Disease Control Using Technology

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***Abstract*— Most of people using small scale Tech to high technology for controlling disease like below machines. Please check below daily uses small technologies machine▼**

1. ***Smart watch***
2. ***Pulse oximeter***
3. ***Glucometer***
4. ***Digital thermometer (ETC)***

This all above Technologies using at home for pre-cautions of diseases (Controlling for disease) And we know about High technologies for disease control and therapy's technologies in 2022 German technologies are best for therapy. After covid 19 , in daily life we using pulse oximeter , body temperature ETC for checking our basic health using technology. Now we can also check chronic diseases using high tech machine technologies like MRI CTSCAN and we cure using Therapy technologies. That's how technologies can control diseases.

I. INTRODUCTION

The current crisis underscores the societal urgency to tackle the growing public-health problem represented by chronic diseases. The failure of efforts to contain them has been a result of a complex morass of medical, behavioural, and socioeconomic factors that have proven difficult for traditional health-care delivery models to address. A solution here will require a bold rethinking of traditional models of health-care delivery that should incorporate new digital health-care solutions.

1.1 Smartwatches and Healthcare:

Wearable devices smartwatches are quickly becoming indispensable technologies in the healthcare industry. For patients, smartwatches can monitor your heart rate, sleep habits, and physical activity. For doctors, patients can then take that information and share it with your physician to gain valuable insight around your health to make alterations that could improve your overall well-being.

Smartwatches also improve your well-being by giving you access to apps designed around specific health conditions like diabetes. They also grant you access to tons of fitness, dieting, and mental health apps that encourage us to maintain a healthy lifestyle more conveniently than ever. Here are four ways smartwatches are improving our health.

1.2 Digital thermometer:

Digital thermometer Digital thermometers work by using heat sensors that determine body temperature. They can be used to take temperature readings in the mouth, rectum, or armpit. When assessing digital thermometer readings, keep in mind that armpit (axillary) temperature runs about ½ to 1°F (0.6°C) cooler than oral readings.

hermometers allow healthcare professionals to provide accurate diagnosis. Temperature can be measured in various locations on the body which maintain a stable temperature. These include oral, axillary (armpit), rectal, tympanic (ear), or temporal (forehead). A high temperature (over 38°C) usually suggests a fever or illness in a patient.

1.3 Pulse oximeter:

The Pulse Oximeter is a portable, convenient, non-invasive device, used to monitor arterial hemoglobin oxygen saturation (SPO2) and pulse rate. The personal application are adult (weight: >30kg) and pediatric (weight: 20-30kg). Index, middle, and ring fingers are suitable for this device.

1.4 Glucometer:

A glucometer is a hand-held electric device operated by batteries with a display and a slot to insert particular "test strips". When used properly, a glucometer gives the blood glucose value. Previously it was used primarily by persons suffering from Type-1 diabetes, but now it's used by Type-2 diabetes patients as well.

Uses of a Glucometer: To better understand the uses of a glucometer, consider the following instances:

You're a diabetic person taking Insulin injections daily. One night, while sleeping you wake up with pounding heart beats, profuse sweating and generalised weakness. You don't know whether your blood glucose level is high or low. Because, if it's high you'll need to take an extra shot of Insulin (which lowers glucose levels) and if it's low, you'll have to eat a candy or some sugar to save your life.

You're a diabetic and your doctor had advised you to check both fasting and post-prandial (after meal) blood glucose level every day for the next two weeks. Unfortunately, you're living at a locality where a medical laboratory is not easily accessible!

You have someone in your home who is diabetic as well as bed-ridden.

Your wife who is 22 weeks pregnant, has just been diagnosed with gestational diabetes.

You've been a diabetic for the past 10 years and is already suffering from poor vision due to diabetic retinopathy and do not want to take risk with yet another complication of diabetes.

II. BELOW TECHNOLOGIES ARE USING HIGH OR CHRONIC DISEASES, IT'S HELPING CONTROLLING DISEASES.

- CT scan.
- Angiograms.
  Electrocardiogram (ECG).
- MRI scan.
- PET scan.
- Ultrasound scan.
- X-ray.
- Laser Treatment. (ETC)

2.1 What Are Chronic Diseases?

While definitions and taxonomies vary, most agree that chronic disease centres on the need for long-term, ongoing medical attention to avoid a significant deterioration in quality of life. As a result, many of these conditions are practically incurable and become physically and mentally taxing to patients, caregivers, and health-care providers who must work to manage them over a lifetime.

2.2 CT SCAN:

A computerized tomography (CT) scan combines a series of X-ray images taken from different angles around your body and uses computer processing to

create cross-sectional images (slices) of the bones, blood vessels and soft tissues inside your body. CT scan images provide more-detailed information than plain X-rays do.

A CT scan has many uses, but it's particularly well-suited to quickly examine people who may have internal injuries from car accidents or other types of trauma. A CT scan can be used to visualize nearly all parts of the body and is used to diagnose disease or injury as well as to plan medical, surgical or radiation treatment.

2.3 MRI :

Chronic-disease-management programmes, incentives for preventative care, and long-term patient-centered care models have all emerged as means to tackle the challenges mentioned above. While rigorous studies of these programmes can be difficult to conduct due to widely varying definitions, heterogeneity in providers and patients, and the expense and length of follow up needed, studies that have been published generally (but not always) show significant improvements in health outcomes.

2.4 Laser Treatment.

This consists of utilizing a laser in surgical treatment. In the 1980s and 1990s, they ended up being popular for melting brain tumors. They are said to more accurate than standard methods of cutting, aspirating, or cauterizing growths. Finally, there is evidence that lasers are costly and slow. The long-lasting impact on clients has never been much better, and in many cases even worse.

III. TRADITIONAL CHRONIC-DISEASE EFFORTS ARE DIFFICULT TO SCALE

Chronic-disease-management programmes, incentives for preventative care, and long-term patient-centered care models have all emerged as means to tackle the challenges mentioned above. While rigorous studies of these programmes can be difficult to conduct due to widely varying definitions, heterogeneity in providers and patients, and the expense and length of follow up needed, studies that have been published generally (but not always) show significant improvements in health outcomes.

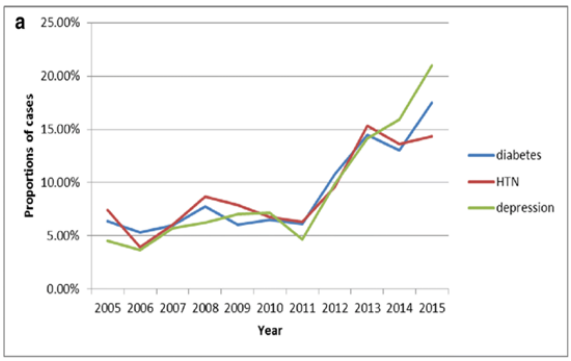
Unfortunately, the results have been mixed as to whether or not these programmes deliver significant net savings (after accounting for the cost of the programme) to the health-care payer. While findings vary, the mixed results have been primarily attributed to the substantial challenges of delivering interventions which can arrest or reverse disease progression and the challenges of deploying preventative measures across a broader, healthier population. These mixed results cast doubt on the ability to sustainably apply these programmes over a broader swathe of the population to manage the rising tide of chronic illness. As a result, it is vital to understand the core challenges and how to address them. Among the most important factors contributing to financial sustainability are:

- Limited and costly provider time: Most health systems rely on relatively highly-paid, highly-trained labour in the form of nurses and physicians. While provider involvement is necessary to ensure quality of care, directing their limited bandwidth to additional tasks related to patient monitoring, follow up, and care organisation presents both significant financial costs as well as opportunity costs (in the form of patients not treated or seen) for a health-care system, especially given the growing administrative burdens faced by providers everywhere.
- Lack of visibility into care gaps: Lack of information on which chronic disease patients are most in need of which interventions makes it difficult for health systems to prioritise interventions. This can result in simultaneously overinvesting in care with marginal benefit while

also underinvesting on interventions in patients where they are most needed.

- Complexity of care coordination: Given multimorbidity and the potential need to involve clinical social work as well as regular patient follow up to achieve sustained behaviour change, care coordination is of paramount importance in treating chronic disease patients. However, many clinical workflows and tools were tailored for acute care and not necessarily optimised for long-term multi-team member collaboration and follow-up.
- Insufficient personalisation: Effective management of chronic disease patients over years requires interventions to be tailored to personal context. This should involve granularly tracking key biomarkers, self-reported measures of pain and mood, and patient adherence to medication and lifestyle changes so that care teams can intervene when needs and circumstances change.
- Inconvenient patient experience: The "health-care user experience" for chronic-disease patients extends beyond simple provider "bedside manner" to longer-term interactions with all aspects of health-care and disease management. As a result, patient friction (even minor things like the time to get to and wait in line for a pharmacy, or the need to make a phone call to get something done) has a disproportionate impact on chronic-disease patients.

Trends for the three chronic diseases represented as three broken line graphs.



Leveraging Technology to Scale Effective Chronic-Disease Management and Prevention

New digital technologies present potential solutions to many of these issues. The same technologies that have successfully catalysed transformations in product offerings and operational efficiency in other industries can be applied to managing and preventing chronic illness. While still in its early stages of adoption, applying digital technology to chronic disease management has a proven track record. Kaiser Permanente, a well-regarded American health system, piloted an initiative it has termed "leveraged primary care" for complex chronic-disease patients. The model pairs traditional health-care providers with a combination of lower cost, non-provider medical assistants who take on more of the day-to-day tasks around patient management; wearable devices for patient monitoring; predictive analytics to prioritise patients for follow up; automated patient reminders for preventive care; pharmacist involvement for medication management; and video telemedicine. Executives at Kaiser saw not only improved outcomes (40 per cent fewer hospitalisations, significantly better control of hypertension than the US national average, and a 40 per cent-plus lower chance of dying from heart disease than the US national average), but also improved financial performance (improved operating profit margins). Similar pilots were run at a number of American primary care organisations that are smaller and less-integrated than Kaiser Permanente which reported similar benefits in outcomes and costs, suggesting intelligent use of new digital technologies can help successfully and cost-effectively scale chronic-disease management.

Predicting and Identifying Patient Care Gaps

Predictive analytics, powered by advances in data infrastructure, machine learning and artificial intelligence, and analytics tooling, have enabled dramatic operational improvements across many industries. Industrial company Shell utilises predictive analytics to optimise its $1 billion-plus spare-parts inventory to ensure better uptime for its globally distributed operations. The credit-card industry has been utilising analytics technology since 1992 to predict which credit-card transactions are more likely to be fraudulent.

Similar methods can be applied to managing chronic illness. Predictive analytics applied to patient medical records, medical payment information, medical

guidelines, and other available data can identify which patients are not being managed well or are most likely to progress to advanced chronic disease, across populations and datasets too large for manual review. This can be sometimes as simple as applying basic demographic and procedure code checks to identify patients overdue for preventative screening, to more complex applications of clinical guidelines and machine-learning algorithms. This allows limited medical resources to be deployed effectively on care which delivers the highest impact, preventing cost-ineffective interventions where they are unnecessary.
Companies like Prealize Health have developed models which can help providers and health-insurance companies predict which patients are at the greatest risk of requiring high-cost care. This allows its customers to automatically prioritise patient outreach efforts. Similarly, companies like HealthPals can utilise reimbursement and electronic medical record data to determine which patients are not being managed according to medical guidelines and what changes in care are necessary to alleviate those care gaps. This can provide clear feedback to providers on which actions need to be taken on which patients to bring them back in line with evidence-based medicine.

Care Coordination and Communication
Software systems have transformed how companies share information and coordinate operations to deliver for their customers. Global hospitality company Marriott, for example, employs customer-service software to provide geographically distributed teams with information on a guest's preferences to make it easier for staff to cater to guests' needs. By providing a history of their interactions with staff, it helps the company follow through 24/7 with commitments across different staff. Digital technologies also allow Marriott to be more responsive by letting staff connect with customers across multiple digital-messenger platforms and to use chatbots to increase efficiency and speed.

Similar approaches can be applied to the challenge of coordinating and communicating care for chronic-disease patients. Software can ensure that care teams, even if they are made up of individuals from different organisations who have never met in person, are aligned on a patient's needs and progress. These plans can be communicated to patients and their caregivers with feedback on a patient's progress relayed to the appropriate members of the care team. Given the long-term and multi-specialty, multi-provider nature of chronic-disease management, even incremental improvements in coordination here can pay dividends over the long term.

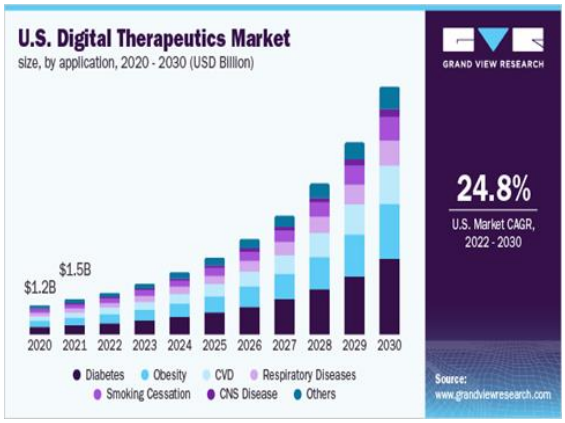
Companies like Careteam are bringing collaboration tools that modern enterprises use (task coordination, notifications and reminders, team messaging, etc.) to a health-care setting to improve patient-care coordination. Other companies are focused on facilitating the involvement of non-traditional providers. Unite Us, for example, has developed software to identify patients with socioeconomic issues that can impact their disease management and helps health-care providers work with social services. Still other companies are applying care coordination and communication to specific diseases. Cricket Health, for instance, focuses on chronic kidney disease and works with providers to educate patients about disease management, and involves nurses, dietitians, social workers, mentors and pharmacists to support a comprehensive care plan.

Digital Therapeutics
Leveraging technology to create durable behaviour change is a key priority across many industries. Many consumer technology companies successfully utilise nudges and algorithmic feeds to boost user engagement and monetisation. These methods have also been applied in sectors such as energy. Opower, for instance, works with utilities to help its customers understand how their energy

use compares to their neighbours and, by doing so, has successfully and scalably lowered energy consumption across a utility's residential customer base.

Given the strong role that lifestyle choices such as diet, drug use, physical activity, and medication adherence play in chronic disease progression, applying digitised behaviour change techniques may prove to be as effective as a traditional pharmaceutical product or medical device. This insight has led to the emergence of 'digital therapeutics': software interventions that focus on changing patient attitudes and behaviours to achieve clinical benefits. Because these are less physically invasive than pharmacological or surgical interventions, they can have lower risks and may be better suited for patients who have difficulty making traditional appointments.

Companies like Omada Health and Kaia Health are commercialising protocols using digitised cognitive-behavioural therapy, community support and habit tracking to help patients manage diabetes/pre-diabetes, hypertension, musculoskeletal pain and COPD. Companies like Pear Therapeutics are even seeking regulatory approval for their digital therapeutics to be prescribed alongside or instead of traditional pharmacological interventions for a variety of conditions such as pain, insomnia and certain gastrointestinal conditions.



Consumer-Friendly Monitoring

The boom in smartphone adoption has led to dramatic improvements in cost and quality for internet-connectivity and sensor technology. This has resulted in a remarkable explosion of wearable and internet-connected devices. The resulting data has been a catalyst for operational improvements and new business models. Shipping giant UPS's ORION system utilises data from drivers' Delivery Information Acquisition Devices (DIAD) and vehicle telematics hardware to optimise delivery routes (including favouring right turns over left turns due to time and fuel savings on American roads), identify areas for efficiency, and provide updates to consumers on delivery timing. Similarly, insurance companies like Allstate have begun to leverage connected telematics devices to offer usage-based automotive insurance products, promising lower rates for drivers based on their actual driving behaviour.

These technologies can also be applied to the challenge of monitoring and personalising care for chronic-disease patients. By leveraging simple-to-use smartphone apps and internet-connected devices, providers can gain insight into a patient's vitals and disease progression between clinical encounters. This data enables providers to prioritise follow ups or intervene earlier, if a patient's disease is taking a turn for the worse, and to make that determination without requiring an in-person visit. The data can also improve chronic-disease prevention by letting a care team encourage healthy habits and provide personalised advice on changing behaviour.

Innovative companies are beginning to leverage connected consumer devices to improve disease monitoring. Healthy.io, for example, has developed in-home diagnostics for chronic kidney disease and other conditions which can be read using a smartphone camera and app. Companies have also developed connected devices like Propeller Health's connected inhaler and Carrot's connected carbon-monoxide monitor to help track asthma/COPD and progress towards smoking cessation. The medical field has also begun to appreciate the use of wearable devices with multiple studies showing that photoplethysmographs (optical pulse detection) and ECGs (electrocardiograms) on popular smartwatch platforms can be used as clinical-grade population-scale cardiovascular-health monitors.

Telemedicine

Social-distancing measures in response to the Covid-19 pandemic have dramatically increased the public's acceptance of the internet for conducting many types of business. This has accelerated a trend which in recent years has seen previously completely in-person activities convert to online-only modalities (for example, the ability to now receive an accredited academic degree through an online course platform like Coursera).

Telemedicine, the provision of medical services remotely, holds the promise to dramatically expand access to quality medical care for patients with chronic illness. By making it possible to consult with providers, obtain prescriptions and carry out medical protocols remotely, chronic disease patients can get more responsive care. This can reduce patient friction, something which has a disproportionate effect on chronic disease patients who must manage their diseases over their lifetime. Telemedicine may also alleviate health-system staffing constraints by allowing part-time or geographically distributed providers to participate in disease management.

There has been an explosion of innovation in the telemedicine arena in recent years. This ranges from offering general remote physician consultations like what Teladoc and DoctorOnDemand do. It also includes efforts tailored towards specific chronic diseases and treatment protocols. For example, consumer telemedicine company Ro offers Zero, a smoking-cessation programme that combines remote physician consultations with prescriptions for pharmacological agents proven to help with helping patients quit smoking. Still other companies like Moving Analytics are focused on supporting in-home versions of protocols like cardiac rehabilitation, which have proven to have dramatic impacts on patient outcomes.

The Role of Policy in Supporting Digital Innovation for Chronic-Disease Care

Policy has a central role to play in supporting the digital-health innovations that are needed to help health-care systems manage chronic disease. There are three key pillars for supportive policy for digital health care.

First, policymakers must help regulators and public health-care payers play a more supportive role in adopting new digital innovations. Even in countries where private-health insurance is widely used, public payers play an outsized role in determining which innovations are adopted. As a result, policymakers need to push public payers and regulatory agencies to modernise their frameworks to account for interventions and innovations which do not fit elegantly in traditional buckets of medical capital equipment, pharmaceuticals, diagnostics, medical devices, and procedures. To be clear, this is not a call for lowering of standards of quality and safety, but for recognising how blind adherence to traditional categorisations and rules can create roadblocks for new care modalities and technologies as they have for the US's largest public payer, the Centers for Medicare and Medicaid Services (CMS) when it comes to new digital health technologies.

A modern framework for approaching digital health should also be coupled with a focus on transparency in communicating the rules for how regulators and

payers will evaluate new technologies and set coverage rates. Public payers and regulatory agencies need to learn to shift their role from being primarily a gatekeeper to a more active participant on the design and monitoring of studies conducted by innovators. This helps innovators manage costs and timelines, but also ensures that studies are designed and carried out to collect data that helps advance care. Initiatives like the UK's National Institute for Health and Care Excellence (NICE), in conjunction with the National Health Services (NHS), on communicating evidence standards for digital-health technologies and efforts to conduct studies on digital therapeutics are examples of how transparency and active involvement from government agencies can foster digital innovation.

Second, governments need to modernise their health-technology infrastructure. While success with health-care digitisation varies widely by country, adoption and roll-out of even basic elements of health technology infrastructure such as electronic medical records continues to be a significant challenge for countries like the UK and Germany. Even when basic infrastructure is adopted, it too often blindly mirrors legacy, offline bureaucracy or suffers from poor interoperability. This reduces the utility of digital-health innovation as, without access to patient data, even the most advanced predictive algorithms, health-care apps and care coordination software are little more than fancy ones and zeros.

To support digital innovation, policymakers need to close remaining adoption gaps for basic digital medical infrastructure like electronic medical records and patient portals. These pushes need to be paired with clear guidelines on interoperability and meaningful use to make sure that the technology can have a meaningful impact on care. Rules that protect patient privacy need to be codified, but they should also be complemented with guidelines for how patients can easily authorise use of their data by third parties for research purposes or to provide valuable medical services or applications. Governments should also work with patient advocates, digital innovators, and providers to help define open standards on patient data de-identification and standard tiers of data sharing to give patients better options that can balance access and privacy while providing innovators with clear standards to follow and innovate around.

Third, policymakers need to support providers in embracing digital innovation in health care. This requires addressing provider discomfort around potential operational and legal issues that may arise. Providers need certainty and assurances around how new technologies may impact their legal liabilities (i.e., lawsuits or complaints about providers missing evidence of an adverse event from increase in remote monitoring, liability uncertainties around use of diagnostic algorithms, etc.). Licensing and registration should also be modernised to recognise how digital innovations enable medical care to go beyond in-person visits to encompass care delivered by algorithms or remote providers. Rules that prevent providers from working with remote patients should be updated to account for the growing importance of telemedicine. Policymakers should also make it clear to providers which new technologies and care

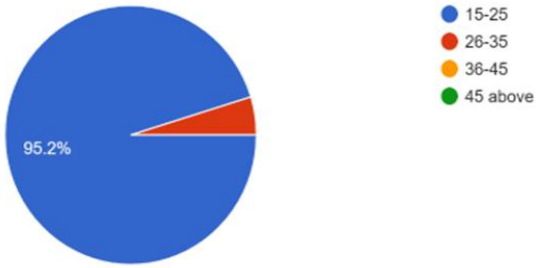
modalities are properly registered and approved for use.

Policy support must also extend to providing financial support to help smooth the path to piloting and embracing new innovations. This is especially true due to the fact health-care organisations already struggle with an understandable cultural aversion to taking chances. Grants for participating in pilots that get published or subsidies for medical scribes and training programmes to help patients, in particular those with less familiarity with technology due to age or socioeconomic status, are two examples where financial support can have a tremendous impact on adoption. Policymakers should also explore providing subsidised or outcome-linked financing to health-care organisations to encourage investment in long-term cost reducing technologies.

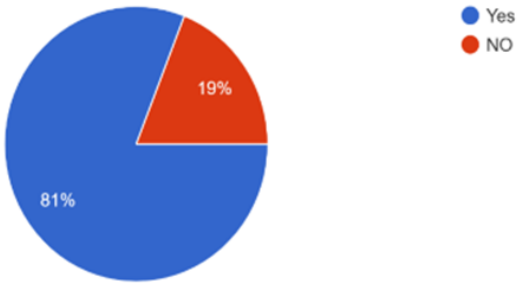
IV. PUBLIC SURVEY

We did Public survey and collected information so below are some public opinion

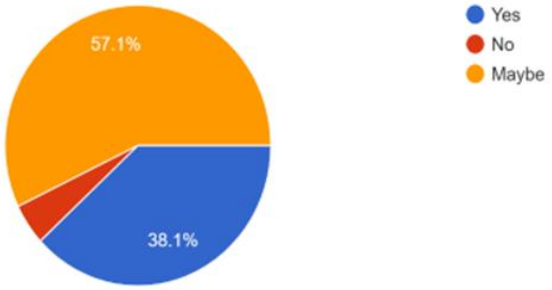
Age group that participated in the survey



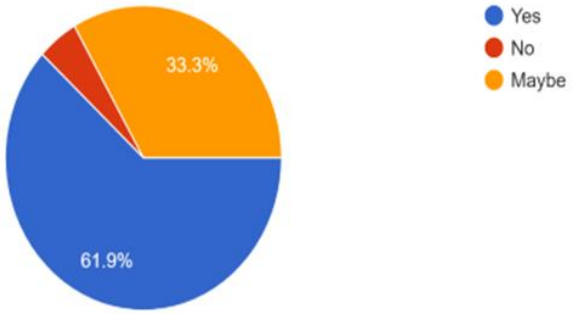
Have you ever used gadgets like fit bit or smartwatch for checking blood oxygen level?



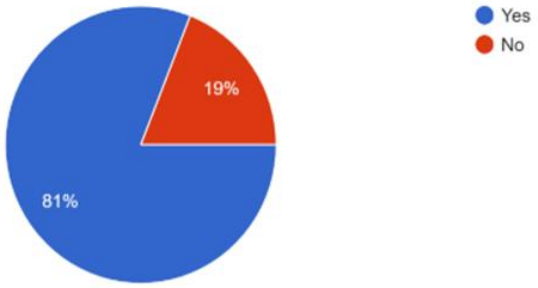
Do you believe such gadgets are effective for disease control?



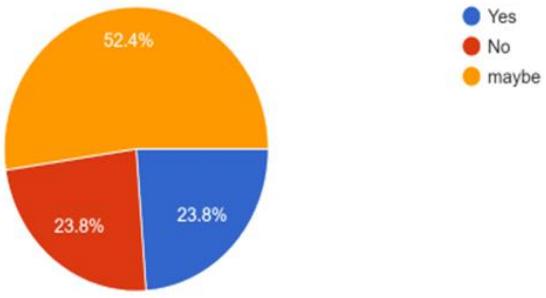
Do you believe technology can possibly help in disease control?



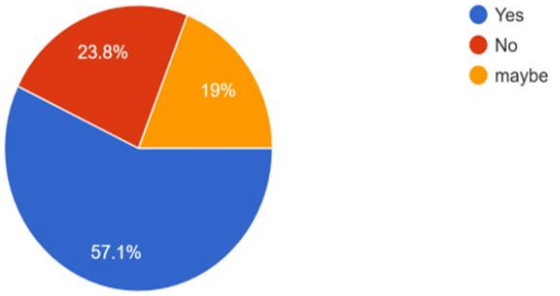
Have you ever used health apps or monitoring apps?



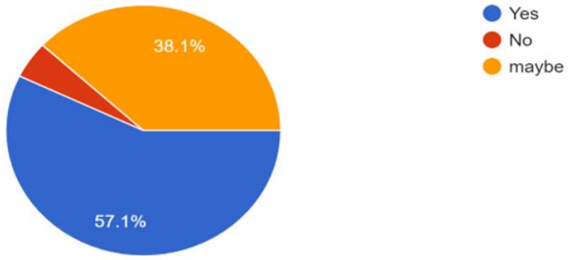
Do you willing to share your data anonymously for improving services?



Are you aware of advanced technology used to improve disease control?



Do you think Smart Technology or devices can improve Disease control?



V. DESCRIPTIVE STATISTICS

Descriptive statistics in the research is used to provide simple summaries about the sample and about the observations that have been made.

Have you ever used gadgets like fit bit or smartwatch for checking blood oxygen levels ?	
Mean	0.809524
Standard Error	0.087805
Median	1
Mode	1
Standard Deviation	0.402374
Sample Variance	0.161905
Kurtosis	0.975232
Skewness	-1.70043
Range	1
Minimum	0
Maximum	1
Sum	17
Count	21
Confidence Level(95.0%)	0.183158

Do you believe such gadgets are effective for disease control?	
Mean	1.52381
Standard Error	0.131277
Median	2
Mode	2
Standard Deviation	0.601585
Sample Variance	0.361905
Kurtosis	-0.0995
Skewness	-0.86107
Range	2
Minimum	0
Maximum	2
Sum	32
Count	21
Confidence Level(95.0%)	0.273838

Do you believe tech0logy can possibly help in disease control?	
Mean	1.285714
Standard Error	0.122336
Median	1
Mode	1
Standard Deviation	0.560612
Sample Variance	0.314286
Kurtosis	-0.33493
Skewness	0.038406
Range	2
Minimum	0
Maximum	2
Sum	27
Count	21
Confidence Level(95.0%)	0.255187

Have you ever used health apps or monitoring apps ?	
Mean	0.809524
Standard Error	0.087805

Median	1
Mode	1
Standard Deviation	0.402374
Sample Variance	0.161905
Kurtosis	0.975232
Skewness	-1.70043
Range	1
Minimum	0
Maximum	1
Sum	17
Count	21
Confidence Level(95.0%)	0.183158
Do you willing to share your data a0nymously for improving services?	
Mean	1.285714
Standard Error	0.184428
Median	2
Mode	2
Standard Deviation	0.845154
Sample Variance	0.714286
Kurtosis	-1.31649
Skewness	-0.61652
Range	2
Minimum	0
Maximum	2
Sum	27
Count	21
Confidence Level(95.0%)	0.38471

VI. CONCLUSION

The future of public health is likely to be increasingly digital, and recognizing the importance of digital technology in this field and in pandemic preparedness planning has become urgent. Key stakeholders in the digital field, such as technology companies, should be long-term partners in preparedness rather than being partners only when emergencies are ongoing. Viruses know no borders and, increasingly, neither do digital technologies and data. There is an urgent need for alignment of international strategies for the regulation, evaluation and use of digital technologies to strengthen pandemic management and future preparedness for COVID-19 and other infectious diseases.

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