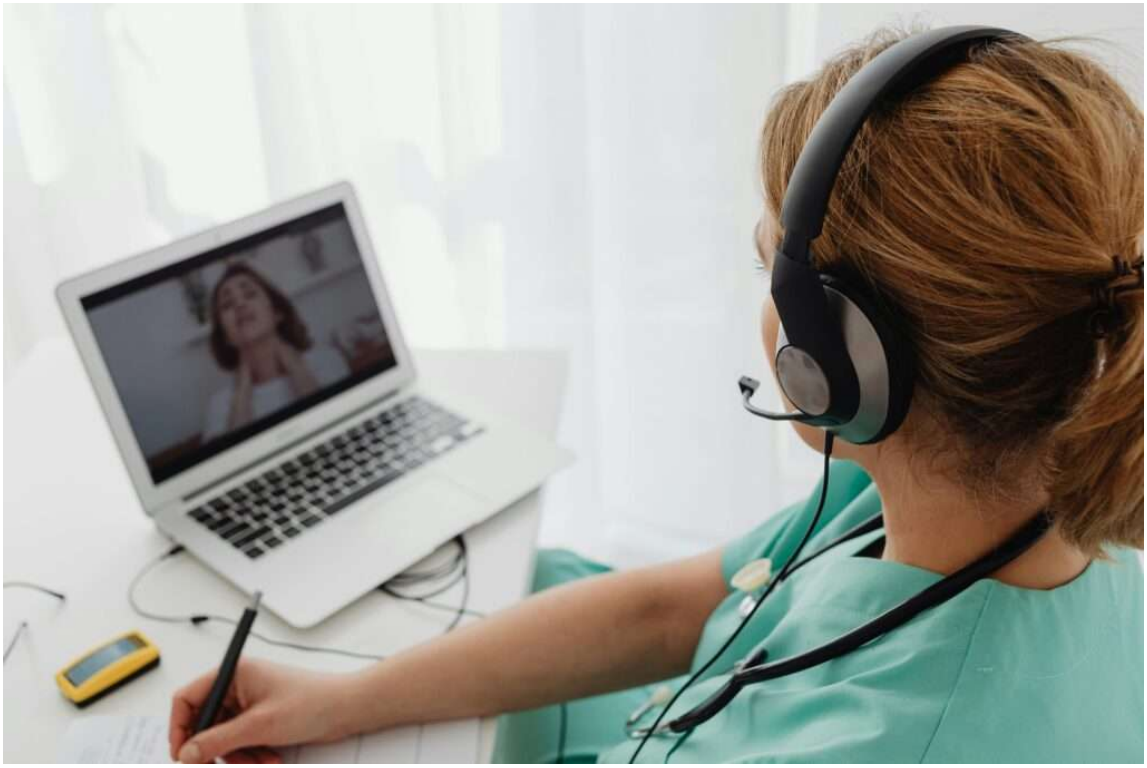
Is Digital Health The Key To A Sustainable Healthcare Future?

Digital health technologies improve health, healthcare services, and well-being. They aid data collection, disease monitoring, risk assessment, and decision-making (Rahimi-Ardabili, Magrabi & Coiera, 2022). Yet, a *digital health paradox* arises when considering the environmental impact of digital health technologies.

Digital health began in the 1960s with electronic health records (EHRs), shifting from paper-based systems to digital platforms. The goal was to improve healthcare efficiency and access. Today, digital health has seen transformative leaps supported by technological developments like AI, blockchain, and machine learning (Abernathy et al. 2022). These advancements aim to deliver better patient outcomes through early diagnosis and mental and emotional support. They offer continuous, personalised care and can reduce in-person medical visits and subsequently, resource consumption.

While digital health enhances efficiency, is it truly the solution to healthcare's sustainability challenges, or is it creating new environmental concerns? Initially, its focus was improving access and reducing strain on traditional systems. Today, sustainability is a key priority—but is sustainability enough? Do we need to aim higher? The concept of thrivability goes further, advocating for a regenerative approach that minimises harm and improves both human and environmental well-being.



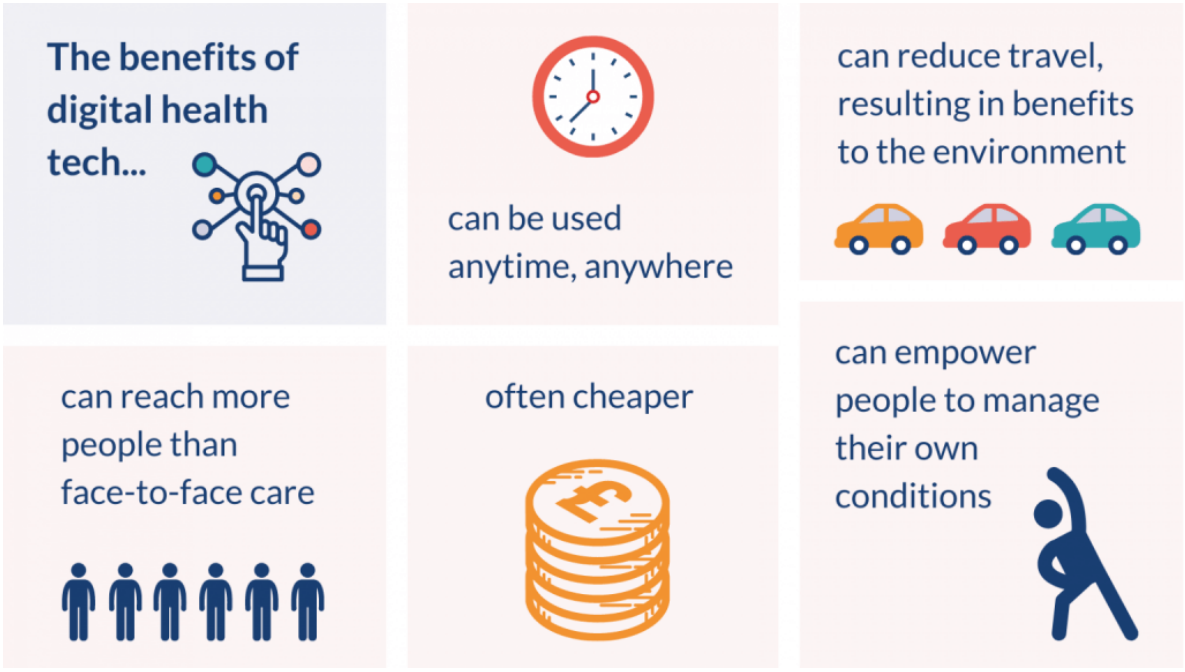
Telehealth services are becoming increasingly common.
Source: Pexels

Digital Health and COVID-19

The COVID-19 pandemic accelerated the adoption of digital health technologies. Telemedicine, electronic health records (EHRs), and AI diagnostics became critical tools in healthcare. These innovations helped reduce hospital congestion and enabled remote consultations. This ensured continuous care access while limiting infection risks.

During the pandemic, telehealth usage increased drastically, resulting in a usage that was 38 times higher than before (Bestsennyy, Gilbert, Harris, & Rost, 2021). The digital health market reached a value of USD$172 billion in 2024, with growth expected to continue (Statista, 2024).

While these innovations helped maintain care access, rapid adoption brought new challenges. The demand for data storage, data integrity, data cleaning, and medical devices has surged. Healthcare infrastructure continues to try to meet the growing need for digital health solutions. This raises a key question: Does the environmental cost of scaling digital health outweigh its sustainability benefits?



Digital Health Technologies can be enormously beneficial to society. Source: NIHR, 2022

The Paradox of Sustainable Digital Health

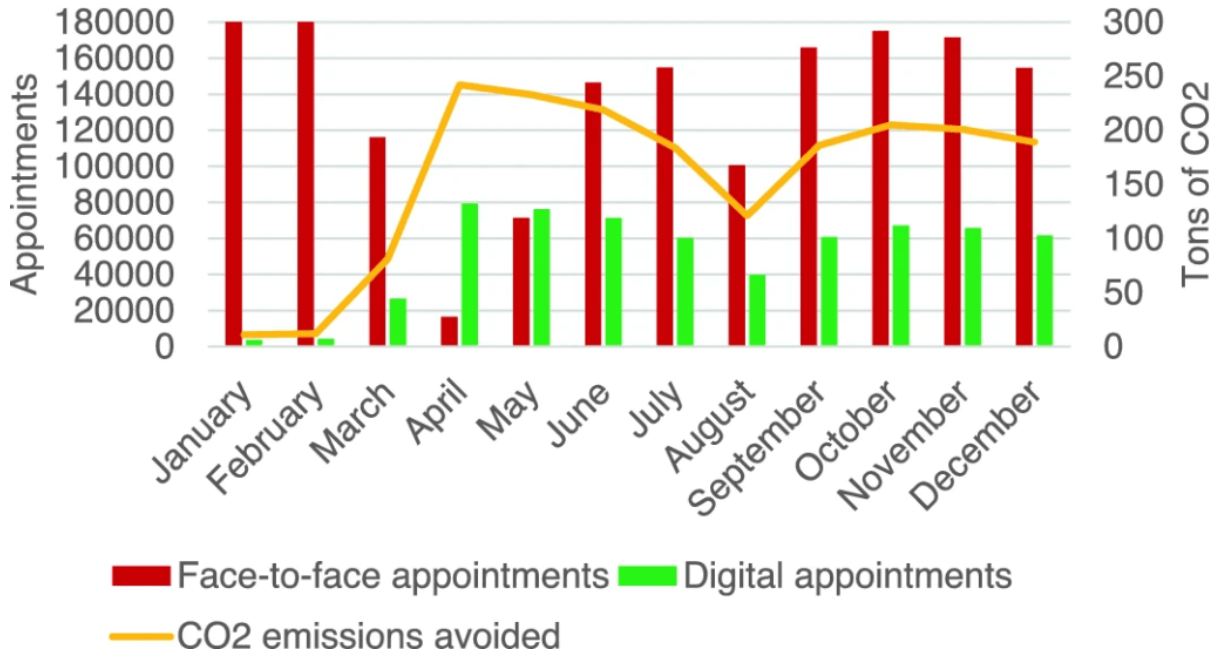
Decarbonising Traditional Healthcare

Digital health has become a powerful tool for improving healthcare access and reducing environmental impacts. Healthcare is responsible for approximately 4.4% of global carbon emissions worldwide (Karliner & Slotterback, 2019). Virtual care has the potential to significantly cut these emissions by reducing the need for travel, decrease hospital resource use, and reduce waste (Sharma et al., 2023).

Additionally, the digitisation of healthcare services through electronic health records (EHRs), e-prescriptions, and digital referrals plays a pivotal role in decarbonising health systems. By digitising workflows, healthcare services reduce paper use, lower emissions associated with physical storage, and streamline administrative tasks. This creates efficiencies that have a positive environmental impact (Serra et al., 2022). These findings suggest that integrating virtual care into healthcare delivery can be an effective strategy for mitigating the sector's environmental impact.

However, digitalisation itself is not without environmental costs and it is essential to assess whether the emissions saved outweigh the energy demands introduced.

While digital health can reduce emissions by cutting down on patient travel, particularly car-based travel, it is far from carbon neutral (Alami et Al., 2023).



Telehealth Appointments in 2020 were estimated to have avoided 1,957 net tons of CO_2 emissions.
Source: Serra et al., 2022

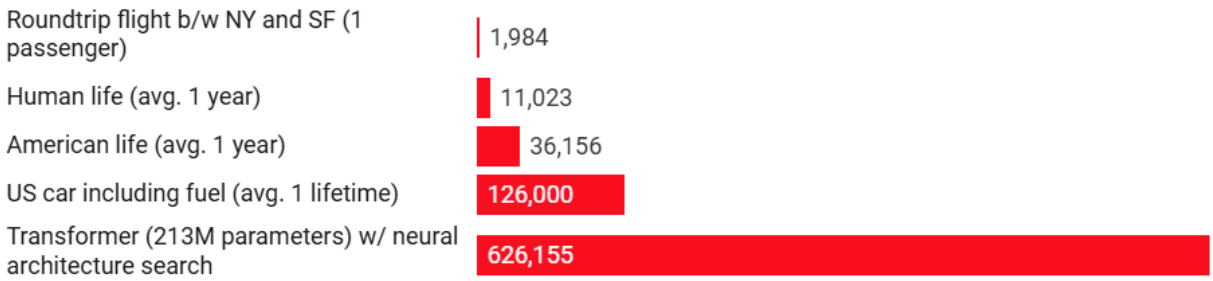
The Big Footprint of the Digital World

The digital industry as a whole is highly energy-intensive and contributes significantly to pollution. Some AI systems produce more emissions than a entire car's lifecycle (Strubell, Ganesh, & McCallum, 2019).

The carbon footprint of digital systems come from multiple factors. These include the energy demands of computing, algorithm training, and the extraction of rare-earth minerals for device production. Additionally, vast infrastructure is needed to support digital services, such as data centers and fiber-optic networks.

Indeed, digital technologies currently account for around 3.4% of global greenhouse gas emissions (GreenIT, 2023). Data centers alone account for nearly 1-1.5% of global electricity use, and this figure is expected to rise as digital health expands (IEA, 2023)

If these environmental costs are not factored into healthcare sustainability strategies, digital health solutions could exacerbate climate change rather than mitigate it.



Common Carbon Footprint Benchmarks in lbs of CO_2 Equivalent **Transformer with neural architecture search refers to an AI model that automatically fine-tunes and improves its own structure.*
Chart Source: MIT Technology Review, Hao 2019.
Data Source: Strubell et al., 2019

Looking Towards a Thrivable Digital Health Future

When comparing emissions from digital health technologies to traditional healthcare, data is still emerging. Studies suggest that while AI-driven healthcare models are energy-intensive, they may still result in lower net emissions than fully in-person care models. This is primarily owing to reductions in travel, hospital energy consumption, and physical resource use (Usher et al., 2024).

Additionally, emerging solutions are being developed to significantly reduce the footprint of AI models themselves. For instance, China's Deep Seek AI model operates with up to ten times lower energy consumption than earlier AI models (NYTimes, 2025). Similarly, advances in energy-efficient computing are making digital health solutions more sustainable (Open Medscience).

Addressing the environmental impact of digital health technologies requires a balanced approach that maximises benefits while mitigating the carbon footprint. A key strategy is improving the energy efficiency of digital health infrastructure. Optimising data center operations through renewable energy sources, advanced cooling technologies, and energy-efficient hardware can significantly reduce emissions. For example, some cloud service providers are already shifting to carbon-neutral data centers powered by wind and solar energy (IEA, 2023)

Additionally, sustainable design principles in digital health technologies can minimise resource consumption (Pazienza et al., 2024). This includes developing software that requires less computational power, extending the lifespan of digital

devices, and implementing circular economy practices such as recycling and reusing electronic waste (Lokmic-Tomkins et al., 2022). Ensuring that digital health solutions prioritise low-energy computing and energy-efficient AI models will be critical in this transition. Policymakers and healthcare leaders must also prioritise green digital strategies. This includes sustainability standards for health IT systems and creates incentives for eco-friendly innovations (Filho et al., 2024).

Examples of DHT	Redesign considerations	Examples	Outcomes
Wearable technologies and electronic devices	• Develop eco-friendly products using sustainable design principles • Choosing and sourcing sustainable, recycled and biodegradable materials and environmentally sustainable manufacturing processes • Develop facilities to manage recycling or repurposing of digital devices to prolong their use	• RecycleHealth (www.recyclehealth.com) collects used activity trackers and then provides them to underserved populations[9]	• Reduction of the global impact of electronic waste through principles of circular economy and climate justice • Minimisation of electronic waste toxic emissions and associated health risks • Reduction of CO_2 emissions during the manufacturing process
Digital infrastructure (computer networks and computer systems powering DHTs, the emissions generated by data storage and transfer)	• Use frameworks that support health technology assessment (eg, life-cycle assessment of the technology, environmentally extended input-output analysis, and comprehensive environmental assessment) to select the most environmentally sustainable DHT infrastructure[5,10] • Design data centres whose energy efficiency is driven by heat and power systems • Create dashboards to monitor CO_2 emissions and identify processes where the CO_2 emissions can be further reduced[10]	• Energy star-certified energy-efficient hardware and data centres, server virtualisation, multipurpose devices (eg, products that combine printing and scanning functions)	• Consumers get a choice on DHTs assessed for environmental impacts on climate change, and toxicological impact on human health and ecosystems during the products' life cycle • Health care systems can monitor their CO_2 emissions and develop health informatics-driven processes to reduce CO_2 emissions[10]

Reducing carbon dioxide emissions in digital health technologies: Actionable Examples.
Source: Lokmic-Tomkins et al., 2022

Moreover, integrating digital health solutions should be done with careful planning to prevent unnecessary digital expansion. Not all healthcare interactions need to be digitised. Maintaining a hybrid model where in-person and virtual care complement each other can help balance environmental trade-offs. By considering sustainability at every stage, from development to implementation, digital health can evolve into a truly climate-conscious solution for the future of healthcare.

Policy Frameworks to prioritise the environment

To realise the potential of digital health in a sustainable manner, robust policy frameworks are essential. Policymakers must prioritise the environmental impact

of digital health alongside its efficiency and accessibility. Without proper regulation, digital health risks becoming an unchecked source of emissions rather than a sustainability solution.

Global and Regional Approaches to Sustainable Digital Health

Currently, some nations have started to implement regulations and incentives aimed at reducing the carbon footprint of digital health technologies. In the European Union, for example, the European Green Deal emphasises a sustainable digital transformation. It calls for significant reductions in carbon emissions across sectors, including healthcare. One of the key strategies involves decarbonising digital infrastructure. This includes promoting energy-efficient data centers and the use of renewable energy sources. The EU Digital Strategy, aligned with the Green Deal, lays out a roadmap for integrating sustainability into digital technologies. It urges member states to incorporate environmental considerations into their digital health initiatives (European Commission, 2020).

In the U.S., policy discussions surrounding digital health have largely focused on improving access to telemedicine and EHRs. However, there is growing recognition of the environmental costs of data storage and cloud services. Policymakers have begun considering how incentives for clean energy can be extended to digital health providers. For example, tax breaks are being offered to healthcare institutions that implement green technologies in their digital health platforms (DMCPAS, 2022). Incentivising the adoption of carbon-neutral digital infrastructure is a crucial next step in making digital health more sustainable.

Furthermore, international organisations like the World Health Organisation (WHO) and the United Nations are pushing for greater integration of environmental sustainability into healthcare systems. Their Sustainable Development Goals (SDGs), particularly Goal 3 (Good Health and Well-Being), Goal 13 (Climate Action), and Goal 12 (Responsible Consumption and Production), provide a framework for integrating health and sustainability. SDG12 calls for reducing waste and improving the efficiency of resource consumption. This aligns with the push for sustainable digital health technologies that minimise environmental harm while enhancing healthcare services (United Nations, 2015).

As the digital health industry continues to grow, it will be critical for governments

to develop policies that ensure this growth does not come at the expense of the planet. Policymakers must establish clear regulations and offer incentives for digital health technologies to meet sustainability standards. This will drive the sector toward greener, more sustainable solutions.

From Sustainable to thrivable

For digital health to be sustainable, it must go beyond reducing emissions. Early evidence suggests virtual care lowers some environmental impacts. These include travel emissions and hospital resource use. However, overall sustainability depends on how digital health is designed, scaled, and powered. Instead of only minimising harm, digital health must create a regenerative system. It should balance healthcare benefits with environmental stewardship.

THRIVE's Systemic Holistic Model provides a structured way to assess digital health, industry practices, and their effects on society and the planet. Instead of treating sustainability as a fixed goal, THRIVE supports long-term strategies for planetary and human well-being.

A key part of this approach is recognising materiality and finite resources. These factors impact business practices and the broader environment. In digital health, materiality means considering both benefits and hidden environmental costs. These include production, use, and disposal of digital health technologies. It also includes rare-earth mineral extraction, data center energy consumption, and electronic waste. Finite resources remind us that Earth's supplies are limited. They cannot be used endlessly. A thrivable system ensures sustainability efforts keep up with digital health expansion.

Integrating THRIVE's Systemic Holistic Model helps digital health become truly sustainable. Thrivability goes beyond sustainability by ensuring healthcare and the environment flourish together.

Conclusion: Balancing Innovation with Thrivability

The conversation around sustainability in digital health is still evolving. Virtual care has clear potential to reduce emissions from travel and hospital operations,

but its long-term sustainability depends on how digital infrastructure is managed. Without careful planning, the energy demands of AI, data storage, and digital services could undermine the environmental benefits of virtual healthcare.

This is why a forward-thinking approach—one that goes beyond sustainability toward **thrivability**—is crucial. By designing energy-efficient digital solutions, prioritising sustainable infrastructure, and integrating environmental assessments into health innovation strategies, we can ensure that digital health truly delivers on its promise.

What happens next will determine whether digital health becomes a long-term solution or an unintended burden on planetary health. By acknowledging both the opportunities and challenges, we can guide digital health toward a future that is not only sustainable but truly thrivable.

At THRIVE, we envision a future where sustainability and healthcare is not the end, but only the beginning. We research, educate and advocate for a world *beyond sustainability*. Dive into our blogs, podcasts and webinars for fresh insights from experts, and subscribe to our newsletter for the latest updates on systemic innovation and sustainable change. Stay connected and be part of the movement toward a truly Thrivable future.