EQUITY RESEARCH

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RBC Imagine™: Imagining the Informed Consumer

It's been more than two years since we published our original *Imagine 2025 – The Consumer Edition* report in which we highlighted the key themes of RBC's flagship Imagine report. In 2020, we saw many of these themes play out to almost extreme levels: a global pandemic that affected the entire world (Escalating Uncertainties); entire industries suddenly having to pivot to meet sudden increases or decreases in demand (Agility Imperative); the largest and most sudden single shift to remote work in history (In Cloud We Trust); and the global collaborative effort to overcome it all (Collective Action).

The pandemic accelerated it all: The pandemic has unquestionably accelerated many trends that had already been occurring for years. The adoption of online shopping, remote working, even pet adoption. Much of the focus (including our own) has been on how much of this sticks and how much reverts once vaccines are fully distributed and we are no longer living under the fear of and restrictions due to the virus. However, we think some of the creative thinking about what comes after has been overlooked or underappreciated while dealing with the immediacy of the pandemic's crises. In this report, we take a look around the corner to start thinking about the Calibrated, Augmented, and Informed Consumer after this is all over.

"From medical to me": Our original 2025 report highlighted the future of customization by discussing a world where products evolve "from mass to me". Indeed, we have seen much of this playing out. What comes next? We have reason to believe that the next theme may be "from medical to me", as the pandemic spurred consumers' existing and growing interest in themselves, their bodies, and their health. We see continued evolution of items out of hospitals and athletics and into the consumer space, such as glucose monitors from diabetics to dieticians and pulse oximeters from operating room to Apple watch.

Knowledge is power, not TMI: Over time, we have seen consumers' interest in knowledge of themselves continue to grow. Thirty years ago, we were learning the ins and outs of DNA in courtrooms, now we are testing our own at home to find out our ancestral makeup and which foods we should be eating. We see consumers becoming less afraid of the nitty gritty of science and we expect this to continue playing out across the consumer space. Indeed, during the pandemic, we saw a step-up in consumer interest in science-focused skincare. After spending a year with science, disease, and medicine as the focus of the global conversation, we expect (relatively) simpler scientific concepts to be less daunting and more interesting to consumers. For example, is the future of performance-tracking fabrics and apparel originally developed to target high-performance athletes now ready for the elderly?

What does it mean for the consumer space? We see several directions and paths for the future of the consumer space. Our space can use advancing technologies in multiple ways, the two most apparent being enhance UX (user experience) or DX (diagnostics). The consumer space can decide to either sit at the end of the evolutionary chain, commercializing technology once it is already far enough along, or be at the start by being the first to innovate its own products (why is Silicon Valley rather than CPG creating the "smart tampon"?).

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Introduction – Giant Leaps for Mankind

Two and a half years ago, we published our original *Imagine 2025 – The Consumer Edition* in which we highlighted the themes of the flagship RBC Imagine report for the consumer space. These themes included The Agility Imperative, The Calibrated and Augmented Self, Collective Action, the AI Race, In Cloud We Trust, and Escalating Uncertainties. We noted in our report that change was accelerating at a dramatic pace, and in 2020, we saw several of these themes play out to almost extreme levels:

The first truly global pandemic in 100 years (Escalating Uncertainties); companies around the world having to instantly deal with an unprecedented increase (or decrease) in demand (Agility Imperative); the largest and most sudden shift to remote work in history (In Cloud We Trust); communities across the world joining together to take on the virus or to tackle systemic racism and violence (Collective Action); and an increased interest in knowing all of the details about one's self and health (Calibrated and Augmented Self).

On conference call after conference call during the last 12 months, we have heard management teams and other experts say that the pandemic only exaggerated, pulled forward, or accelerated trends and changes that were already happening. While the focus (including our own) has so far have been on agility, the change in work, suburbanization, and migration to online, we believe some other deeper and long-running themes have been underappreciated or overlooked.

In this report, we take another look at the Calibrated and Augmented Self and the informed consumer and how we think these themes will continue to evolve in the future as well as their acceleration through or due to the pandemic.

"From Medical to Me" – Another Look at the Calibrated and Augmented Self

In our original *Imagine 2025* report, we highlighted the rise of "from mass to me" (technologies making it easier to customize at scale). Indeed, since then, we have seen the rise of "from mass to me"—and "back to mass"—for one of the examples we highlighted: Function of Beauty shampoo and conditioner. The shampoo and conditioner were custom-created for the user upon filling out an online survey about one's hair needs and preferences, e.g., texture, style, scent. Fast forward four years later, and the brand is now available in Target stores, with various base shampoos as well as a variety of "booster shots" to be added to the base by consumers based on their hair needs.

Exhibit 1: "From mass to me" and "back to mass"

Source: Function of Beauty

We think what may be next in line is "from medical to me". Consumers have been becoming ever more curious about themselves and their bodies—a curiosity accelerated even further by the COVID-19 pandemic—and have become more and more scientifically and data driven. We have already seen some of these trends play out in the transition from standalone product to a feature (another theme we highlighted in our original Imagine report).

Take for, example, the finger pulse oximeter, which measures blood oxygen saturation. The technology for this was developed in the 1930s, originally measuring via the ear, and the first finger pulse oximeter was not commercialized until the 1970s in Japan and the 1980s in the US. Pulse oximeters have been staples in hospitals for decades, having been developed for measuring oxygen during surgery while the use of ventilators during anesthesia became ever more common, and revolutionized the work of anesthesiologists.

The pulse oximeter went from the ORs to the recovery rooms to the primary care office and is now considered a vital sign. Technology advancements continued and portable battery-operated versions have been inexpensive to buy at drug stores and pharmacies for years; however, there was not necessarily ever a strong urgency or high need from the average consumer for these until the COVID-19 pandemic. The UK's largest pharmacy chain, Well

Pharmacy, saw sales of pulse oximeters skyrocket more than 2,000% during the pandemic as healthcare officials globally informed citizens that a low pulse ox was a sign of COVID-19 and that if it fell below a certain threshold consumers should go to hospital.

In certain wearables, e.g., Apple and Samsung smart watches, features such as pulse ox monitoring are already available. While the manufacturers' notes on the devices contain cautions about the accuracy and reliability of their tracking and data (which we expect to improve over time), we expect similar evolutions to take certain products and categories away from being exclusive to the medical realm and into the area of general consumer health, wellness, and personal care.

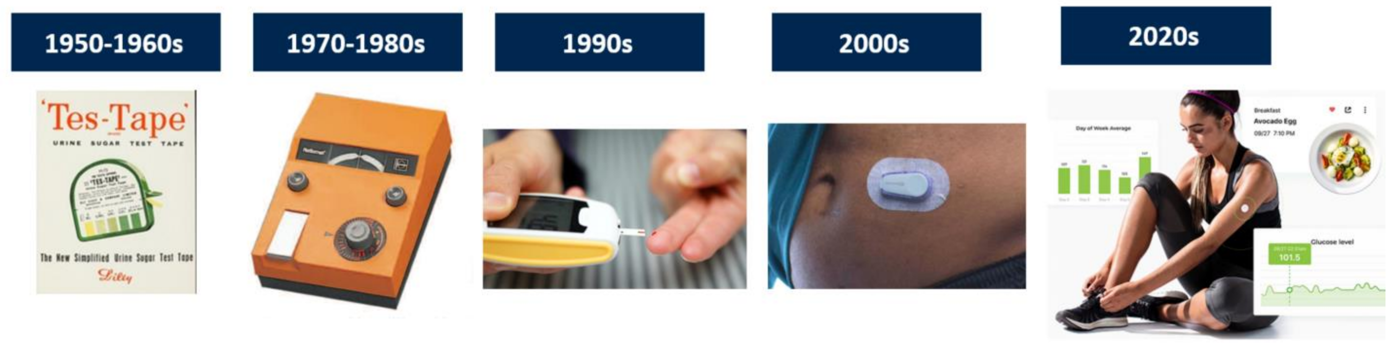
Exhibit 2: From product to feature, the evolution of the pulse oximeter

Source: Wood-Library Museum of Anesthesiology, Walgreens, CNet, RBC Capital Markets

Another area that we see evolving in the cross-section of wearables and medtech is continuous glucose monitors (CGMs). CGMs are wearable devices that monitor blood glucose levels via a small electrode under the skin; data is transmitted from the device to a separate receiver/device. These devices are typically used by T1 and T2 diabetics and replace the traditional finger pricking needed to check glucose levels (in the earlier days, glucose levels were tested via urine test strips). These technologies are much younger than pulse oximeters; the first CGM system was approved by the FDA in 1999. Since the first iteration, they continue to evolve to be worn by users for longer and longer durations (from 72 hours to 14 days, and an implantable version for 180 days) and are also being used in closed loop systems with insulin pumps to develop the artificial pancreas.

Now we are seeing the extension of such devices away from chronic illness management to health/wellness and nutrition. Nutrisense provides a program through which it sends CGMs to users and analyzes the data to show consumers how their bodies respond to food, sleep, exercise, and stress in real time, along with nutrition guidance, and an app for monitoring and reviewing the data.

Exhibit 3: From chronic disease management to the curious and informed consumer

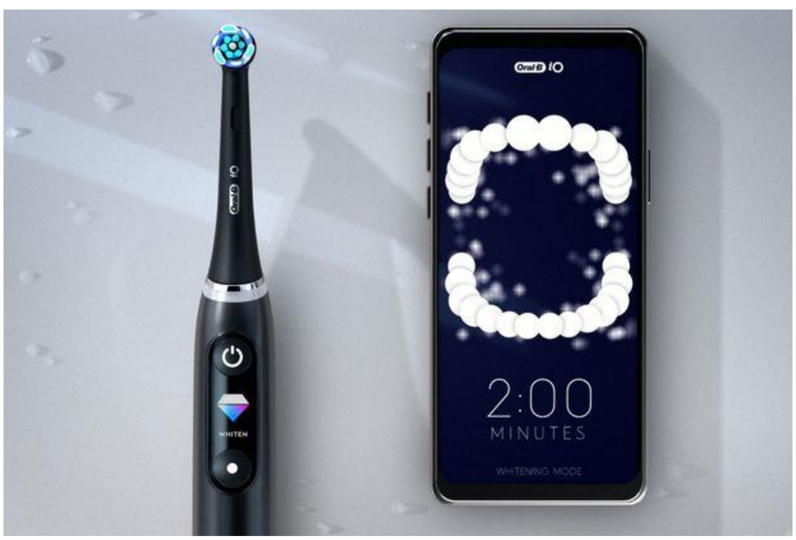


Source: Pennsylvania State University, WebMD, Dexcom, Nutrisense, Google Images

While these programs use CGMs not on a continuous long-term basis the way that diabetics use them, we do see this as an area where consumers are able to obtain vastly more data and information about themselves and their bodies at home.

So far, we have seen most of the innovation around oral care center around bristle shapes and sizes, toothpaste formulations to serve consumer desires (fresh breath, teeth whitening, etc.), and the evolution of the electric toothbrush. The advent of the "smart" toothbrush was inevitable, and we've seen this essentially presented in terms of telling or helping consumers to brush more effectively (Did you miss a spot? Did you not brush long enough? Did you ignore that back molar?).

Exhibit 4: Is this too much or not enough innovation?

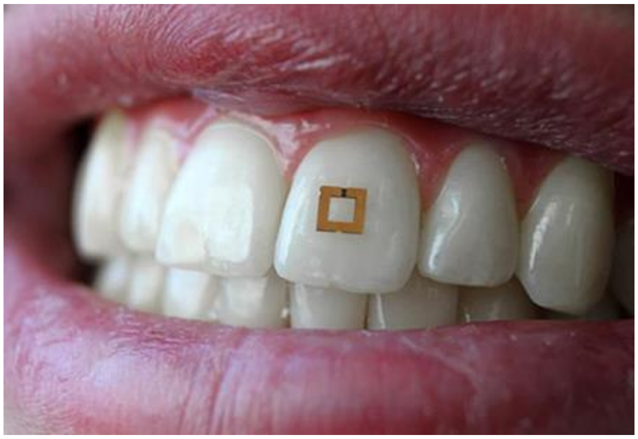


Source: Procter & Gamble

While this may marginally improve user experience, is it too much or not enough innovation? Is this innovation in the right direction? Is there a limit on how much the user experience of something can be improved through technology? Is it time to take the leap toward diagnostics? How much is possible? The table below (see Exhibit 6) from the American Dental Association shows examples of biocomponents detectable in oral fluid, demonstrating just how much free information is floating around in our mouths. Included in this list are viruses, fungi, drugs, and tumor markers.

In our initial *Imagine 2025* report, we discussed a sensor developed at Tufts that could be attached to a tooth, tracking items eaten by a user and emitting the data straight from the mouth. The gadget, 2x2mm wide, was made to be highly sensitive to alcohol, salt, and glucose, sending radio frequencies upon detection. While this has not yet been commercialized, it does provide a glimpse of what could be coming down the pipe as consumers continue to seek solutions for monitoring their health, nutrition, and weight.

Exhibit 5: From chronic disease management to the curious and informed consumer



Source: Tufts University School of Engineering

Exhibit 6: Examples of biocomponents detectable in oral fluid

Biocomponent Class	Examples
Hormones	Cortisol, androgens, estriol, estrogen, progesterone, aldosterone, melatonin, insulin
Cytokines	Interleukins (IL-1beta, IL-6, IL-8), tumor necrosis factor, troponin
Antibodies	IgG, IgA
Proteins/Enzymes	Amylase, pepsin, matrix metalloproteinases, C-reactive protein (CRP), mucins, lactoferrin, antimicrobial peptides
Growth Factors	Epidermal growth factor (EGF), vascular endothelial growth factor (VEGF) insulin-like growth factor
Nucleic Acids	Human and microbial DNA, mRNA, microRNA, tRNA-derived small RNA (sRNA)
Viruses	HIV, HSV-1, HSV-2, EBV, HPV, CMV, VZV, HCV
Bacteria	*P. gingivalis*, *S. mutans*, *Lactobacillus spp*, *T. forsythia*, *E. coli*, *H. pylori*, *M. tuberculosis*
Fungi	*Candida*, *Aspergillus*
Drugs	Anticonvulsants, chemotherapeutic agents (including antibiotics and antineoplastic agents), analgesics, drugs of abuse, ethanol
Metabolites/Electrolytes	Phosphate, calcium, sodium, potassium, glucose, chloride, nitrate, uric acid, amino acids, lipids, carbohydrates
Tumor Markers	CA 15-3, HER2/neu, CA 19-9, p53, leptin, CA 125, alpha fetoprotein, CEA, somatic mutations in tumor suppressor genes, loss of heterozygosity, promoter hypermethylation of genes, microsatellite DNA alterations

Source: American Dental Association

DX vs. UX: Multiple Options for Future of Personal Care

We have seen how new products and services for the everyday consumer can be developed from the healthcare and medical field, but in which direction can personal care go? Should personal care companies wait to be the last in line for technology to evolve (or devolve) into a simplified enough form for an everyday item? Can personal care products evolve or be enhanced as a starting point rather than as an endpoint?

We examine this question through the menstrual tampon. While there is evidence that the history of the tampon dates back thousands of years, the modern tampon with an applicator was commercialized and popularized in the 1940s. Since then, advancements have mostly been around the applicator, absorbency, and materials (which we are not downplaying in importance, as there were major health implications around some of these). But for the most part the tampon of yesteryear is not too dissimilar from the tampon of today—it's cotton, it's got a paper (or plastic) applicator, it's individually wrapped. If it ain't broke don't fix it, but is there more to be done here?

Exhibit 7: Almost 90 years later, the tampon has not changed all that much

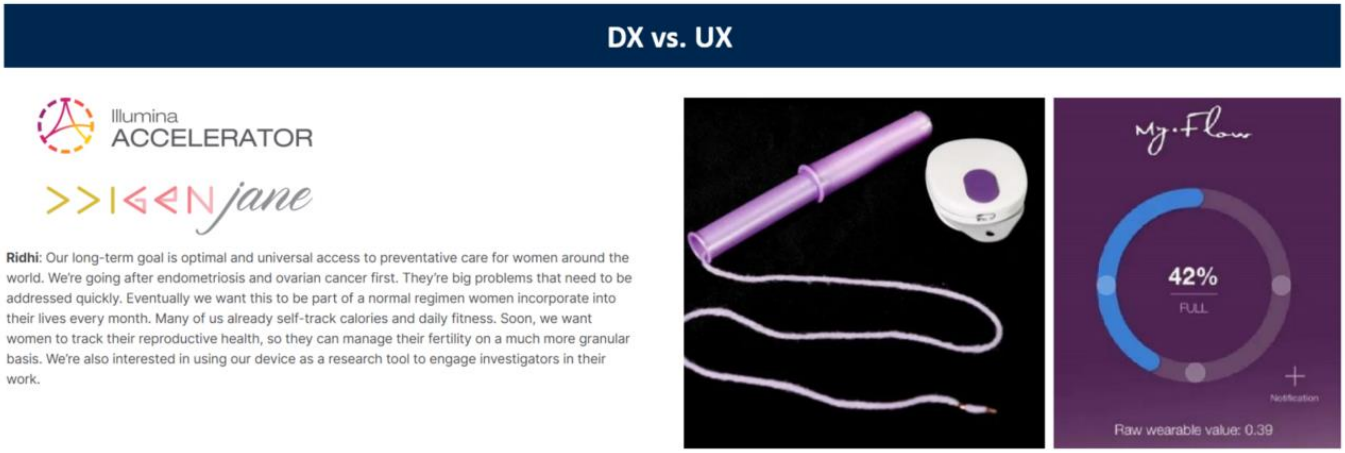
Source: Museum of Menstruation, Procter & Gamble

We are seeing menstrual health products being developed outside the major HPC players, whether around menstruation generally or specifically around tampons. We see these going in two different routes, toward either user diagnostics or improving user experience with their own menstrual cycle.

Take, for example, NextGen Jane and MyFlow—two young companies innovating around tampons in completely different ways. NextGen Jane is taking the diagnostics route, with funding from genomic sequencing company Illumina. The company wants to take a used tampon as a specimen for preventative health, using it to examine the user's reproductive health on an ongoing monthly basis; the company is currently eyeing endometriosis and ovarian cancers as the first targets for its detection goals.

On the other hand, MyFlow smart tampon, which currently has a working prototype, has a much simpler goal: tell the user how full the tampon is. The tampons have conductive threads, which attach to a wearable belt clip; the saturation levels of the tampon are recorded and conveyed to an app on the user's phone. While this seems to fall just short of convenient given the belt clip connection, it is an actual attempt at big leap innovation.

Exhibit 8: Different approaches being taken toward innovating tampons—one diagnostic, one more around user experience



Source: Illumina, MyFlow

While our blood can provide a wealth of data and information, so is something that is much easier to access: our saliva. Though not as revelatory as blood can be, saliva can still tell us a lot. Is this an area where oral care can serve as diagnostics?

Knowledge Is Power…or Is It TMI?

The smart tampon brings us to the next important points about the Calibrated and Augmented Self: curiosity and knowledge. Rather than just a ball of cotton that acts as a plug, a tampon could be a source of regularly provided health information about one's body. In the skincare boom of the pandemic, American consumers began to develop entire multi-step routines, researching skincare chemicals and their own skin types (the more discerning consumers in Asia had already been doing this for years). And while we have been looking at examples of data collection that center around convenience or health, there are some forms of data collection that consumers seek purely out of curiosity (i.e., ancestry kits).

We recently came across news of a Stanford radiologist who has spent the better part of two decades developing a smart toilet. The prototype is more a collection of devices assembled together in a sort of a bidet attachment that can track all sorts of data about consumers with the goal of detecting abnormalities in feces and urine and flagging signs of cancers and other illnesses.

Exhibit 9: Smart toilet being developed by a Stanford radiologist

Source: Nature Biomedical Engineering

At first glance, this may seem like TMI. But then again, colorectal cancer is the third-leading cause of cancer-related death in both men and women in the US. We also note that during the pandemic, surveillance of COVID levels in wastewater data helped epidemiologists get real-time measurements to assess whether the pandemic was expanding or contracting. And given that SARS-Cov-2 can be detected in wastewater/stool samples, would lack of testing not have resulted in a national crisis had something like these smart toilets already been ubiquitous for many years?

We also note that when something moves from a lab or a hospital to the consumer space, its utility may not be immediately apparent or existent. Take, for example, DNA testing. The American public was still mostly unfamiliar with DNA testing in the mid-1990s when it first started garnering attention due to highly publicized/televised criminal trials. Fast forward 30 years and the popularity of at-home DNA testing has soared and become quite commonplace among everyday consumers. Why? What consumer problem does it solve for one to learn they are 5% Eastern European?

Exhibit 10: Our evolving relationship with DNA

Source: Ozy, 23andMe, GenoPlate

The answer is that consumers are simply more curious than ever about themselves. And, with enough time, this has evolved to provide utility—Google “DNA + nutrition” and no fewer than five services are available at your fingertips to provide personalized nutrition based on DNA data from existing or new at-home testing kits.

During the pandemic, we witnessed a dramatic increase in skincare while color cosmetics lagged due to the lack of social occasions, quarantining, and mask wearing. We expect that during this time there was a massive increase in both the wealth of knowledge and curiosity around the underlying science of skincare. While consumers in Asia already had advanced skincare routines and knowledge for years, this was slower in the US/West, which caught up during the pandemic. One manifestation of this was the increased popularity and sales of The Ordinary (recently acquired by Estee Lauder), a *masstige* (mass + prestige) brand of affordable but science-oriented skincare products.

Exhibit 11: Consumers increased their knowledge of skincare science during the pandemic; the charts below are a snippet of what items/ingredients from The Ordinary skincare brand that can/cannot be used together

	Products you can use ✅	Products that conflict ❌
Peptides		
Buffet Matrixyl Argireline	Antioxidants Hydrators & Oils More Molecules Retinol & Retinoid Vitamin C Derivatives	Direct Acids Vitamin C LAA/ELAA
Copper Peptides		
Buffet + Copper Hylamide Sub Q Skin NIOD CAIS NIOD CAIL	More Molecules Hydrators & Oils	Antioxidants Direct Acids Retinol & Retinoids Vitamin C (all)
Vitamin C (Direct)		
L-Ascorbic Acid Powder Vitamin C 23% Vitamin C 30% Ascorbic Acid + Alpha Arbutin	Antioxidants (except EUK 134) Hydration & Oils More Molecules (excl. Niacinamide	Peptides incl. Copper Peptides Niacinamide Serum or Powder EUK 134 Acids Retinol/Retinoids
Vitamin C (Derivatives)		
Magnesium Ascorbyl Glucoside Ascorbyl Glucoside Ascorbyl Tetraisopalmitate Glucoside *Ethylated Ascorbic Acid	Antioxidants Direct Acids Hydration & Oils More Molecules (excl. Niacinamide) Retinol/Retinoids Peptides	Niacinamide Serum or Powder *Niacinamide, Peptides, EUK 134

Direct Acids		
Glycolic Acid Mandelic Acid Lactic Acid 5% & 10% Azelaic Acid Salicylic Acid Salicylic Acid Masque	Antioxidants (except EUK 134) Hydration & Oils More Molecules (excl Nia Powder) Vitamin C Derivatives	Acids EUK 134 Niacinamide Powder Peptides incl Copper Retinol/Retinoids Vitamin C Direct
Antioxidants		
EUK 134	Hydrators & Oils More Molecules Peptides (exc. Copper Peptides Retinol & Retinoids Vitamin C Derivatives	Buffet + Copper Peptides Direct Acids Vitamin C (ELAA & LAA) Resveratrol & Ferulic Acid
Resveratrol & Ferulic Acid	Direct Acids Hydration & Oils More Molecules Retinols & Retinoids Peptides (ex CP) Vitamin C Derivatives	Buffet + Copper Peptides EUK 134
Pycnogenol*	Direct Acids Hydration & Oils More Molecules Retinols & Retinoids Peptides (ex CP) Vitamin C Derivatives	Buffet + Copper Peptides

Source: DeciemChatRoom

The Ordinary’s most popular product, a 30% AHA/BHA peeling solution that went viral on TikTok during lockdown, costs less than $10. We think this is a small glimpse of the future in which even mass and affordable products have a fair amount of science and information about them—and brands will not be shy about the nitty gritty of it, nor will consumers avoid delving into the details.

From Performance to Personal

To get glimpses into the future of the Calibrated and Augmented Self, we also look to the world of sports, where such advancements of technologies sometimes first emerge to enhance or monitor performance. You may already have seen some of these advanced wearables on elite athletes if you have asked yourself why a male athlete was wearing what looked like a sports bra over his jersey during a game.

Exhibit 12: Several brands already offer performance-tracking garments for athletes

Source: Sky Sports

We expect these offerings to continue growing and expanding, especially as home fitness demand soared during the pandemic (Peloton sales grew >150%), as has consumers' curiosity about their own health and bodies. But we are also starting to see the expansion of these technologies beyond performance and into personal care.

For example, Skiin is a new company making performance wearables that include underwear, a sports bra, and a wearable band around the chest. Not only do the garments measure various vitals, they can also be monitored remotely. So rather than being worn by elite athletes, this can be a way to monitor the stats of perhaps an elderly loved one. We expect more innovations to tilt toward the elderly and elder care, as there are already more than 50mm Americans over the age of 65, and this demographic is expected to grow 50% in the next 20 years. According to the AARP, more than 90% of seniors want to stay in their homes as they age.

Exhibit 13: From performance to personal, these garments can track vitals and activity and be monitored remotely by, or sent to, a third party

Source: Skiin

We also imagine and wonder what if these technologies were already ubiquitous and worn by the masses when the pandemic hit? Some of the greatest concerns during the peaks of the pandemic rose when hospitals could not accommodate everyone and had to decide who was admitted, who was sent home, and who could/should go to the hospital and when. Had we all had such monitoring garments at home already, could we have been less worried about elderly family members or other family members living away from home? Could doctors have monitored more of our vitals remotely, sending ambulances when needed rather than waiting for us to determine whether we were sick enough to call?

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