
FUTURE
AGENDA
Open Foresight
THE FUTURE OF
ASTHMA CARE
A Global Expert View

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1.0 Introduction

Context

Asthma is one of our oldest recognised diseases. Over 2000 years before Hippocrates first gave it a name, its symptoms were mentioned in writings from as far afield as China and Ancient Egypt. Influenced by the immune system, it is an inflammatory condition that can be managed by a huge array of treatments. As yet, however, there is no cure.

Approximately 400 million people worldwide currently have asthma. Because it is affected by environmental degradation, poor air quality and rising obesity levels it disproportionately affects the poor. The combination of rapid industrialisation, increased urbanisation, and projected ecological change indicates we are heading towards a world where as many as one in eight people will be afflicted within the next decade. Expect an associated rise in mortality.

The sector is dominated by a small number of key players. Perhaps because of this governments, healthcare providers and supporting business structures have been slow to respond to the rising incidence of asthma. As a result, scientific advances which could have the potential to transform diagnosis, treatment, and management seem to be constrained by clinical and political complacency.

Looking ahead, global trends are shifting how and where future innovation may take place and which organisations could have a controlling influence. Better patient engagement, more personalisation, greater access to data, including the use of AI, alongside scientific innovations and the wider availability of longer lasting medication are all combining to offer new models for healthcare delivery. Leading universities, researchers, and pharmaceutical companies have already prioritised specific areas of focus including inhaled delivery, the growth in the use of biologics, and the targeting of genetic areas. Beyond this, changes in funding priorities will pave the way for a plethora of new entrants revealing new opportunities, particularly for technology companies with their increasing focus on healthcare and taste for disruption.

As this plays out then more, and better support for the increasingly visible 1 billion sufferers may follow.

This Research

This report seeks to provide a globally informed view of the future of asthma care. Its aim is to highlight changes that are probable, those that may be possible, what is certain and what may remain uncertain. To do this, alongside the views of global experts in the treatment of asthma we also spoke to over 100 recognised leaders in similar, supporting or otherwise influential disciplines across multiple markets. At the same time, we used ethnography to study the aspirations and lived experience of 30 patients in greater depth. This has been complemented with a wide range of additional desk research for context and clarification.

This Document

This research was funded but not edited by a pharmaceutical organisation. Its aim is to present a coherent view of what asthma care will look like in the years to 2030 and beyond.

All Future Agenda research adopts the Chatham House rule, and therefore all quotes are anonymised. However, where it is helpful for context or validation, references to existing published materials are included.

The report is split into five key sections: a short overview of the process adopted, and the underlying research methodology, followed by a high-level summary of the four macro trends impacting a shift in power and influence across healthcare generally. Next, a synthesis of the four sector shifts that will most impact the future of asthma care, as seen from the expert dialogue, is shared ahead of four areas of opportunity for substantial change around care, and innovation. The document ends with a conclusion and some questions for readers; for those in government and policy; those in industry, both pharmaceutical and outside; for healthcare providers and the multiple healthcare professionals who support asthma care delivery on a day-to-day basis; and finally, for patients themselves.

2.0 Methodology

Overall Approach

Real life is often messy, intertwined, and complex. It is why being able to distinguish between what may be a short-term distraction from what will be long-term change is difficult. This is where strategic foresight has a role to play.

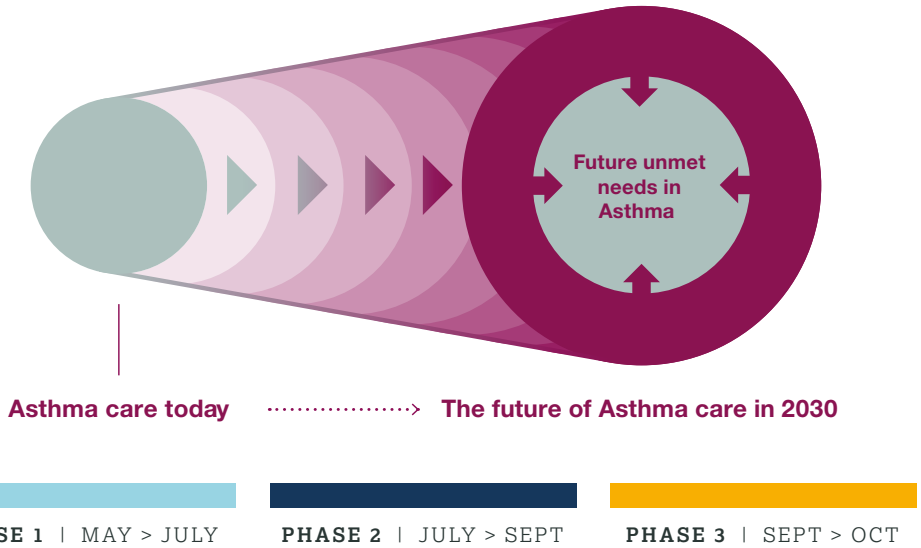
Foresight is neither prescriptive nor predictive, but when undertaken well, it does provide guidance on potential future pathways and implications. Its success lies in differentiating between the possible and the probable. Open foresight combines consultation with experts with appropriate research, to give individuals and organisations greater confidence around the decisions they are placing on the future. Future Agenda has been active in the field of global, multi-issue open foresight for well over a decade, and for this project, was able to leverage a wealth of research to apply to this challenge.

If a clear understanding about the future is developed, commercial and societal value can only be gained when it generates action. With a greater recognition of how change might play out in the future it is often possible to develop a more considered response to the challenges ahead. Sometimes, new issues are identified, and more research is needed before informed decisions can be made. Sometimes no action is necessary because the research simply validates what is already known and planned for.

Across our dialogue, we have therefore highlighted and challenged the areas which we believe should be explored in more detail and identified the areas where it seems clear that further action should be taken.

Project Approach

For this project, we began by focusing first on the big picture, the global shifts that are likely to impact asthma care generally, before turning to the emerging changes that will specifically affect those living with asthma, and then exploring the emerging future needs.



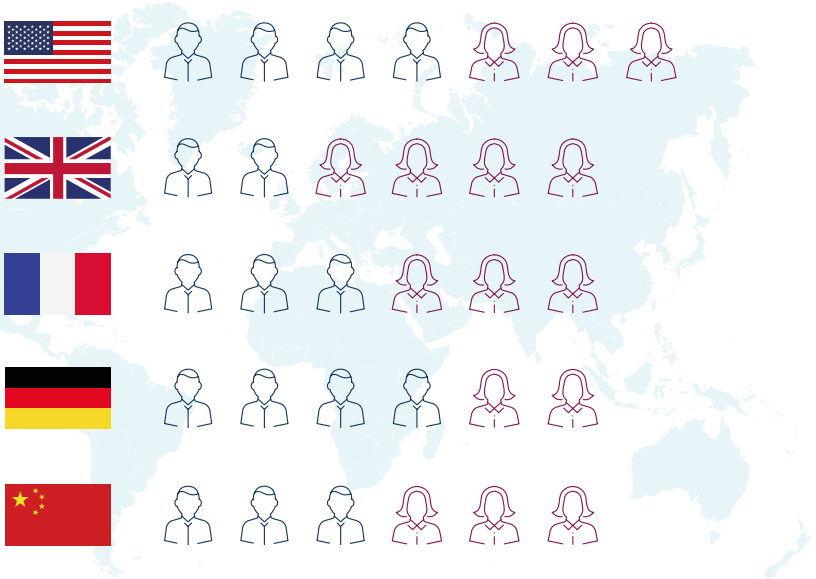
Three Phase Approach

We first canvassed the opinion of expert voices from within the pharmaceutical industry. We then moved externally to talk to 85 stakeholders, all experts in their field, including clinicians, policy makers, big tech executives, competing businesses, charities, the military, elite sports professionals, behavioural researchers and academics. Discussions took place between April and September 2021. The major shifts were identified and discussed with participants from a wide range of industries, providers, researchers, governments and start-ups. Considering both the internal opinions and the wider external view of the possible future changes in asthma care, enabled the identification and qualification of the core unmet needs.

We aimed to discover what change is predictable, what is probable, what is possible and what is uncertain. We did our best to ensure that we talked to and included the opinions of as wide a cohort as possible from multiple different disciplines and across all sectors. As such, this report has built a broader view of probable changes ahead. Our discussions challenged assumptions around the future of asthma care and considered the possible impact of change.

Global Expert Engagement

Coincident with this, we undertook an ethnographic study of 31 patients with a range of asthma conditions in five core markets – China, the US, the UK, France and Germany. Future personas of how these patients see their future life, challenges and wishes were then developed to stimulate dialogue.



Ethnographic Research

Lastly, ahead of the production of this report, a PPT level summary of key insights and findings was shared online. This was sent to all participants for direct feedback and made public for wider comment to add in nuanced, localised commentary and provide specific additional examples of probable change.

3.0 Macro Trends

Looking at the future of asthma care specifically, we see four macro trends that have significant impact. They are all influencing how asthma care is both considered and addressed, and will, over the decade ahead, seed further transformation.

These are:

1 The Socio-Economic Impact of Asthma
2 Asthma in Society
3 Changing Business Models
4 Data-Driven Innovation

3.1

The Socio-Economic Impact of Asthma

As the prevalence of asthma increases, it will become of greater concern for both health systems and commercial payers with the focus shifting towards how policy interventions can help reduce its burden. We heard *"Any time I'm talking to a policy maker, it comes down to three things, emotion, evidence and economics."* But to change policy, more consistent, robust evidence about the impact of asthma is needed. Without quantitative research around the social and economic impact of asthma, it is difficult to assess funding needs when compared to other chronic diseases such as heart disease, diabetes or cancer. Good analysis is available in some markets such as the UK, Singapore, and the US; however, elsewhere, information is patchy at best.

Because they are easy to ringfence, there is a general view about the direct costs of asthma, including hospital administered solutions such as the number of admissions and the expenses incurred around the provision of medication and treatment, these are generally borne by governments and healthcare providers and are relatively low. A deeper understanding of the indirect costs, those that affect the individual and society, reveals a totally different picture. Think of the cost of a broken education, absenteeism from work, and the impact that asthma can have on mental health. These can have a profound impact on careers, education, and relationships, but are not easy to assess.

This disconnect between direct and indirect costs has meant that there is little appetite from payers to increase funding because, on paper at least, asthma can be relatively easily controlled without huge investment. This has made it difficult for new players and pharma companies to justify increased spend on innovation. As a result new treatments have not been forthcoming, and improvements in patient outcomes have virtually stagnated. Indeed, such is the current lack appetite for change amongst policy makers, that even best practice clinical guidelines, like the Global Initiative for Asthma (GINA), which exist to support improvements in treatment, are not commonly implemented, and country-specific guidelines are inconsistent.

As more detailed research is published around the indirect cost of asthma care, it will be easier for policy makers and healthcare providers to identify possible interventions and quantify the potential savings that could be made. It will also make it possible to identify areas most in need of innovation and change. This could include developing more effective treatments or improving adherence, which is notoriously poor.

3.2

Asthma in Society

The prevalence of asthma is an increasingly political issue that will grow steadily. We know that those from disadvantaged socio-economic groups are more likely to be exposed to its causes and triggers, such as smoking, poor living conditions and air pollution. Its prevalence can therefore be used as a proxy data point for social inequality, the *"canary in the coalmine"* if you like. Whether they wish to or not, the organisations involved in the treatment of asthma may find themselves in the spotlight. They need to prepare for close and critical scrutiny of their business models and profit margins.

Greater public awareness will drive policy makers to be more proactive about identifying areas where intervention could make a material difference, such as by improving air quality in the home and workplace, ensuring more funding for HCP training and offering support for treatment innovation. A broader shared view across markets will help to standardise the approach and reveal greater clarity around the cost effectiveness of different interventions.

Governments in SE Asia in particular are more likely to concentrate on disease prevention, including stronger regulation around clean air, obesity and urban planning. Others may take a broader approach and include policy around asthma as part of wider changes to their national health and innovation strategy. Given the need to address a fast-growing asthma epidemic and its stated imperative to lead in healthcare technology development China is likely to show leadership here.

3.3

Changing Business Models

Around the world, those charged with maintaining a balance between cost and quality face a big problem; as healthcare spend is still growing faster than inflation, and inefficiencies remain rife. Payment models are therefore under review, with some payers increasingly moving towards value-based healthcare (VBHC) and payments based on results. This has proved to be more effective for the management of some conditions than others. Those which can be easily diagnosed and measured, such as diabetes, have, for example, started to demonstrate particularly good results. A value-based approach is not so straightforward for asthma because the condition is difficult to diagnose and it is influenced by multiple environmental factors which are difficult and time consuming to quantify.

That said, for patients, the outcomes that are important remain clear. In the absence of a cure, they include reducing the risk of getting asthma in the first place, reducing number of exacerbations and the amount of medications necessary to manage the condition when they do.

If the patient perspective is taken into consideration, then the likelihood is we will see a change of treatment focus. It is interesting to see that a VBHC approach towards asthma is already being trialled within parts of the US military with some considerable success.

Having easier access to medication is another challenge which could be addressed through a different lens, particularly in the markets where every doctor's appointment comes with a bill, and the cost of medication is an issue for patients. One option to consider here would be the increased role that others could play. Although the doctors' surgery will retain ultimate responsibility for patient care, it is clear that community pharmacist could have the capability to be more proactive around device education and in the treatment of mild to moderate asthma. As access to patient data becomes more widely accessible, pharmacists may well improve on some of the traditional prescription and patient education tasks that have traditionally belonged to physicians.

Controversially, some we spoke to suggested that when you balance the inconvenience and cost of visiting a doctor's surgery with the minimal risk of misuse of asthma medication for mild to moderate patients there may be significant patient benefit in deregulating asthma medication and, alongside hay fever tablets and the contraceptive pill, allow it to be sold direct to patients OTC.

3.4

Data-driven Innovation

New technologies can simplify the healthcare model, improve customer service, and reduce the cost. For example, in time pressured surgeries the constant and unflappable power of artificial intelligence has the potential to achieve more accurate diagnosis, prompt care and provide greater efficiency than can be offered over booked GPs. The question is how, and importantly, which organisations will take

the lead in its development. *"In the next ten years, we will see a huge influx of technical solutions, and people will be willing to accept them and adapt to them in their everyday life. But the tech industry is ten steps ahead of the healthcare industry and the patient community. Tech moves so much faster."*

A key driver here is the growing acceptance of more digital healthcare technology by patients. Many people already monitor their health and diet through smart devices and increasingly trust that the data this generates will be held securely. Accelerated by the pandemic, many can more readily see the benefits of sharing some personal information across consortia, the use of remote monitoring, and virtual healthcare support. From a business perspective, new technology is already helping to simplify the healthcare model and reduce costs. For example, AI is helping to predict exacerbations and can be incorporated into clinical decision tools to enhance outpatient care.

Over the next ten years, it is likely we will see 24/7 health monitoring via smartphones and wearables, with tools such as smart inhalers, health apps and remote monitoring solutions becoming the norm. One of the key transitions will be around the adoption of pattern recognition. The ability to access personal, clinical and proxy data will allow a far more detailed picture of a patient's condition, and reveal insights which were previously unknowable.

In addition to the conservative nature of the major players there a few significant obstacles to overcome. In particular, how to manage and care for the massive datasets that AI systems need, while protecting patient privacy. The advent of electronic medical records has ushered in stringent regulations, such as the HITECH Act in the US and the Data Protection Act in the UK. But for the benefits from the adoption of AI to truly take off, more rapid and wider sharing of data is necessary. That will require new legislation and a change in the accepted approach towards personal privacy – particularly in western markets.

Little can change without public support as trust in the widespread sharing of personal medical data will be key. Future policy makers would benefit from a shift in public perception from considering heath data to be private and belonging to an individual, to one where the sharing of anonymised health data considered is a civic duty.

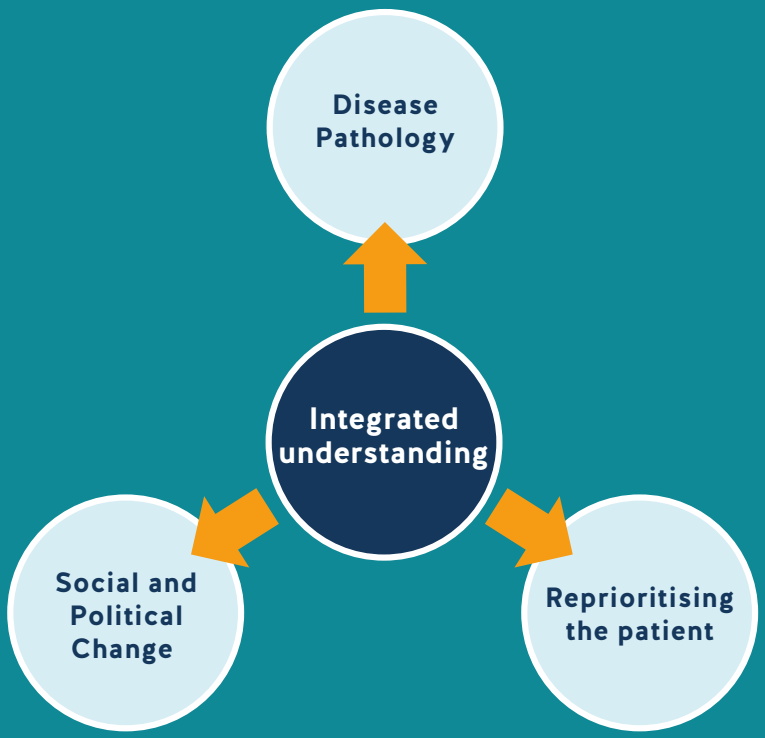
Data-rich organisations, including Apple, Amazon and Google, are already highly active in this area, and are deploying massive resources across the healthcare sector. They have established deep levels of trust with consumers regarding the protection of their data and the efficacy of virtual healthcare, so will have a pivotal role going ahead. Keen to maintain their dominant position within healthcare but also acutely aware of their lack of expertise in the technology space, it will be interesting to see how traditional pharma companies respond. Expect new collaborations between consumer technology and digital health companies and look for more and larger multidisciplinary research initiatives that have the potential to overcome existing silos and develop novel therapeutics. As healthcare data becomes automated, data marketplaces will have an increasingly influential and enabling role to play.

Although not unique to healthcare, together these 4 macro trends are having a tangible impact on how the scale and rate of change is set to play out for the future of asthma care. They are setting the pace for wider innovation and providing catalyst initiatives that will provoke action through the emulation of others' success. As they become increasingly pervasive across healthcare and specifically within the treatment of asthma, they may well also shine a bright light on a new set of unmet needs.

4.0 Sector Shifts

Turning to the condition more specifically, the four macro trends are driving major shifts within asthma care. Taken together, these may well pave the way for a sector-wide transformation that reveals specific opportunity areas for more impactful innovation.

The sector shifts are:
1 Disease pathology
2 Reprioritising the patient
3 Socio and political change



Many we spoke to felt it unlikely we will see breakthrough treatments in the next ten years. Rather a key focus will be on the **disease pathology** and a greater standardisation within the language, diagnosis and treatment of asthma.

There is a wave of incremental change that is largely driven by the established players in the global healthcare system. This is a collection of modifications derived from following existing scientific, organisational, processes and business models. It will build on current practices and deliver a suite of slow change to the way asthma is considered and managed.

Central to many healthcare reforms now underway, is the **reprioritising of the patient.** Rather than having to adapt to the structures and procedures of established healthcare practices, patient needs are given precedent. This may lead to a delivery care model where providers are paid based on patient health outcomes, rather than the amount of healthcare services that they provide.

As prevalence increases and public awareness grows, expect a **social and political change.** This has the potential to fundamentally reposition how government, funders and citizens respond to the condition, and could lead to a major repositioning of asthma within the wider hierarchy of disease management.

Lastly, expect a **deeper understanding of asthma,** fuelled by greater clinical knowledge, wider access to richer data, better classification of groups and subgroups, increasing personalisation and the development of a more meaningful language to describe asthma. Over time, this will provide a new suite of tools that can help to embed a way of thinking that acknowledges and is more sympathetic to the ongoing challenges facing those living with the condition.

4.1 Disease Pathology

Traditionally, healthcare innovation is a long game, with pharmaceutical developments taking years to progress through clinical trials and into general practice. To an extent, the Covid-19 pandemic has changed this. Within months, business models and services were transformed by the availability of new technologies, with new partnerships and greater cross-sector collaboration opening the door to multiple innovation opportunities across the healthcare sector as a whole. However, while the pandemic did shine a light on the importance of collaboration, including technical advancements and digital engagement, many we spoke to believe it is unlikely that we will see significant innovation that will improove asthma care at scale over the next decade.

Despite this, over the next decade understanding of the disease pathology and communication about it will evolve within these areas:

- Language and classification
- Accurate diagnosis
- Biomarkers and risk profiling
- Faster regulation

Language and Classification

It would really help if there was consensus around language. Asthma is often considered the poor relation of other respiratory conditions, but greater clarity round its symptoms, diagnosis and treatment has the potential to change this - allowing more joined up thinking and wider collaboration for respiration and breathing in general. A key focus area will be greater standardisation within the language, diagnosis and treatment of asthma.

Successful management of disease depends on a consensus of description of phenotypes and endotypes to allow clear and precise communication across professional silos and across geographical boundaries. The current terminology is at best confusing and at worst contradictory. Some healthcare systems are focused on whether patients are controlled or uncontrolled, and others talk about severity of impact. Even the term prevention is unclear. Some experts talked about prevention to stop the onset of asthma, whereas others, notably in the US, the UK, France and Germany, use the term to describe preventing asthma attacks, rather than stopping its onset.

The development of an agreed and detailed classification and corresponding patient-centric and practice-based guidelines will make it easier for patients to explain their experience of their symptoms more accurately and practitioners to ensure a consistent approach to their care. It is also essential if we are to make the most of the opportunities that new treatments can provide. This has already been recognised by the Lancet Commission, which argues that currently, asthma guidelines have conflated symptoms (coughs, wheezes, and breathlessness), physiology (variable airflow obstruction) and pathology (eosinophilic airway inflammation), and suggests that, *"Airway diseases should be deconstructed into traits that can be measured and, in some cases, modified (treatable traits), and which are set in the context of social/ environmental factors and extra-pulmonary comorbidities."*

Clarity around the language of asthma is also vital as new organisations enter the markets and begin to transform healthcare delivery. The pharma sector may have been traditionally unsupportive of this, but it is beginning to recognise the advantages of open collaboration with peers and industries such as. the big-tech giants who hold great technical expertise and a more direct patient relationship. This is a complicated process as reimbursement models will be challenged, but better precision around the language of asthma will facilitate both collaboration and stronger competition from within and outside the sector.

Creating a cross-sector view of the 'category' of asthma in the context of better breathing may help raise its profile and open the door to more funding. It would provide an anchor for more meaningful communication around the triggers and diagnosis between governments, payers, and clinicians. *"Some people think the problem with asthma is it doesn't cost a lot, and therefore it's not high on our agenda, but I would say, putting asthma, COPD and bronchiectasis, under one label would allow you to address that issue, to gain traction. And, as a clinician, it makes sense to do that, because there aren't any official clinical separations between the two."*

It is not surprising that in the absence of a standard language around asthma and a lack of consensus around phenotypes and endotypes, there are no widely accepted guidelines for diagnosis and management. These would not only make treatment and diagnosis easier, but they would open the door to new ideas, better medicine, and ultimately better patient outcomes. Guidelines take time to become widely accepted so looking forward to 2030, it seems a pragmatic approach would be to identify and agree internationally the commonly used terms across the most significant fields.

Accurate Diagnosis

In the absence of significant disruptive innovation, a key focus area over the next ten years will be greater standardisation of diagnosis and treatment. *"We need some sort of unified approach to address the symptoms that patients present with, rather than the disease that we are presuming they might have."*

Asthma symptoms vary day to day, season to season and patient to patient. As much as it is a hallmark for the condition, this variability poses significant challenges. *"Just as there are many different types of cancers, there are at least 12 different types of asthma, all of which need to be treated in a different way, but your average GP doesn't get that, never mind the public."*

Efforts to establish a standard global response to asthma have been ongoing but as yet have been unsuccessful and therefore it remains an unmet need. Although guidelines such as GINA's Global Strategy for Asthma Management and Prevention have been created to provide greater consistency, they have not been universally adopted. On top of this, there is no simple to use gold standard test. Those that do exist, such as spirometry, are not always available, and even when they are, there is little consistency of training for their use amongst primary healthcare professionals.

It is no suprise therefore that asthma remains widely misdiagnosed resulting an unnecessary escalation of risks, consequences and costs.

An objective, universal diagnostic test, based on the combination of an agreed set of measures that takes out the guesswork for the physician, would transform asthma care. In its absence, the adoption of a fixed standardised approach to diagnosis, with the inclusion of objective measurements prior to treatment, would significantly help to reduce misdiagnosis.

Biomarkers and Risk Profiling

Much hope is being placed on digital biomarkers. These are defined as objective, quantifiable, physiological and behavioural data that are collected and measured by means of digital devices such as portables, wearables, implantables or digestibles. They are already being used alongside AI to provide visualisations of the key signals that can offer greater detail of an overall condition. In time expect a range of apps and devices to progressively offer more and better health data which will feed into structured datasets and provide access to an increasingly detailed view of context and options for treatment. Their integration alongside personal data and historical trends will all help transform risk stratification for asthma.

Individualised risk profiles will be shared, to warn those living with asthma about probable flare ups and allow more focused and timely intervention. As predictive algorithms proactively identify high-risk patients, this will allow healthcare workers to better prioritise resources.

With med tech and consumer tech strategies increasingly overlapping, many see the potential for innovation around the capture and analysis of longitudinal physiology trends gathered by smartphones. Apple's acquisition of monitoring start-up, Tueo, is just one example of this. By 2030, we will probably see an improved understanding of the status and level of asthma control, with wider access to longitudinal patient physiology data. Indeed, the whole area of integration of personal, clinical and proxy data will help to summarise multiple datasets so that individual patients know where, when and how their asthma is best controlled.

Alongside this, there is increasing interest in the use of digital twin technology to help identify biomarker's and compare and test treatment options for patients who share similarities in age, gender, ethnicity, and underlying conditions. Such analysis would be impossible for medical professionals to do on the same scale with real-life patients; however, it has the potential to detect disease patterns, simulate the effects of treatments, and identify the most promising paths for further research. This requires the mobilisation of colossal amounts of de-identified patient data, including synthetic datasets to help prevent bias in the data and training of algorithms. Researchers must leverage significant computational, storage, AI and the machine-learning capability to make these insights actionable – all while maintaining patient privacy and data security. Some argue that this is where the tech sector will make its most significant impact.

If the ideal of every asthmatic being offered their current short-term future risk profile 24/7 via their smartphone is to be achieved, then by 2030, significant further progress is needed with improving patient access to technology being very much a priority. Free or subsidised connectivity from mobile networks will be key for health data sharing across low-income groups.

Faster Regulation

Some say that innovation in healthcare is often constrained by cautious regulation. Certainly rapid adoption of new technologies has meant that current regulation has failed to keep up, requires consolidation and needs to be future proofed. We repeatedly heard calls for convening bodies to show leadership here – either on a regional or global perspective. There are fundamental differences between European and US regulation on issues such as privacy, data protection and citizens data rights which need to be ironed out have a profound effect. Some worry that too much regulation too early could inhibit innovation. *"Legislators and funders tend to be risk averse, there is too much desire for certainty".* But others suggest common standards should be made a priority. We heard, *"We need networks, vocabulary and common standards to make sharing possible"*

New technologies mean that patients can already provide considerably more detail about their personal circumstances than ever before. Add this to shared research built on massive health datasets and it will be possible to reveal what was previously unknown and unknowable. This requires a more mature regulatory environment supported by regional and maybe global standards for ethical AI application. How quickly we achieve this will depend very much on how well we coordinate the delivery of the known opportunities. Many are low hanging fruit. All require strong collaboration.

As companies and research universities roll out planned developments, the incremental innovations already in the mix will undoubtedly have impact on asthma care. The question is how quickly the envisaged changed changes will take to implement, and how much further we can push progress over the next decade. The potential for innovation beyond the incremental agenda is there for the taking. However, achieving this requires leadership and collaboration across multiple parties – something that is frequently cited as a challenge for healthcare and the pharmaceutical sector in particular.

4.2 Reprioritising the Patient

Cutting across much of the reinvention of healthcare is the view that the voice and aspirations of asthmatic patients should be heard more clearly, and their needs better supported. This can be achieved by integrating deeper, better knowledge about individual patients and their lived experience into day-to-day care. The benefit of this is to give healthcare professionals the ability to focus on specific groups and subgroups where exclusive improvements can be achieved. It also allows individuals to retain greater agency and control.

The specific areas which were identified include:

- Emotional Understanding
- Prevention and suppression
- Greater agency and control
- Behaviour research gap

Emotional Understanding

With relatively few detailed studies, the human impact of asthma on an individual's everyday life is largely hidden from the medical community, and therefore only relatively few in the profession have any meaningful understanding of the lived experience of asthma. *"Patients have a keen awareness of the uniqueness of their own*

experiences of asthma and the difficulties in being lumped together with others who do not have similar experiences." Prioritising the patient and their emotional journey alongside their medical condition will force a more holistic review of the individual pathways – the patient journey – and reveal how they really want to be treated and supported. It will provide a deeper, richer understanding of what they value, and the sacrifices they may or may not be prepared to make to manage their condition. This will help to shift the clinical decision-making process from one that manages the disease to one that achieves a better quality of life for the patient. We heard that most often the things that really matter for a patient are a compendium of conflicting challenges; responsibility – both for their own care and for those around them, personal autonomy, and the compromises necessary for day-to-day life. These can often combine to create difficulties around compliance.

Although, in general, clinicians acknowledge the need for a more holistic understanding of asthma that includes the contextual diagnosis and the range of cultural, psychological, and sociological impacts that a particular treatment may have, the reality is that they don't have the time to fully deal with individual experiences or the range of options needed to accommodate treatment within them.

A first step towards addressing this may well be to reframe the conversation around asthma care; changing the way we talk about asthma and agreeing key points of reference so that patients can better explain their physical and emotion needs. This will allow HCPs to respond more easily and efficiently. *"We are ready for a new language to talk about asthma - it's too confusing. It's very much entrenched in historical views,"* and, *"Why don't we talk about good breathing? We ought to start talking about lung attacks, not flareups or exacerbations."*

More broadly as medical paradigms shift towards chronic disease management and social care, more effective communication of the lived experience of asthma may help to breakdown some of the cultural barriers and social stigma that some asthmatics must endure.

Prevention and Suppression

Reducing exposure to its triggers can both prevent and control exacerbations. This is where policy makers can help through tougher, more focused legislation in areas such as air pollution and supporting high-profile education campaigns around smoking or obesity. Expect to see more work on this. *"We need to be fighting to prevent triggers for exacerbation. Many of the unmet needs that we're hearing from patients are about trying to avoid some of the things that limit their lives."* Lessons about 'quick wins' have also been gained from the pandemic, so expect a greater focus on non-pharmaceutical preventions such as advice around seasonal mask wearing or limiting exposure by encouraging greater digital interactions and online services.

Concentration around smaller populations will reveal a better understanding of the mechanisms and triggers that cause asthma. In particular, there is a specific interest in childhood asthma, because in utero interventions may prevent its onset in high-risk individuals. *"If you can identify some factors in pre-school children, allergies and that sort of thing, and you can have interventions earlier in life that change the course of the asthma that someone may experience, you can have some form of remission. This is something which is getting towards a cure for asthma. It's more than just controlling it."* By focusing on early diagnosis among children, some see that over the next decade, it may be possible to reduce the incidence of adult asthma by as much as 50%.

Patient adherence has long been a problem in the treatment of asthma. Although many patients struggle to use inhalers successfully, most we spoke to expect inhaled delivery will remain the primary treatment for those with mild to moderate asthma. *"To be honest, I think that inhalers are treating symptoms the best way you can."*

There will be innovation however, in particular the integration of digital technology into devices. Digital inhaler health platforms, which incorporate apps to monitor time and date of dosing, will be a widely available and effective disease and medication management tool. Connected wirelessly to smartphones, they can enable care between clinicians and patients, and provide a more in-depth understanding of actual inhaler use. The data obtained can then be used

to deliver self-management interventions tailored to individual patient needs. Most inhalers may well be smart by 2030, if not earlier. Many will have add-on or embedded technologies that quantify inhaler actuations and evaluate inhaler technique. This will allow patients to better control their condition themselves or have closer interactions with healthcare professionals. Clinicians as well as MedTech and community- based platforms, will also be able to access data remotely and reach out to patients in a timely way, to better inform them about disease status, medication adherence and inhaler technique.

This will not be without challenges. Patients will still have the inconvenience of having to carry a device around and, although patient and HCP training will be digitised, it will be an effort to ensure time-pressed healthcare workers are kept up to date with all the different devices. Establishing common standards to enable interoperability is essential.

Some see this as just tinkering at the edges. Inhalers are clunky and inconvenient.*"Patients when they feel good, they don't take their inhalers. Then when they're not feeling good and they start using it, sometimes it's too late."* To counter this expect a growing interest in alternatives that can be administered in different ways. These include trans-dermal patches, affordable biologics and ultimately maybe, a vaccine. *"I think we will see more of the longer duration biologics so as you get one shot maybe every six months."*

While a cure remains elusive, the prospect of long-term suppression is much more achievable. Achieving suppression with agreed endpoints is seen as a credible goal for some subtypes. *"I think there will be drugs, most likely injectables, that you can give much less frequently than we are doing today. And I think that that will add value by itself. If you can take a biologic once every six months, and you can reduce your oral corticosteroid use, I think that's going to be tremendously valuable".*

Greater Agency and Control

Some argued that the greatest change around the provision of asthma care in the next ten years will not be around the development of new drugs or a potential cure, but rather about giving patients more agency and control. *"The biggest gains to healthcare are delivering the drugs and the devices that we've already got in a far more systematic and logical fashion. It's using what we have already in a smarter way,"* and, "Do I see any sort of major innovations in the next 10 years? No, nothing, nothing really. I think of more implementation because that is part of an innovation. It's not an innovation until it's been implemented for years and resulted in a step change." We see several factors which will contribute to this; more accessible communication around the treatment of asthma; increased involvement of community

pharmacies and greater use of smart technology in disease management.

Others are more optimistic and suggest that next generation care will soon introduce a predictive and personalised model able to utilise technology to track medication adherence and other contextual data. This will inform preventative approaches to asthma care. Some go as far as to suggest that within the next decade we will see a service model that utilises digital tools - such as smart asthma inhalers that communicate directly with the cloud. This could reduce cost and improve accuracy significantly.

Certainly there is evidence to show that shared decision making is associated with improved outcomes, so more patient involvement has the potential to benefit both children and adults. As more attention is paid to this, we will see changes in the way asthma self-care is communicated. Technology will play a huge role here. The pandemic has already made more people comfortable with online services and increased the appetite for individualised self-managed treatment dependent on, for example, ethnicity, literacy, and beliefs about treatment methods. The real challenge however, is in support care beyond online advice. Given the pressures on the doctors, community pharmacies are well placed to play an important role, particularly for those patients with mild to moderate asthma. Indeed we heard that in response to increased patient demand for convenience and accessibility, asthma treatments may well shift from prescription-based to being offered over the counter (OTC). *"The capabilities of the average consumer to understand things, and for us to reach them with truth about medications and about their conditions, has dramatically improved over the course of the last 20 or 30 years."* Alongside fundamentally changing the interaction between a patient and a doctors' surgery this will have a profound effect on reimbursement models. Although rejected as often as it was suggested, this would certainly provide more cost-effective access to treatment for those who do not benefit from healthcare free at the point of need – in the US, for example. *"Deregulation replaces doctors and nurses, and dramatically lowers the cost of these things."*

Another consequence of increased patient understanding is an expected growth in at-home diagnostics. *"In 10 years from now, I'm not sure whether albuterol will be over the counter per se, but I can see a time when someone's smartphone or smart device, or whatever it is, is able to write the prescription, based on an assessment made as you've been speaking. If it detects a wheeze it can notify you or the doctor or the pharmacist in some way. So all that needs to be done is for you to go to the drugstore and pick up a prescription, or more likely, a drone will be dropping this at your house 15 minutes later…"*

The use of diagnostic technology such as this is already available but currently unregulated in many markets. As more nations follow the example set by Australia, Japan, Singapore and the EU to create similar standards for determining the quality, safety and clinical value of new health devices, many will find support outside traditional doctors' surgeries.

Behavioural Research Gap

There is a well-established perception that, despite scientific advancements and new technologies, clinical and political complacency hinders the delivery of high-quality asthma care. For example, compared to other conditions, there are relatively few studies of the sociology and anthropology of asthma. As such, the impacts of asthma on everyday life are largely hidden from public view. As focus turns to the re-evaluation of healthcare systems, this will change. There will be a deeper understanding of asthma, whether through the

identification of more biomarkers, the adoption of new treatments, or the recognition of a broader set of health conditions. An area of specific progress is in the development of more integrated diagnosis within primary care. This may lead to further consequences for the wider healthcare system, such as the adoption of alternative endpoints for asthma treatment.

Adherence remains a significant problem. To address this most clinicians we talked to see the need for more behavioural research to understand the distinction between patient attention and action, particularly between reliever and prevention treatments and accept different ways of thinking need to be considered. The optimistic believe that by 2030, we will have greater patient involvement in the design of asthma care devices. Some we spoke to talked about the benefits of individual risk profiling pointing out that the integration of digital biomarkers, personal data and historical trends will all help to drive a step change in the way that we stratify and manage risk. Individualised risk profiles can be shared to warn patients of likely flare ups and so enable greater agency and more focused, timely interventions.

Prioritising for the patient based on their data is a focus for many. Probable by 2030 is that we will have an improved understanding of risk, status and level of control. Smart technology will continue to be transformational so expect wider access to longitudinal patient physiology data and supporting regulation to make the sharing of personal, clinical and proxy data between healthcare professionals easier. Smartphones are also key to visualising and providing similar multiple datasets so that individual patients will know when, where and how the asthma is being controlled.

With all the focus on VBHC, VOC and patient-centric design becoming pervasive across healthcare, new levers for change will become available for the treatment of asthma. Issues such as suppression, agency and behaviour all have avenues of promising innovation, and could well set standards for wider deployment.

4.3 Social and Political Change

As the number of asthmatics rises and there is deeper understanding of its social, economic, and environmental causes, the conversation is likely to get increasingly political. Asthma can affect anyone but, because rich people can afford to move away from one of its main triggers, declining air quality, it is seen as a poor person's disease that primarily affects those with unsatisfactory housing and sub-standard working conditions who have little option but to put up with poor ventilation and high pollution levels. *"Nobody really talks about it because everybody's very non-judgmental, but asthma is a disease of poverty. So, if you really want to unpack it, you're getting into broader societal issues very quickly."*

For those campaigning to improve their local environment, monitoring and publishing stats around the prevalence of asthma, and using individual case studies to showcase its impact provides good headlines. Human stories have the potential to influence the public, politicians, and policy makers in a way that important but abstract conversations about the science simply never could. Asthma is well positioned to be, *"the canary in the coal mine"* that amplifies the unequal consequences of issues such as increasing pollution, global warming and poor air quality on public health.

Social and political change can be divided in to 5 areas. These are:

- Better breathing
- The lived experience
- Natural Capital - the focus on environment
- Social Capital – the true value of treatment

Better Breathing

We heard, *"The prioritisation of where to focus health resources is as much political as it is medical."* One of the reasons for the expected politicisation is the growing prevalence of asthma particularly for mild to moderate sufferers. We know from WHO data that in 2020 there were 350 million asthmatics worldwide. This is set to grow to 425m by 2025, and the multiple effects of global warming, increasing air pollution, and rising urban obesity will mean this figure is likely to increase further. We heard from some that, *"there will may be a billion people with asthma in 10 years - that's what current predictions are."* Although, treatments are comparatively cheap and widely available, with this level of net growth, it is likely that one in eight people will be afflicted with asthma over the next decade. More effective health strategies, greater public awareness and more accessible treatments are needed to address this.

As the incidence of asthma increases, it becomes a proxy for wider public health and wellness we can expect greater attention from academics, from politicians and the media, *"It's an area of growing political focus. Social and health inequalities will put asthma centre stage."* The primary media concern here will likely be the impact of poor air quality on children, who are especially susceptible because their lungs are still developing, and their breathing is faster than adults. They therefore take in more pollutants relative to their body weight.

In some countries asthma stats will play a key role in all sorts of air quality campaigns including, on a macro level, encouraging industry to move to renewable energy supplies, to more local campaigns including helping promote the installation of air filters and air quality monitors in public places or imposing zero carbon car zones around schools, or more hedges to be grown between roads and playgrounds.

But such measures are no substitute for the need for bigger change. To improve public health, all governments must spend not just on health services but also on health education and community services. In the US, only 12% of the population are considered by the country's health department to be, *"health-literate",* and over one-third struggle with basic health tasks, such as following prescription-drug directions. Couple this with a lack of access to consistent healthcare (one in eight adults report not going to a doctor in the past year because of the cost) and it's hardly surprising that sufferers find it hard to adhere to treatments which require an understanding of how and when to use different inhalers. Although health literacy is a wider political issue, how asthma is managed can be seen to encapsulate all the challenges health inequalities present.

In China, rapid urbanisation and industrialisation has caused an associated spike in asthma, which has already pushed it up the political agenda. The government has chosen to prioritise its treatment within the National Health System.
Not every healthcare provider will be able to provide sufficient care. *"Will the world be a better place for asthma patients? As a whole, it all depends on where you live, what access you have to healthcare, and environmental factors. Providing better medications, treatments, and support is a start. Working on addressing pollution and climate change will help too."*

The Lived Experience

There is recognition that, *"The real burden of asthma is currently outside the health system. It's largely borne by the individual".* This has had a profound effect on the way the condition is managed and means that in addition to their medical challenges often sufferers have had to endure economic hardship too. Many talked of the need for a wholesale re-evaluation of the treatment process so that it can better respond to the real needs of patients. Compared to other diseases, there are relatively few studies of asthma's lived experience so it is almost impossible to get a comprehensive understanding of what it means for individuals. As a result, medical advice relies heavily on the science, but there is less focus on how to live with condition on a day to day basis.

"Asthma attacks highlight the life-threatening potential of disordered breathing – the side of asthma we know from the news, public health campaigns, experiences with friends and family members, and possibly our own lives. But this focus on events renders invisible the mundane daily care practices that that make up normal life for sufferers."

Beyond this, cross cultural understanding of asthma is also poorly comprehended. Whereas in the West, the general view of asthma is that it is often a minor health inconvenience which can, with the appropriate treatment, be managed successfully, in some cultures it can have a much more dramatic impact on life prospects and be a source of family shame. Young women can be particularly stigmatised.

Looking ahead, greater personal agency, including the use of social media and digital platforms, will provide a deeper understanding of what it means to live with the condition. *"Above all, asthma will no longer be a taboo subject. Everyone will be more open about talking about it – not just the people who actually have it."* The louder the public voice around asthma, the more influential its impact on health and social care politics will be.

Natural Capital - The Focus on Environment

Beyond the tangible financial and human costs of asthma, we heard increasing recognition of the growing impact of other elements of the multi-capital framework.

Inhalers are commonly used by people living with respiratory conditions such as asthma and COPD. Because the propellants in these devices are powerful greenhouse gases, landfill disposal is harmful to the environment as residual gas from the canisters is released into the atmosphere. In the UK for example this accounts for approximately 13% of the NHS's carbon footprint related to the delivery of care.

Although much has already been achieved to address the environmental consequences of inhaler use, by, for example, increasing the adoption of dry powder inhalers, more work is needed. The UK is still over-reliant on metered dose inhalers (MDI) therefore its emissions are around three times that of the rest of Europe. We heard, *"2/3 of inhalers prescribed in the UK every year go to landfill – they are just tossed away."*

Looking ahead, strategies that replace overuse of reliever MDIs with regimes emphasising inhaled corticosteroids and that have the potential to improve asthma control alongside making significant reductions in greenhouse gas emissions, are much more likely candidates for policy support.

Social Capital – The True Value of Treatment

In terms of social capital, we also heard, *"This is one of the most uncontrolled diseases with a high patient burden that's disconnected from cost,"* and, *"There's not enough recognition of the costs of poorly managed asthma."* Greater understanding of the economic consequences will have a profound effect on the way governments see and provide care funding. As the language around asthma is clarified and its human impact is better understood, expect a reassessment of this. A clearer, fuller, and shared view of its economic burden is of profound political interest and should form the basis for further policy interventions. This clearly aligns with the need for greater recognition of the socio-economic impact of asthma, identified as a key macro trend, and seeds the opportunity for one of the major players to take a lead on this to differentiate its actions from the others.

Faced with a number of emerging areas of concern from media, society and political standpoints, it is clear that asthma may become more of a centrepiece for public debate. Aligning the core issues, calls to action and improved public understanding around the common elements is both a challenge and an opportunity that will become increasingly high profile as an anchor for debate – and one which will grow significantly over the next decade.

4.4 Integrated Understanding

Patients, healthcare professionals and system providers will all gain from richer insights to help drive more refined focus. Ensuring that patient needs remain a priority forces a re-evaluation of the lived experience of different asthmas and deeper understanding of how individuals manage their condition is acknowledged in clinical decision making. Greater patient empowerment, self-management, and more accessible, credible support all enable a better level of control, so that asthma is part, but not the determining factor, of life. Pattern recognition and deep learning AI significantly improves our understanding of asthma and specify treatment, while apps accessing personal, clinical and proxy data provide HCPs and patients with a detailed picture of their condition.

Key to all of this is a recognition of the gaps that still need to be addressed. We heard that these include:

- Groups and subgroups
- Global guidelines
- Full personalization
- Exploiting digital footprints

Groups and Subgroups

Today, a cohort of leaders in asthma care, particularly those from clinical and behavioural arenas, believe that the current segmentation over-generalises the condition to such an extent that it is just not working for most patients. Asthma is associated with several different patterns of airway inflammation, and it is clinically important to distinguish between them. Currently too much is bundled under the asthma umbrella, which makes an accurate diagnosis difficult. *"The reason why there isn't a single diagnostic is because, actually, we're lumping stuff together. Calling something asthma, which is probably actually 12 or 20 different things."*

Because asthma acts as a collective term for multiple conditions, including different degrees of airflow obstruction, different patterns of inflammation, bacterial and viral infections, an over sensitive cough reflex and mucus hypersecretion, the way it is treated is simplified and there is little consideration given to determine the specific type or cause. For many hard pressed GPs A patient exhibiting shortness of breath, wheeziness or a cough is most likely to have some form of asthma, so the default is to treat them with ICS and send them home with either a blue or a brown inhaler. Sometimes this works, but often it doesn't. It's difficult to tell why. Sometimes the sheer inconvenience of having to use multiple inhalers means that the patient simply fails to adhere. Many we spoke to believe this process is too generic, has constrained innovation, left patients under served, and a review is long overdue. *"Many patients sit uneasily under the 'asthma' umbrella and receive regular asthma treatment with little evidence of benefit. It's hardly surprising that adherence is poor."*

A first step would be to deconstruct the asthma traits that can be measured or modified, and then to put them into the context of the lived experience of sufferers. Alongside more precise clinical definitions, this may shed light on a more effective segmentation and help to identify patients who are at high risk of serious outcomes. *"We need the categorisation on severity but given where that line is going to be drawn, there is a very big incentive for governments to draw it very tightly."* Take, for example, two asthma patients aged between 18-24, currently categorised as suffering from moderate asthma. One is from a middle-class supportive family about to head off to university, the other from a poor and chaotic background in a low paid job. Under the present segmentation, the risk of either having an exacerbation would be the same, but in fact the likelihood is that the support system around the student will be better placed to manage his/her condition. In comparison, the patient from a poor background may well struggle due to his/her circumstances – poor accommodation, financial instability, lack of good ventilation at work and so on. *"We need to identify high-risk disease scenarios more clearly and engage patients in ways that encourage them to adhere to their treatment. The current 'treatment-based' definitions of severity-driven asthma need to be modified to encompass elements of physician and patient behaviour."* Greater focus beyond clinical diagnosis may also provide an anchor for more meaningful communication on issues including exacerbation risks, behaviour change, and the development of personalised therapies that demonstrate the positive effect of non-medical interventions. *"If we are to see dramatic improvement for the disease, I think it has to do more with advances in psychology than the actual treatment, because sometimes the treatment is effectively there. The problem is payers don't necessarily have the same priority for behaviour change intervention as they might for monoclonal antibodies."*

Given this discussion, it is perhaps surprising that there hasn't been greater collaboration around a more accurate segmentation already. Some point to the regulatory complexity around clinical trials that makes patient segmentation difficult, others believe the reason for this may be the conflicting commercial interests of the pharmaceutical industry. We heard that, *"there is just something in the pharma mindset that means they cannot understand the benefit of working together to establish a category language, segmentation, or pathways, because they are always trying to promote whatever the latest drug launch is. That's the reason that asthma is such a mess. It's because asthma is so lucrative for pharmas."*

Global Guidelines

The development and clinical use of non-invasive methods to assess airway inflammation, have now demonstrated that 'asthma' consists of pathologically distinct processes and has allowed new precision medicine approaches to be used in some cases. Their efficacy, and the associated biological treatments they enable, reinforce the need to unravel the mix of airway diseases under the asthma umbrella. This will help identify opportunities for future development. For this to be achieved perspectives need to change. *"Let's stop saying, "you have asthma."* Let's say, *"This is the type of asthma you have."*

To be effective, many propose that recategorisation should first be agreed at a global level. Then work is needed to ensure that the resulting guidelines can reach those on the front line of care. The framework is already in place to do this. The Global Initiative for Asthma (GINA) offers a global strategy on asthma management and prevention. It is designed to be a clinically oriented strategy document that supports the development of practice guidelines in different countries and regions. It is the most widely cited evidence-based report on the optimal management of asthma in both adults and children, intended for global use. However, it still struggles to see its recommendations implemented. We heard, *"For all the publicity GINA has had in the literature, very little of it has percolated down to the practicing physician level,"* and, *"The people who really talk about GINA are the select few at the top of the pyramid in terms of doctors, academics and possibly policy makers. It doesn't really impact what happens on a day-to-day basis in the practices of the vast majority of physicians. That must be a missed opportunity.* There is a clear need for pragmatic, accessible and well disseminated guidelines.

Many believe that, in the end, the multiple different asthmas will become more widely understood and acted on as a category of chronic disease which is underpinned by new or enhanced patient beliefs. But this is unlikely to be achieved by 2030. More likely is that we will see incremental change around segmentation, with new approaches to diagnosis and treatment moving from a one size fits all to one tailored to individuals. Moreover, there will be greater recognition that patients can move from one condition to another within their lifetimes. Precision medicine is clearly going to help clarify these differences, with more phenotypes and genotypes being agreed across healthcare. However, it remains to be seen the extent to which commercial interests delay or accelerate adoption. With the ambition to be a leader in this area, several see that Chinese companies will be playing a major role in some international markets, especially across Africa and Asia.

Challenging the usual default to ICS prescription, we heard calls to explore non-pharmacological treatments, and shift the management of asthma from a medical model to one more focused on social care and alternative therapy options, including respiratory physiotherapy. Technology can help with this; for example by making it easier for patients to articulate their motivation, track their symptoms, potentially identify what triggers them and of course to self-medicate.

In the search for new endpoints, there was almost universal agreement that greater practical and accessible support for asthma suffers is needed that goes beyond the doctors' surgery. There are a range of different channels which could be considered, some online but others in convenient locations such as a local pharmacy or in schools. Greater accessibility will require more training for front-line workers but for patients the benefits will be more personalised diagnosis and care. *"By 2030, it is probable that we will see more longitudinal and less acute disease management. People will be treated in the context of their lived experiences over time, not just in the moment of consultation or emergency."* Key to looking at how change will be most significantly achieved is how people living with asthma will respond to the issues at play, most of which focus on adapting their behaviours as much as their treatment.

Full Personalisation

The prospect of more individualised healthcare is accelerating. It has long been argued that predictive analytics and genetic profiling will transform medicine. A good number of experts we spoke to believe that within the next decade we will see, *"truly bespoke, targeted healthcare at the 'n=1' level, available for those where governments, funding organisations or even individuals are prepared to pay."* For the wealthy few, *"you're going to see the digital measures, biomarkers and tools that are not just clinical snapshots – these will provide the evidence base."* So far, biologics have been used to treat severe asthma, but now, attention is turning to how they might help in patients with mild to moderate asthma.

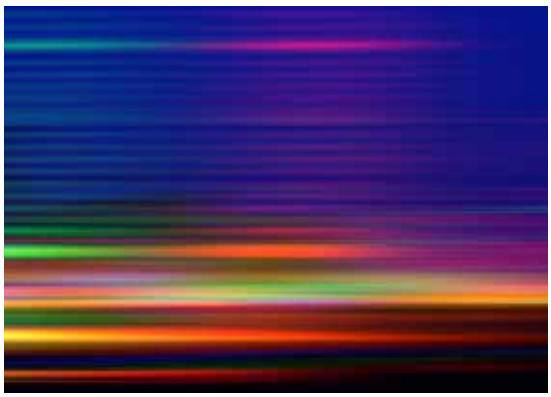
The implementation of precision medicine in the management of asthma requires the identification of phenotype-specific markers. To become useful, these biomarkers need to be quantifiable by reliable systems, easy to obtain, cost-effective and reproducible in the clinical setting. As a growing suite of diagnostic tools, the integration of omics biomarkers is expected to add a new range of reliable indicators and deliver a step-change in the speed and accuracy of assessment. Presently largely used for severe asthma, the current cost presents a challenge for widespread adoption when compared to other options. A combination of smart technology, greater data sharing, the increased use of predictive risk algorithms and virtual GP services, are all paving the way for them to be used more extensively and more conveniently.

Over the next ten years, several expect that biologics will extend into mild and moderate asthma care, and even be made available for paediatric asthma. *"At the moment, they are only prescribed by specialists in most countries, and usually administered in a hospital setting. In the future, probably more will be administered in less inconvenient ways. Significant access is driven by a reduction in the average costs of treatment so that affordability and return on investment are no longer barriers."* As investments in innovation already planned have impact, steady progress will be made across the board. *"I think there'll be more emphasis on finding the right biologic for the right patient, as patients will be more demanding. Things like home care, remote consultations and the uptake of digital will be much more prevalent in the next 10 years. However, I don't think it's going to happen automatically and there needs to be a huge push in that area to really drive change."*

Alongside people with other chronic conditions, asthma sufferers would like to have more personal agency and have greater control of their quality of life. It makes sense as, when patients are well engaged in their care process and follow an action plan, there are fewer occurrences of an asthma attack and decreased need for medicine. Digital technology can help. New regulations are driving a shift in the ownership of data so that individuals have the option to be more informed about its use. Patients will gain significantly more and better access to information about their own health. At the same time, smart technology will assist by monitoring the external environment, such as pollution levels or pollen count, capturing symptoms and taking objective measures of treatment response. *"Imagine it's like a temperature gauge saying your risk of having an attack is highly elevated right now, but we have more accuracy, based on all the different data sources and the patterns that we've been able to observe. The app knows that the person with higher risk is in a high-risk environment, and therefore changes colour to represent this."*

It's not just the patient who benefits. Alongside leading to better overall asthma self-management, smart technology will also give HCPs the chance to reach and collect data from a large cohort at any one time. Much is already being achieved, *"If what you're trying to measure is that today this a high-risk day for asthma, you may be able to get enough off your smartphone's ambient datasets plus geolocation, what the weather's going to be and so on. But what we're also trying to do is manage the severity of the symptoms; that's when we need to connect and interrogate the digital inhaler data."* Demand for devices that can facilitate remote 'examination' and diagnosis will only, many foresee, increase over the next decade. Some, however, remain sceptical. *"People have been trying to come up with machine learning apps to help with diagnosis ever since the start. The reason why none of those have been implemented yet is because it's so complicated. It's not just based on a defined set of symptoms; it's also based on personal medical history and physiology which are distinct from the healthy condition."*

By 2030, we will probably have more clarity on which existing biomarkers are the most useful. There will be integration of omics within precision medicine, and in some regions, a multi omics approach will extend to three or four different sources. One ideal would be that there will be an AI supported system in every GP surgery that, for example, analyses your breath as you enter, and provides a detailed view of your asthma in context. Using a combination of inhaled VOC analysis and other new omics-related data, between 5 and 6 sources of insight will be merged to provide a unique view of the patient's asthma condition – one that not only builds a snapshot of the moment in time, but also draws on historical, physiological insights to give the patient and the doctor a richer, deeper view of the true condition.



Exploiting Digital Footprints

Lastly AI has the potential to provide a richer overview of a patient's condition than is currently available. In particular machine learning techniques are useful for the analysis of large complex datasets encompassing heterogeneous sources of information. The treatment of asthma is well positioned to benefit. We heard, *"At best, a patient with asthma probably has over 2000 hours of experiencing their asthma symptoms between doctors' appointments. Not much of that is recorded on their electronic health records."*

Looking ahead, a combination of smart phone, smart inhaler use and high-quality wearable sensors will capture huge amounts of time-sensitive data which, if mined efficiently, will reveal clinically relevant information and previously unknowable information about the patient, their life and their environment. *"You're going to see digital measures, digital biomarkers and tools that are not just clinical snapshots."*

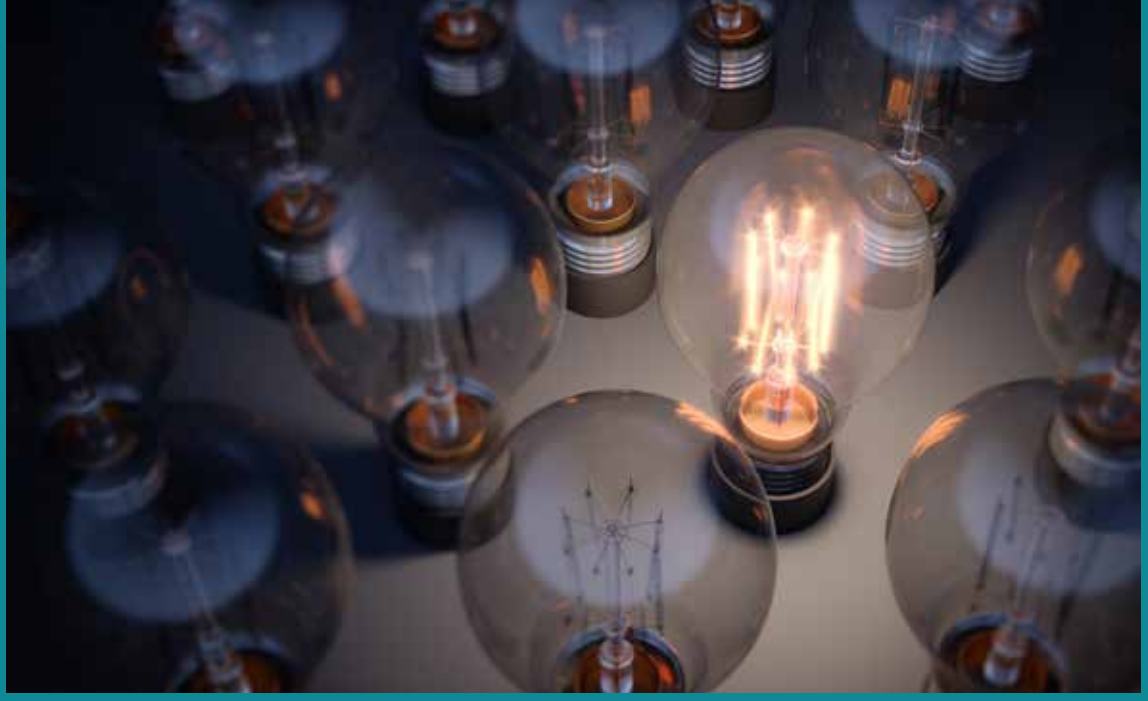
However, although the data currently being generated and interpreted across different domains is increasing, alongside consensus around disease definitions, there are still considerable challenges to overcome, including a lack of data standards, difficulty with data interoperability or sharing, and concerns about data quality and fidelity. As regulation continues to lag technology innovation, the calls for a global independent organisation that can establish common principles and standards will only get louder.

Many of the big tech firms have the potential to drive change here, because in different ways, they increasingly own the patient relationship and enjoy high levels of consumer trust. They are well positioned to provide personal diagnosis, insight, and support. Amazon and Apple are leaders and were repeatedly identified to have the potential to cause the most disruption. It's not just the data that Amazon owns and can scrape from Alexa and other business areas, it's the data that it already hosts on its server that can be accessed and analysed. We heard that, *"the company has a full digital twin of each and every user"*, so adding in health information alongside all the other personal data is an easy progression.

Considering the changing markets traditional pharmaceuticals may well have to reassess their business models, becoming nimbler and adding additional support services to their offering. *"Google doesn't yet have the capability to produce medication, but pharma will have to become more than just a company that makes drugs. They will move to provide additional support and holistic approaches."*

Some see that, *"many markets are going to shift towards being largely serviced via generics, so either the leading pharma brands have to develop more differentiated drugs, or they will veer towards making ever more complicated devices. But they need to keep their market share, particularly in the mild to moderate space which is where new biologics may make it easier to maintain leadership for a bit longer."* Perhaps the biggest future source of healthcare competition for chronic disease management may well be already here.

As improved understanding of asthma fuels more insight and more innovation, the richer, deeper awareness of how the multiple asthmas can be better categorised will be a pivotal shift. Not only will this help drive better focus and use across all of those living with asthma, but it will also generate greater acceptance of a more refined view of the varied and more sophisticated categories that can be meaningfully used by patients and HCPs to better codify the varied conditions and associated treatments themselves. Deeper understanding of asthma and its impact is set to accelerate change in how it is seen and managed within the wider healthcare shifts underway. Aligning these four areas will be paramount.



5.0 Opportunity Areas

Throughout our discussions and exploration of key future trends, there have been four pivotal areas which are seen as major opportunities for improving asthma care, driving innovation, and addressing many of the significant unmet needs. Differing regulatory frameworks, prevailing business models or the influence of a dominant payer system means they are not all the same in detail of execution in every location. However, they are all seen as areas of considerable change over the next decade and beyond.

Significant investment in some of these areas has already been made - both by government and the private sector. Many we talked to believe that greater focus and coordination will accelerate their benefits.

The opportunity areas are:

5.1 The Real Impact of Asthma
5.2 Longer-Term Treatments
5.3 Serving the Visible Billion, and
5.4 The Community Pharmacy

The Real Impact of Asthma

Long Term Treatments

Serving the Visible Billion

The Community Pharmacy

5.1 The Real Impact of Asthma

2030 Summary

There is little doubt that, compared to other, more well-known chronic conditions, the real impact of asthma on society in the broadest context is neither accurately understood nor well popularised. *"Leaders in public policy see that asthma has lost a PR battle against other diseases."* A clearer, fuller, and shared view of the socio and economic burden, including the direct and indirect costs, is sorely needed not least because it would highlight areas of potential savings to be gained from policy changes.

Asthma is seen as a relatively cheap, low impact disease, which can be easily and cost-effectively managed so currently it is of little concern to healthcare providers and policy makers. But many of those who suffer from asthma have a different experience. They are obliged to endure financial and social hardship due to the constraints of their condition. This is seldom acknowledged and certainly not quantified. By 2030, as the numbers of sufferers escalates, this will have changed. Expect greater interest in the full socio-economic impact to reveal a clearer understanding of the real costs of asthma on society. Alongside the impact on payers and care providers this will reveal how asthma can limit the personal lives of individual sufferers, taking direct costs such as hospital visits and outpatient costs, and indirect costs, such as its impact on education or work, into consideration. Over the next decade, there is an opportunity for prominent players to collaborate to demonstrate leadership in this area - bringing informed, rigorous but accessible analysis to the table.

The Challenges

Many payers and healthcare providers alike all agree that, *"the cost of asthma is woefully under-understood - it is much more than we think"* and that, *"the full picture of the economic burden of asthma, both direct and indirect, is unclear but very substantial."*

What is needed is more than just a summary of traditional direct costs to the healthcare system. In Europe we heard, *"I would argue that it's not just about the financial cost, but also the emotional attachment: It is a social illness"*, while in Asia, another standpoint was that, *"there's not enough recognition of the cost of poorly managed asthma."* In South Africa, we heard that, *"the economic impact of asthma is still largely unresolved - as are the payer motivations to get involved,"* and in California, it was proposed that, *"unfortunately, in the US, most of the cost of care is misunderstood."* There is much work to be done to improving our understanding of the direct and indirect costs of asthma not least because, *"The current burden is outside the health system. It is largely borne by the individual."*

The Issues – Areas of Priority Concern

Digging deeper we can see that across a wide range of influential bodies there are issues about which there is strong alignment and focus. For example, *"the burden of disease studies that drive health policy tend to focus on mortality rather than morbidity which is bad news for asthma."* We also heard. *"The perception is that the mortality of asthma is low but in actual terms it's quite high. People don't recognise this."* In contrast it is recognised that the morbidity burden of asthma is high. As a result sufferers and their families may miss school and work with financial impact on the family and wider community but this is not often recognised or accounted for. However, *"This is one of the most uncontrolled diseases with a high patient burden that's disconnected from cost."*

Any comprehensive view of the future liability of asthma that is seeking to embrace the full socio-economic burden must address both the direct and indirect costs. As well as the 'direct' hospital costs, HCP resources and community healthcare support, it must consider the more 'indirect' costs. These include the impact on education, levels of achievement, work participation, levels of absenteeism, and community engagement - including participation in patient groups.

Solutions – Potential Ways Forward

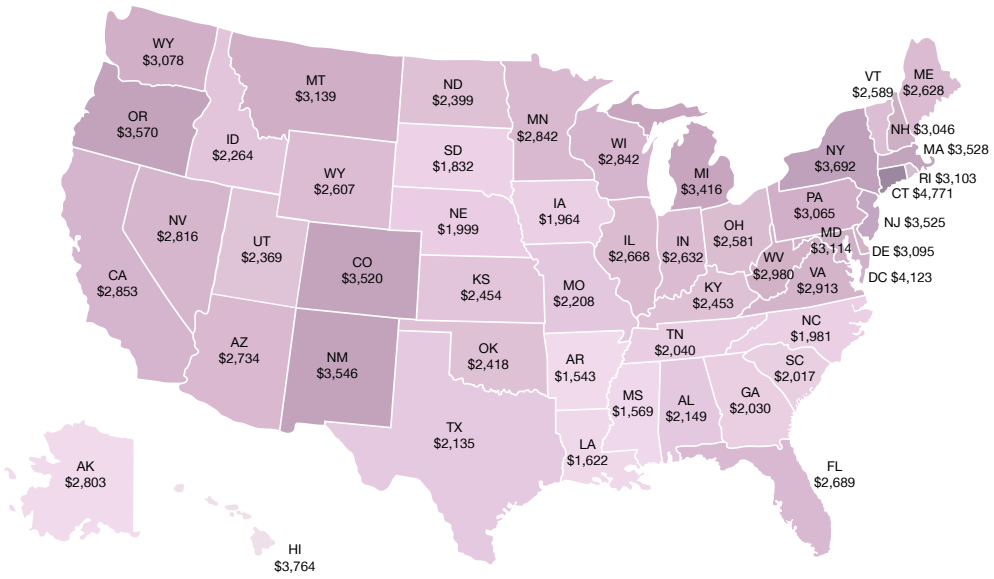
Amongst all the experts we consulted has been a common desire to create, *"a common generic global blueprint for asthma care that can be developed and applied to multiple markets."* The core assumption here is that, *"this should be modelled on existing analysis of some core locations – key regions such as Singapore, Germany, the US and parts of China, the UK and Canada."* This can be used to challenge existing care regimes and be used as a blueprint from which new treatment approaches can be built, tested, shared, refined, and fine-tuned, and then fed into policy making in varied regions for further iteration and refinement.

In addition, the experts we engaged with proposed several potential areas for further research, some with generic global application and others more specific. Some have suggested focusing on the key global trends that will be impacting healthcare in the future. For example, the increasing influence of Traditional Chinese Medicine (TCM) which is seen to address the long acting preventative needs, while more technology intensive Western medicine deals with short acting, rescue inhalers. Emerging shifts that will have a tangible impact across asthma care include:

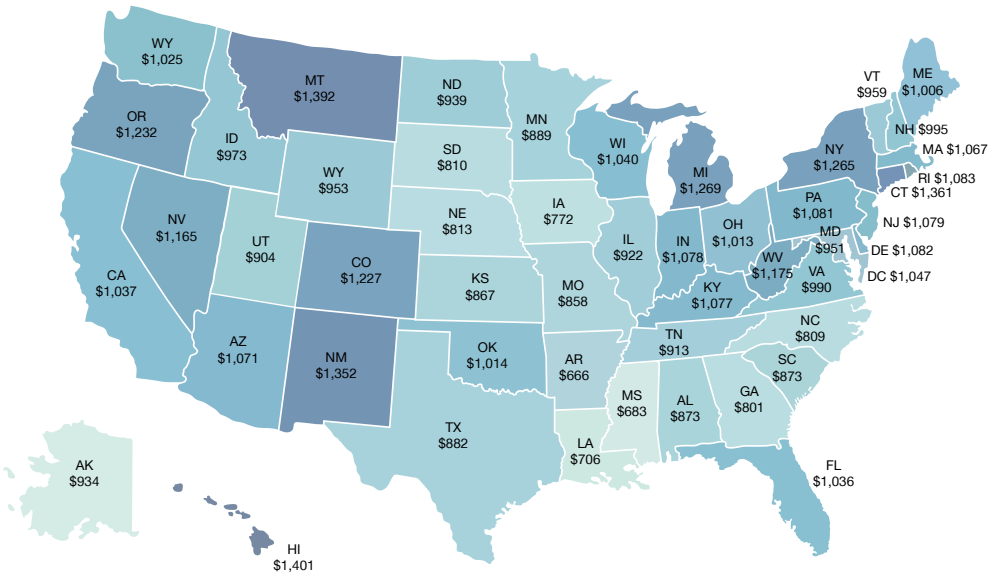
- *"Opportunities for social prescribing, that will empower patients to address non-medical problems in their lives"*;
- *"Addressing the quality-life ambitions for people living with asthma, especially for children"*;
- *"The effect of AI more efficiently replicating the role of doctors or nurses, and so dramatically lowering resource cost."*

Another increasingly popular approach is to take a more outcome-based view that drives thinking more towards value-based healthcare. While other conditions such as diabetes have been successful in agreeing common outcomes around which to focus attention, and so align payment, with asthma, *"as there are so many nuances of outcomes, how do you agree, ex ante, what the target outcomes will be?"* As such, progress to date in adopting value-based healthcare at scale has been limited. *"I don't know of any major VBHC projects around asthma, but there's clearly a lot of need in the space."* Many expect that the initial steps will be, *"to seed action around some discrete projects in well-defined small markets within which agreed outcomes and measures can be agreed and aligned with target payments, and then scale up from there."*

A leading example here is the analysis and predictive assessment of both direct and indirect costs from 2019 to 2038 asthma care in the US, undertaken by researchers at the Respiratory Evaluation Sciences Program, Collaboration for Outcomes Research and Evaluation and Department of Medicine, Institute for Heart and Lung Health at UBC in Canada. Looking across all states, this has, *"estimated a $900bn burden of uncontrolled asthma in the United States in the next 20 years."*



2030 Direct Costs (per capita)



2030 In-Direct Costs (per capita)

US Future Asthma Care Costs - 2030

5.2 Longer-Term Treatments

2030 Summary

While daily inhaled therapies continue to be the mainstay for most incremental innovation, patients, clinicians, and innovators are all increasingly engaged with the prospect of longer duration treatments. A wide range of innovative platforms, including vaccines, patches and oral therapies will gain regulatory support, research focus and VC investment to accelerate the potential for changing the treatment paradigm. With this comes greater self-agency for patients who are increasingly influential in determining which medicines gain support. Allied to the shift, is some significant and proactive rethinking around traditional pharma business models and standard setting, where more equitable pricing options are sought and experimented with to improve access across many key markets' traditional healthcare models.

The Challenges

While traditionally the default has been the use of inhalers to provide short-term daily treatment, the assumption for many is that we will start to see a range of innovation driven by changes from outside, that can pass regulatory thresholds quicker and so demonstrate a faster time to impact. *"In the next 10 years, we'll see a huge influx of tech solutions and people's willingness to accept and adopt those into their everyday life. But the tech industry is 10 steps ahead of the healthcare industry and the patient community. Tech moves so much faster, even our processes of regulatory review and things like that are slower."* To compete, *"Pharma will have to end up learning how to be quicker and become more than just companies that make drugs."*

High on the list of candidate changes for some types of asthma is the potential to adopt alternative solutions, including longer-lasting treatments – whether they are weekly, monthly, or longer. *"Look at other options such as small molecular entities which don't need to be injected, or smaller inhalers."* Better management of the half-life of drugs is a field of growing interest, as modified release and sustained release dosage medication is an area of ongoing formulation development as companies seek to better manage the prolonged delivery of treatment. With a daily half-life for release of opioids increasingly a standard, several companies have been moving the timescales for impact out further towards a weekly period.

Additionally, based on success in areas such as combined hormonal contraceptives at a monthly level, *"patch technology is growing in popularity and will probably take over from a lot of existing options."* Better still for asthma treatment, therefore, would be *"a long-lasting tablet or a monthly injection. That would be a good start. What matters most is being able to lead a normal life as far as possible."*

Post-Covid, it has been vaccines that are increasingly seen as the default model. The flu jab has built up a good track record for six-month therapeutic benefit, but the potential for other formulations to deliver more complex treatments is increasingly tangible. *"We've got new mRNA vaccines; we don't really know what the long-term future of those is."* The pandemic has also challenged many to think differently about what may

be possible: *"What this has taught us is to start thinking more deeply into the future, rather than just business as usual."*

"Patients who have atopic asthma or asthma plagued by rhinitis, like hay-fever, are very willing to go along to have the equivalent vaccination to reduce their immune sensitivity." Thinking more about this and the potential for an annual vaccine, *"That'd be wonderful. There will be a subtype, and we've already got it to a certain extent for those with grass pollen allergies, maybe for rhinitis. So having preventative injections for those - that's a possibility for a subgroup of patients."*

Biologics are new medications for asthma that interrupt the inflammatory pathways in the condition. They can only be provided by a specialist and are given by injection every month or two. So far, biologics have been used to treat severe asthma, but now attention is turning to how they might help patients with mild to moderate asthma. Potentially, if biologics were more widely available, then many people could benefit from improved asthma control, with less reliance on the use of steroid treatments. Several experts also see strong parallels with previous changes: *"So, the analogy I would give is monoclonal antibodies in rheumatology. When they started out, they were seen just for the severe patients. But as they saw the transformative potential of that treatment, they are now giving it increasingly early, and even now they are starting to expect remission. It has replaced what was the standard before that, which was tablets, or orange or gold injections. It has the same potential for asthma. With some of the biologic therapy, to give it earlier could be transformative in the patient's life."*

The Cost Problem

That said, there are problems to be addressed. For one we have the issue of cost: *"you've got to put in nursing time to administer a vaccine, whereas it is much easier to just prescribe a pill."* Moreover, if you take an even longer-term perspective; *"they could at least do an annual vaccine like flu, but the question is what you would pay for that?"* As some see it, *"the scientists may well be very keen on annual vaccination, but the system doesn't reward annual vaccines, financially, compared to steroids and inhalers."*

Looking ahead, several do, however, see that there is potential in bringing some of the break-even points down, if pricing models can indeed change. *"If you can give somebody a particular vaccine, why wouldn't you just take on the responsibility for vaccinating them for six months? That's the convention that seems to be around for severe asthma, and having a monthly biologic injection makes sense."* Clearly, different regions and health systems have varied costs to accommodate, and the US is often highlighted as an expensive location for the potential launch of new approaches. *"If you can justify the costs - that is $30,000 a year - it's expensive. But if biologics can move into mild and moderate asthma; you're talking $2,000 to $3,000, then you can go into the monthly cost. But to be at around $1,000 just doesn't even cover the injections."*

Piloting in Europe

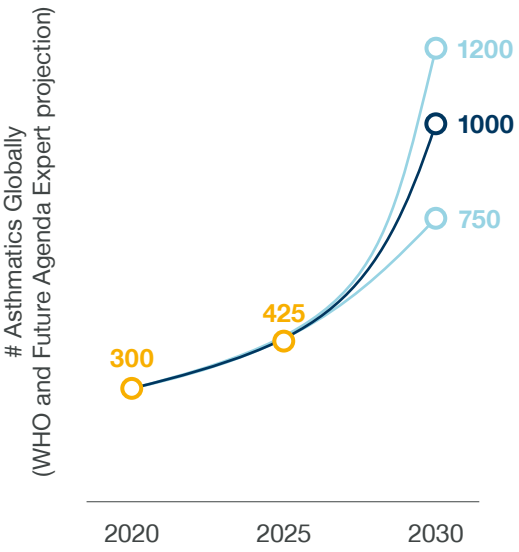
While there are several examples of clinical developments now becoming a reality, it is in Europe where the greatest progress has been made at the Universities of Bern and Oxford as well as at the National Institute for Health and Medical Research in Paris. In Switzerland and France, the initial focus is now becoming clear. *"We are planning to initiate clinical trials with anti-il-5 vaccine in the not-so-distant future. Because "il-5 is an excellent target for the treatment of allergic and non-allergic asthma with an eosinophilic component. We propose to develop a vaccine against il-5 for the treatment of asthma in humans, to broaden patient access to the highly effective therapy and to facilitate long-term treatment. It could be a six-monthly vaccine, that sort of middle ground."*

5.3 Serving the Visible Billion

2030 Summary

With 1bn asthmatics by 2030, asthma's prevalence more than doubles in a decade. Driven by the effects of global warming, increasing air pollution, and rising urban obesity, demands for more effective health strategies and treatments escalate. As it becomes more widely recognised and better understood, the gaps in care are more transparent, so greater understanding of the reasons for its prevalence shapes public debate and drives increased access to funding, which itself is better focused. With a more granular understanding of the overall numbers of people with asthma and the types of asthma that they suffer from, perspectives on how categorisation is best undertaken will be accepted, leading to agreed global methods and new partnerships for action.

Often hidden from view, asthma is a set of chronic conditions that will impact around 1bn of us by the end of the decade. Despite the availability of new treatments and more effective drug-delivery devices, many sufferers currently risk being undiagnosed, wrongly diagnosed or, find it difficult to control their condition. As the prevalence of asthma grows, so too does public awareness, and there is increasing pressure for better outcomes and different treatments. A first step towards this is changing the semantics of asthma so that it can be easier to accurately articulate traits that can be measured and assessed, including putting them in the context of social/environmental factors. This allows for new techniques to be adopted and greater progress in drug discovery. In the absence of a cure, attention turns towards prevention and quality of life. As healthcare workers, policy makers and planners focus on better breathing and how to address the fundamental causes of asthma, healthcare companies work to move beyond acceptance of the status quo towards an ambition to prevent, or better still, to cure asthma.



The Visible Billion

Net Growth

Whereas a rural upbringing has been shown to protect from allergies, the prevalence of asthma is increasing in industrialised countries. Urbanisation, climate change, changing diet and environmental fluctuations suggest that over the next decade, the prevalence of asthma will continue to rise. We heard, *"Asthma is 100% a disease of the environment. So, our lifestyle is driving the rise in the prevalence of asthma, and that will continue. As the standard of living rises in highly populous countries like China, India, and possibly Africa, then asthma prevalence will start to rise, and a 1% increase in asthma prevalence in China equates to billions of people. That's already happening."* China is a good example of a country which has developed from a traditional agricultural society into an industrialised country with dense populations in megacities and the accompanying challenges of air pollution. These rapidly changing lifestyle and environmental factors could affect the incidence and prevalence of asthma. Figures vary, but in China, studies estimate they already range from 1·2% to 5·8%. Experts suggest that a figure of 10% would be a more accurate view which will grow further by 2030, *"official figures for asthma incidence move from 4% to 10% to 15%, etc. which drives more notable inclusion in 5-year planning for healthcare improvement."* Similar patterns can be found in other large population countries of influence, such as India, Indonesia, Nigeria, Pakistan, and Brazil. Asthma is both under-reported and rising fast in many significant centres of population growth.

Elsewhere, in more developed regions with smaller populations, many expect a rise in asthma, as similar factors also have impact. Overall, the number of asthmatics visible to health systems globally will increase from 300m in 2020 to 425m in 2025, and between 750m and 1.2 billion by 2030. A billion asthmatics within the decade is a frequently cited view. But behind this, the data is likely to be relatively sketchy. The real challenge is to ensure a common diagnosis across all markets.

Changing Perspectives

Asthma has long been recognised as relatively cheap to control, and therefore this has remained the primary focus of care. However, given this future escalation, we can expect increasing pressure to challenge what some see to be, *"the current complacency around the treatment of asthma",* and for healthcare providers to move from supporting the idea of control to encouraging greater focus on prevention and cure. Our experts generally recognised the current classification system is seen as too over simplistic to support this transition, *"It's too general a term; it's useful for government, it's useful for the media, but it doesn't allow you to treat a person effectively."*

So, one of the first steps will be to redefine the semantics around asthma, to acknowledge the heterogenous nature of the disease and to be better positioned to identify the treatable traits, articulating them in a way that includes the social and environmental factors. *"Let's reframe it as all the different subtypes of asthma and be more specific, because that's what's important about the diagnostic and the precision medicine side."*

At the same time, we heard about the continued need for asthma to be categorised as part of a general approach to better lung health to be able to access larger budgets and government support. *"We've got to make asthma more important to the people who are putting cash in. Just now we're around about twelfth or thirteenth in pretty much every country by traditional measures of mortality and cost. So then you have this whole debate as to whether asthma should sort of buddy up with COPD and get access to a bigger picture of health funding."* In Scotland, the NHS respiratory plan is combining several conditions together as part of a deliberate strategy to raise awareness amongst payers, but, *"it seems to be a bit of a dichotomy. We need to be granular, because we need to be more specific. But at the same time, to be on the radar, we need to have a higher profile. That means we need to be more general and to start to talk about lung health and stop talking about asthma."*

Whether asthma is grouped with other respiratory conditions to increase scale and visibility with policy makers and funders or not, is clearly an issue of debate. It is an area filled with nuance around clinical definitions, historical precedent, pharma brand strategies and patient self-identification. Equally, the dominance of severity as a primary driver of classification of who is and who is not asthmatic is another area of confusion.

The shift from control to treatment will also have particular significance as the prevalence of asthma increases in Asian countries such as China or India. We heard that, *"our Western paradigm of pushing the puffers every day won't work in China or India, whereas the long-term injectable treatment, I think will. It is a great paradigm for what I understand is the practice of people and doctors in China. I can see that being fast-tracked from a technology point of view, but also from a cultural fit."* Especially in China, the common view of western treatments is that it is fast acting. As such, while reliever inhalers from the global pharma brands are seen as beneficial and worth using, preventers are a harder sell. If a coherent global alignment of views on asthma diagnosis, treatment and wider support is to be developed, then ensuring that this is achieved in a manner that ensures cross-cultural understanding will be key.

Agreed Methods

As increased prevalence will shape public debate and require more funding, pressure to gain clarity on what counts as asthma and its causes remains an ongoing unmet need. This is extremely difficult to map because the current data is either not available or simply misleading. Also, some regions are more open than others. For example, despite its large population size, China has had no comprehensive study of the national prevalence, risk factors, and management of asthma.

The Global Asthma Network (GAN) have attempted to address the problem and have recently published a report in the Lancet, which provides standardised global estimates of prevalence and severity of asthma symptoms in school aged children. It also explores whether the burden of the disease is changing. Significant causal differences were found in different countries. For example, an important risk factor in high-income countries is seen as allergic sensitisation because of the complex interplay between genetics and the environment; however, the rising incidence of allergic diseases in low to middle income countries may be caused by increasing urbanisation, more air pollution, and changing diets.

Moving forward, many agree that greater alignment of techniques for measuring the scale and impact of asthma will be prerequisite if we are to gain greater clarity and agree on global methods for quantifying and qualifying those who we can credibly consider to be asthmatic or not, and why.

Partnerships and Collaboration

As prevalence increases, we heard that, *"avoiding asthma onset is probably the best preventive strategy to develop. To achieve this, identifying people at risk, especially newborns and children, and adopting different behavioural advice are the first steps."* This is seen to be primarily the responsibility of government and, where possible, international health systems. *"It stretches way beyond just something the individual can do. It needs to come from a larger governmental level, so air quality standards could play a factor in that. More accurate monitoring of particulate levels within cities or regions of cities, that sort of thing."* In some markets, expect global initiatives to be backed up by the private sector. *"If it's in the US, insurers will tie you in with smartwatches and things, and by giving you discounts around a kind of healthy lifestyle, or penalise you for an unhealthy lifestyle, that's coming"*, and, *"soon they will stop calling themselves drug companies. They'll be offering a pack of healthcare services, and calling themselves something like a holistic healthcare service."*

Although the shift from 350 million to one billion asthmatics by 2030 is a major jump for many to accept, there is little doubt that a good number believe that this is a credible figure, and one that can both influence action and guide policy and funding. The growth in the importance of asthma on the global scale of health conditions that matter is set to change, and agreeing the size of this growth is going to be pivotal – both in terms of number and technique for confirmation. It will influence our understanding of the disease, and with it, perceptions of how it is best supported and funded in terms of care and treatment options.

5.4 The Community Pharmacy

2030 Summary

Better support for asthma is delivered by a more empowered community pharmacy. Greater access to and availability of patient data enables pharmacists to take over and improve on some of the traditional patient interactions that were previously managed by physicians.

The role of the community pharmacy evolves into a more data-rich, patient-focused hub. In some markets, business models change to incentivise more meaningful personal interactions, so that pharmacists deepen their patient relationships, taking the lead in patient education, annual reviews, and behavioural change. Alongside this, the growth of the digital pharmacy accelerates the role of a hub for data acquisition, interrogation, and use. In some markets, asthma medication moves from prescription to OTC, driving a change in access and pricing. More companies seek to be proactive in this field, seeding multiple trials to test new business models and core assumptions.

Becoming more patient focused

In today's healthcare ecosystems, the community pharmacist is a trusted, critical, but underutilised resource. Often the first point of contact in a country's health infrastructure, they are the most accessible healthcare facility available to the public, particularly for the vulnerable and the poor. They play an important role in reducing the burden posed by chronic diseases, including asthma, by providing health screening, treatment management, health promotion, health education and encouraging better self-management of health and wellness. They are already a key pillar in the cost control of medicines and facilitate billing and payment by both patients and healthcare providers. Looking ahead, as dispensing becomes a commodity, pharmacies need to develop sustainable revenue streams based on monetising their role at the healthcare centre. Expect them to play a vital role by offering an accessible human face on the front line of smart, effective healthcare provision. *"The next 10 years is transforming practice from dispensing a product to providing a flexible, high-touch, personalised service experience with better clinical outcomes."*

The shift from the treatment of acute illnesses towards having to manage chronic disease and deliver more complex treatment processes has meant that many health and social care organisations regularly face a shortage in financial, personnel and material resources. As a result, some governments and private health providers are exploring more integrated approaches to health service delivery, with a greater focus on value-based care. Local pharmacies are well placed to engage in this. They are often more conveniently located and

more accessible than doctors' surgeries, so they are well placed to offer deeper and more ongoing patient interactions. We heard that they have the potential to, *"act as a trusted, credible source of asthma advice to all patients - improving adherence and offering on the spot guidance and education."* Some we spoke to have a clear vision about how to make better use of the care opportunities that this presents. In the UK, we heard, *"…in an ideal world, the pharmacist would go back to the role that they were really designed to have, which is medication management and utilisation reviews, and really assessing how specific drugs or treatments work or are not counterproductive to one another."* The key question is how to achieve this. In the US, we heard, *"We have never figured out how to effectively utilise pharmacists."*

The Heart of the Community

Some believe that community pharmacies are well placed to be the eyes and ears for asthma health maintenance because pharmacists themselves have more time to support patients and can do so in an informal and therefore less imposing environment. *"The economic burden of asthma is potentially preventable – we just need better adherence to some kind of evidence-informed asthma management strategy. This has the potential to substantially reduce cost and improve quality of life. Local pharmacies could manage that."* A number of small-scale initiatives have already been successful but have yet to be rolled out at scale. As well as inhaler education programmes, these also include annual reviews and check-ups. *"The trick was getting the community pharmacists to do the reviews because the patient has to go to the pharmacy to pick up the inhaler."* Initiatives such as these have been successful not only in profiling good practice, but also in identifying problems. *"When patients brought their inhalers back, about half the inhalers were full. The patients hadn't used them at all. So the patient clearly doesn't know how to use their medication, which is an enormous safety risk that we could address quite quickly."*

Fewer Doctors

A key reason for the increasing role of local pharmacies is tied to the expected decline in the availability of doctors. "*It's not that there aren't going to be doctors 20 years from now, but my suspicion is that there will be many, many fewer doctors per unit of population."* In part this is because of the growing number of start-ups and technology companies that are identifying ways to treat patients' directly. *"They ask what is being done in a clinic that could be done somewhere else, and how can we take that revenue away. This is obviously quite an important issue for physicians, but I find that they don't notice the patients that don't come in."* The fear is that, as patients turn away from doctors' surgeries, revenues will begin to suffer. *"Of course, many clinics will simply not be able to survive economically. And in fact, that's exactly what we're seeing in the United States, with hospitals closing."*

Given the anticipated decline in GP presence, many suggest that local pharmacies are well placed to become the first point of contact for asthma diagnosis. For some patients, this would make medication more affordable, reducing, for example, the consultation costs. In Canada, we heard, *"studies have estimated the cost effectiveness of the pharmacist prescribing medication for some ailments……we found that if we allowed pharmacists to prescribe medications for small problems, there could be significant cost savings, as we eliminated indirect costs - the travel costs from the home to the GP clinic or to the hospital to the emergency department."* Clearly, a diagnosis of asthma outside a formal doctor's surgery is a significant change. However, with some suggesting, *"there is the possibility of a more algorithmic, less subjective diagnosis. If we put ourselves in a future where there's more AI and more technology in the mix, then the ability for the pharmacist to make a diagnosis will increase."* We also heard, *"I'm not sure about diagnosis, but certainly there should be no problem with repeat prescriptions."* That said, there are others who see potential problems with this approach, as it necessitates a change in money

flows. *"Some of the biggest obstructive voices in that conversation are physicians, because they're trying to protect their own turf."*

Digital Pharmacies

As new players are entering the market and developing digital models, some existing pharmacies, to an extent, are vulnerable, and to stem a decline in significance have also been developing online channels. *"I think asthma care will and should completely move out of the doctor's office, out of the clinical world. And this is both because of deregulation and technology."* Influenced by their experience during the pandemic, consumers are growing increasingly confident in their ability to use smart devices to manage their own symptoms. *"If I envision 10 years from now… it may be that someone's smartphone or smart device is able to write the prescription based on the fact that it's detected that I'm wheezing. And it's notified me in some way. We've detected wheezing, and it is characteristic of asthma, and therefore, go to the pharmacy and pick this up."* Not everyone agreed with this vision, and cite the challenge for patients to identify the most appropriate treatment, *"The patient will struggle with choosing the medications they should take. I wouldn't think about bringing aspects of other chronic disease management to asthma and pushing even more onto the patient."*

The who, what, when, where, and how of pharmacy care is rapidly evolving in the face of technological challenge. However, over the next ten years, local pharmacies will play a huge role in ensuring that health systems are more accessible, patient-centred and focused on the needs of the community. Although big tech companies such as Amazon, Google and Apple are increasingly focusing on the development of online pharmacies, the need for ongoing support for chronic conditions also presents an opportunity for bricks and mortar pharmacies to become key in the provision of face-to-face care. Business models will evolve to acknowledge this, as value-based healthcare propositions increasingly become part of government strategy. Progress to date has been limited. *"I don't know of any major VBHC projects around asthma, but there's clearly a lot of need in the space."* However, with innovation expected around diagnostics and treatment methods, many we spoke to were hopeful of change. Expect the initial steps, *"to seed action around some discrete projects in well-defined small markets, within which agreed outcomes and measures can be agreed and aligned with target payments, and then we can scale up from there."*

6.0 Conclusions and Questions

Conclusions

With some of the pivotal developments already in place, asthma care is getting more personalised, more patient-centric and ever more data-driven. The investments being made across the sector by governments, pharmaceutical firms, IT companies and multiple new entrants not only support this direction of travel, but are also building further momentum. In some key regions, there is both the opportunity for change and increasingly supportive regulatory environments that will encourage better integration and more focused innovation. The US and China are, in many eyes, those to watch for most action, but other more mature and 'joined-up' systems in Europe, Australia, Canada and Singapore are showing equal promise.

While there are many with significant ambitions, for now it seems that initial changes for asthma are most likely to occur at a more incremental level, but with substantial shifts rapidly coming into place for the medium term. From all our discussions, it is apparent that there is great potential for the future of asthma care, but also lots of challenges. There are many patient benefits as well as multiple additional opportunities for the broader community. These may include hospitals, health systems and existing healthcare organisations, not to mention a host of new companies – many with deep pockets and sophisticated technology.

While this report has highlighted a wide range of both opportunity and challenge and has sometimes focused on the potential for the key players involved, we must not lose sight of the main motivation for most people in the sector – better care of the patient. Although some of the issues addressed here have covered the behavioural challenges around sustained asthma treatment, the changing technology landscape, as well as improved efficiency and effectiveness, and therefore reduced cost, few have relevance without delivering a clear advantage for those who most need better healthcare – often some of the most vulnerable in society. If we can align the multiple strands of the identified, emerging unmet needs, over the next decade, people living with asthma will:

- Become more involved in their overall health and how to improve it.
- Have greater control of their asthma, health and lived experiences.
- Be provided with more tailored support, diagnosis, and treatment.
- Be active, not passive, in the creation and sharing of value, and so.
- Live longer, healthier, and perhaps happier lives.

If we get it right, these benefits will be delivered for the many and not just the few.

As a project, this has been an insightful experience for the project team and, judging from the feedback we have already received, it has also been useful for many of those who kindly spared their time to join in the discussions. Once more, we thank all those who participated for their time and enthusiasm.

This report and accompanying PPT presentation is now being openly shared under Creative Commons, in partnership with several organisations around the world, so we hope that its global context and multi-disciplinary perspective will help more to see the opportunity through an informed lens. There may well be significant challenge, but there is also huge opportunity. We look forward to seeing the potential change, that so many have talked about, successfully delivered.

To follow this project further and access more information, please track the discussion on the main Future Agenda website on www.futureagenda.org

Key Strategic Questions

From the global discussions and insights gained from this project, asthma care is undoubtedly a field that is ripe with both opportunity and challenge. As we look ahead, it is also evident that, as future unmet needs become clear, some organisations and governments are more ready for the emerging shifts than others. To help provoke further dialogue and discussion, we have suggested several questions that could be addressed.

As with all Future Agenda projects, we are using these, and other stimuli such as future patient personas, as part of follow-on discussions with other companies, healthcare systems and governments. They may also be useful to you internally to help further challenge assumptions and identify new areas for potential innovation. Below, therefore, please find five questions each for governments, for healthcare providers, for HCPs and for people living with asthma themselves.

Five Questions for Governments

1. With the significant rise in prevalence, how can we best align funding, resources, and public engagement on the full range of asthmas?
2. What is the role for an inclusive, holistic respiratory plan to bring together strategic priorities for the future of asthma and wider lung health?
3. Which are the pivotal opportunities to significantly improve the effectiveness of asthma care globally/regionally, and how can they best be delivered?
4. Where can the best advances in digital platforms and novel data use drive down the healthcare costs associated with asthma?
5. What regulatory modifications would most help to accelerate meaningful and lasting change for people with asthma?

Five Questions for Healthcare Providers

1. How can you help to provide patients with better information about their unique circumstances to better manage their health in context?
2. How can you build and maintain trust in an increasingly transparent market with multiple new entrants, from within and outside healthcare?
3. Which of your specific assets can create the widest social and patient value from being shared more openly with others?
4. How can you leverage personalisation and singular insight to better treat individuals and benefit the many?
5. How can you more proactively partner with payers to highlight the interventions that will provide the most lasting efficiency?

Five Questions for Doctors/HCPS

1. In what ways will better access to new information about their asthmas best empower your patients to take more control of their health?
2. How will more focused, accurate data enable your patients to better prevent future illness, improve diagnosis and manage their treatment?
3. How can you help your patients to better understand their condition and what their health data is telling them?
4. How can emerging AI visualisation help to accelerate and improve the level and impact of care you provide to patients?
5. Where will be the most significant shift in the doctor/patient relationship for asthma treatment?

Five Questions for People Living with Asthma

1. To what extent do you feel that you understand the wider, more complex range of conditions increasingly associated with having asthma?
2. To what extent is your asthma something that you will be able to better manage in the future vs. a condition that will define how you feel?
3. Do you believe that your asthma is increasingly a response to the environment within which you live, or a reflection of your genetic profile?
4. Who do you most trust with your personal, health and social information to the extent that you would share this to help change your behaviours?
5. How much is living with asthma down to you to manage as an individual, rather than relying on the system to be increasingly proactive?

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Open Foresight

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Future Agenda is an open source think tank and advisory firm. We help organisations, large and small, to explore emerging opportunities, identify new growth platforms and develop game-changing innovations. Founded in 2010, Future Agenda has pioneered an open foresight approach that brings together senior leaders across business, academia, NFP and government. The aim is to connect the informed and influential, to challenge assumptions and build a more comprehensive view about the future that will help deliver positive, lasting impact.

For more information and to have access to all our insights please visit
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