: 3.39-5.93; p<0.001 and ≥75 years, univariate: OR: 1.50; CI:1.20-1.87; p<0.001; multivariate: OR: 4.83; CI: 3.53-6.60; p<0.001).

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21. Odds of not using telemedicine decreased significantly as income increased in both univariate and multivariate regression analysis ($100,000 to $149,999 univariate: OR: 0.44 ; CI: 0.37-0.52; p<0.001; multivariate: OR: 0.70; CI:0.56-0.87; p=0.001; $150,000 to $199,999 univariate: OR: 0.30; CI: 0.23-0.38; p<0.001; multivariate: OR:0.60; CI:0.44-0.80; p=0.001 and ≥ $ 200,000 univariate: OR: 0.26; CI: 0.20-0.32; p<0.001; multivariate: OR: 0.61; CI: 0.46-0.82; p=0.001).
22. Urban and suburban residents, as compared to rural respondents, had lower odds of not using telemedicine in unadjusted and covariate-adjusted regression analysis (Suburban - univariate: OR: 0.74; CI: 0.65-0.84; p<0.001 and multivariate: OR: 0.79; CI: 0.69-0.91; p=0.001. Urban- univariate OR: 0.40; CI: 0.35-0.46; p<0.001; multivariate:OR: 0.67; CI: 0.58-0.79; p<0.001).
23. The odds of not using telemedicine decreased significantly with an increasing number of prescription drugs in univariate and covariate-adjusted regression analysis (10-12 prescription drugs - univariate OR: 0.12; CI: 0.08-0.19; p<0.001; multivariate: OR: 0.10; CI: 0.06-0.16; p<0.001. 1-3 prescription drugs - univariate OR: 0.32; CI: 0.28-0.35; p<0.001; multivariate: OR: 0.34; CI: 0.30-0.39; p<0.001).
24. Univariate regression analysis (OR:1.19; CI: 1.05-1.35; p=0.009; multivariate regression analysis (OR:1.20; CI:1.02-1.41; p=0.025).
25. 1: Health metrics include weight, heart rate, blood pressure, medications, physical activity, food/diet, sleep, blood sugar, and other. 2: Analog tracking methods include paper journals or logs, and mental tracking. 3: Digital tracking tools include apps, wearables, connected devices, and digital journals. Source: Rock Health Digital Health Consumer Adoption Survey (n2020 = 7980; 2019 = 4,000; n2018 = 4,000; n2017 = 3,997)
26. Percentage of group owning a wearable: **Area description**: rural=28%, suburban=36%, urban=58%. **Income**: <$35K=28%. $35K-74K=35%. $75K-149K=50%. $150K+=73%. Age: 18-34 years old=53%, 35-54 years old=57%,55+ years old=21%. **Gender**: man=49%, woman=36%, non-binary and prefer not to disclose: 41%. **Chronic condition**: chronic condition=46%, no chronic condition=38%. **Education**: high school grad and less than high school: 28%, some college, no degree: 28%, associate's degree and bachelor's degree: 41%, graduate or professional degree, masters or PhD=69%.
27. Respondents were able to select multiple reasons for how they were using their wearable.
28. Percent of respondents who stopped using a wearable for one or more purpose: 35-54 year olds (20% vs. 57% of 18-34 year olds and 66% of 35-54 year olds), men (64% of men vs. 42% of women), urban respondents (69% of urban vs. 38% of rural and 40% of suburban), higher-income individuals (68% of $150K+ vs. less than 55% for all other income groups), and those with chronic conditions (62% of those with chronic conditions vs. 39% of those without chronic conditions).
29. Average level of trust in all entities: **Age**: 18-54 year olds (cumulative)=3.46. 55+= 3.16 (10% higher). **Gender**: Men=3.48, Women=3.23. Non-binary / prefer not to disclose=2.97 (men 8% higher than women). **Area description**: Urban=3.56. Rural and suburban (cumulative)= 3.22 (urban 10% higher).
30. **Age**: Odds of data sharing with physicians were significantly higher in older as compared to younger respondents, both in univariate and multivariate regression analysis (55 to 64 years, univariate: OR: 4.28; CI: 3.46-5.29; p<0.001; multivariate: OR: 3.25; CI: 2.56-4.11; p<0.001; 65 to74 years univariate:OR: 8.68; CI:6.61-11.4; p<0.001; multivariate: OR: 6.55; CI:4.65- 9.23; p<0.001; ≥ 75 years: OR: 10.1; CI: 6.88-14.9; p<0.001; multivariate: OR:7.83; CI: 5.02-12.2; p<0.001). **Gender**: Compared to men, odds of data sharing with physicians were significantly higher in women (univariate OR: 1.74; CI: 1.58-1.92; p<0.001; multivariate: OR:1.46; CI:1.30-1.65; p<0.001). **Area description**: Compared to rural, odds of data sharing with physicians were significantly lower in urban residents in univariate (OR: 0.37; CI: 0.32- 0.43; p<0.001) and multivariate regression analysis (OR:0.71; CI: 0.60-0.85; p<0.001). **Ethnicities**: Compared to non-whites, odds of data sharing with physicians were significantly higher for white respondents both in univariate (OR:1.74; CI:1.57-1.93; p<0.001) and multivariate analysis (OR:1.35; CI: 1.18-1.53; p<0.001). **Doctor visits:** After adjusting for covariates, those with more doctor visits per year (as compared to less) were associated with greater odds of data sharing with physicians. For >10 visits/year, odds were highest in both univariate (OR: 2.11; CI:1.60-2.77; p<0.001) and multivariate analysis (OR: 3.02 CI: 2.19-4.18; p<0.001). Again for 6-10 visits/year, odds of data sharing with physicians were significantly higher (univariate OR:1.80; CI:1.48-2.20; p<0.001 and multivariate OR:2.17; CI: 1.71-2.77; p<0.001).

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31. **Willingness to share COVID status with a technology company**: Older age groups, as compared to young, had lower odds of willingness to share Covid status with a tech company (45 to 54 years OR: 0.66; CI: 0.51-0.86 and p=0.002; 55 to 64 years OR: 0.58; CI: 0.44-0.76; p<0.001; 65 to 74 years OR: 0.31; CI: 0.22-0.45; p<0.001; ≥ 75 years OR:0.40; CI:0.26-0.62; p<0.001). **Willingness to share COVID status with a government organization**: Older age groups, as compared to the young, had lower odds of willingness to share Covid status with a government organization. Odds of willingness to share decreased more in age groups 65 to 74 years and ≥ 75years (OR: 0.60; CI: 0.45-0.79; p<0.001; OR: 0.60; CI: 0.43-0.84 p=0.003 respectively) than in age group 35 to 44 years and 45 to 54 years (OR:0.70; CI: 0.56-0.87; p=0.002; OR:0.78; CI: 0.62-0.97; p=0.02 respectively) in covariate-adjusted analysis. **Willingness to share COVID status with a physician:** Opposite findings were seen with willingness to share Covid status with physicians and health insurers. Older age groups had higher odds of being willing to share Covid status with physicians (45 to 54 years OR: 2.00; CI: 1.63-2.44 and p<0.001; 55 to 64 years OR: 3.95; CI: 3.16-4.95; p<0.001; 65 to 74 years OR: 6.64; CI: 4.85-9.08; p<0.001; ≥ 75 years OR:9.33; CI: 6.16-14.11; p<0.001) in covariate-adjusted analysis. **Willingness to share COVID status with a health insurer:** Compared to younger respondents, older age groups had significantly higher odds of being willing to share Covid status (45 to 54 years OR:1.16; CI:0.96-1.41; p=0.12; 55 to 64 years OR: 1.57; CI:1.29-1.90; p<0.001; 65 to 74 years OR:1.56; CI:1.22-1.99; p<0.001; ≥ 75 years OR:2.27; CI:1.71-3.02; p<0.001) in covariate-adjusted analysis. **Willingness to share COVID status with a pharmacy:** Compared to younger respondents, older respondents had higher odds of being willing to share Covid status with pharmacists in univariate analysis, but the associations were no more significant after controlling for covariates. **Willingness to share COVID status with an employer**: Older age groups, as compared to younger age groups, had significantly lower odds of willingness to share Covid status with an employer in covariate-adjusted analysis (35 to 44 years OR: 0.71; CI: 0.58-0.87; p=0.001; 45 to 54 years OR: 0.75; CI: 0.62-0.91; p=0.004; 55 to 64 years OR: 0.70; CI: 0.58-0.86; p<0.001; 65 to 74 years OR: 0.40; CI: 0.30-0.52; p<0.001; ≥ 75 years OR: 0.35; CI: 0.25-0.50; p<0.001). **Willingness to share COVID status with family members:** Older age groups, as compared to the young, had significantly higher odds of being willing to share Covid status with family members in covariate-adjusted analysis (25 to 34 years OR: 0.72; CI: 0.60-0.86; p<0.001; 35 to 44 years OR: 0.74; CI: 0.61-0.90; p=0.002; 45 to 54 years OR: 1.18; CI: 0.97-1.43; p=0.09; 55 to 64 years OR: 1.62; CI:1.33-1.98; p<0.001; 65 to 74 years OR:1.95; CI:1.50-2.53; p<0.001; ≥ 75 years OR: 2.44; CI:1.79-3.33; p<0.001).
32. Survey question (asked to respondents that answered "a technology company" to the question "which of the following individuals or organizations would you be willing to share your health information with"): Which of the following technology companies would you be willing to share your health information (e.g., your medical records, test results, prescription drug history, doctor appointment times, genetic information, and physical activity data) with? Responses: Amazon, Apple, Facebook, Google, IBM, Lyft, Intel, Microsoft, Samsung, Uber, None of these.
33. Delayed care group defined by those who answered yes to the question: "During this COVID-19 pandemic period, have you delayed or avoided medical care that you would have otherwise sought?".
34. After controlling for covariates, older age groups, as compared to the young had significantly lower odds of delaying medical care.(55 to 64 years: OR: 0.62; CI: 0.51- 0.76; p<0.001; 65 to 74 years, OR: 0.54; CI: 0.42-0.69; p<0.001; 75 years or older: OR: 0.41; CI: 0.31-0.55; p<0.001).
35. Compared to those without chronic conditions, the odds of delaying medical care for those with chronic conditions were significantly higher in unadjusted (OR: 2.07; CI: 1.88-2.82; p<0.001) and in covariate-adjusted (OR:1.92; CI: 1.73-2.14; p<0.001) regression analysis.
36. The odds of delaying medical care were significantly higher in respondents with a mental health condition than those not reporting to have one in both univariate (OR: 1.27; CI: 1.11- 1.46; p<0.001) and multivariate (OR:1.19 CI: 1.03-1.38; p=0.02) regression analysis.

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