

Preparing for Climate Change: The Essential Role of Pharmacy in Addressing the Next Global Crisis

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Introduction

- Climate change is leading to an increase in acute climate events such as flooding, wildfires, heatwaves, hurricanes etc. and long-term events such as warming, sea level rise etc. These events have a significant impact on public health by either worsening existing health conditions or giving rise to new ones¹.
- While significant progress has been made in establishing the health effects of climate change, there is much to be understood and quantified for actionable health systems readiness. Notwithstanding the efforts underway to reduce carbon footprints and reach net zero, including those by health sector stakeholders such as hospitals, retail pharmacies and their suppliers, the imperative to prepare for the future of 2040 or 2050 is now urgent.
- Understanding the impact of climate change on medicine use through historic data analysis and projection of future use trends can equip various health system verticals, particularly retail and hospital pharmacies, with the information needed to anticipate impacts on demand in order to deliver quality and timely treatments.
- Pharmacists, through their vital role of dispensing and administering medicines to patient, will be a critical stakeholder in preparing for – and addressing - this next global health crisis.

Methods

Impact of acute climate events on medicine use

- Historic global medicine sales and volume were analyzed from IQVIA MIDAS, a global database tracking pharmaceutical products in retail and non-retail channels across 93 countries and 12 years of history. Historic prescriptions in the United States were analyzed from IQVIA National Prescription Audit which measures demands for prescription drugs by capturing over 92% of all outpatient prescription activity covering all products, classes, and manufacturers in the US.
- To adjust for differences in volume measures across medicine forms, historic medicine volumes were converted into defined daily doses (DDD) based on World Health Organization (WHO) methodology. The DDD measure represents a standard day of therapy for a maintenance dose of a chronic therapy.

Modelling of respiratory agent use in Australia for 2023-2032

- The impact of bushfires in 2019-20 on respiratory agent use in Australia was estimated by assessing the growth in use for Australia vs. other developed countries (Canada, France, Germany, Italy, Japan, South Korea, Spain, UK, and U.S.) in the same timeframe
- To estimate the respiratory agent use for 2023-2032, first the CAGR between 2012-2022 was applied to the 2023 to 2032 timeframe. This provides the expected 'natural' increase in respiratory agent use in this timeframe without accounting for additional bushfires linked to climate change.
- Based on previous modelling published in the literature² every year, including 2023 to 2032, it was assumed that there would be one bushfire of half the magnitude as the 2019-2020 bushfire in Australia.
- The impact of the 2019-20 bushfire can be seen in one quarter (Q4 2019) primarily resulting in additional respiratory agent use. An assumption is made that half of this additional use will take place each year in one quarter for 2023-2032.
- Caveats: This does not account for significant climate adaptation efforts that might reduce bushfires. There may also be newer areas which witness the impact of these bushfires over time. Additionally, bushfires have multiple causes and the full extent can not be related to purely climate change, however, an increase in bushfires is linked to climate change in several prior publications³.

Estimated Potential Anticipated Change in Medicine Use Across Therapy Areas

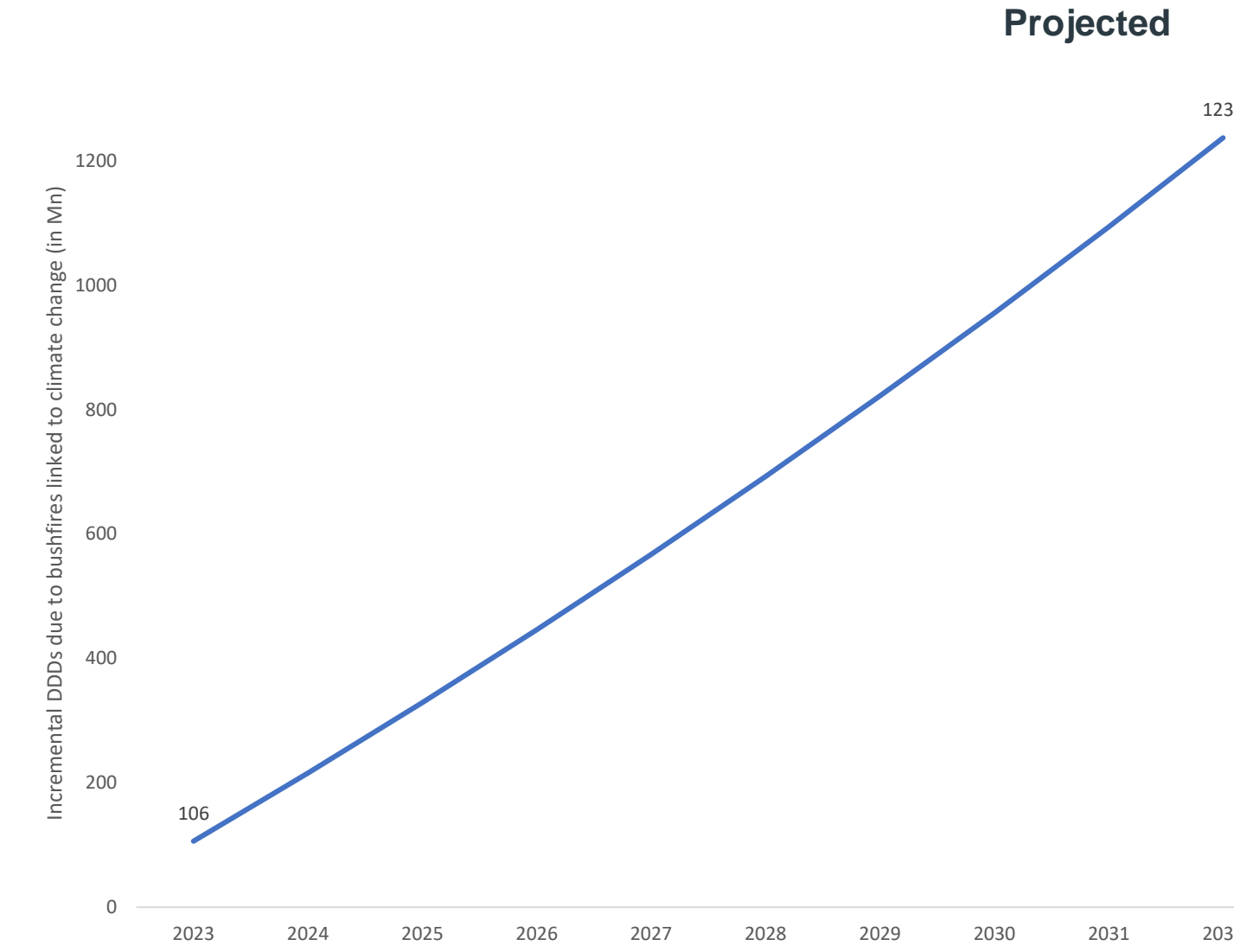
- To understand potential anticipated change in medicine use by therapy area, the current use was analyzed for developed countries from IQVIA MIDAS. Next, a literature review was conducted to understand the impact climate change is having on different disease and therapy areas. Existing evidence on the impact of climate change varied by disease area and was not always quantifiable. However, based on the literature, the therapy areas were placed into high-medium-low categories based on their estimated impact from climate change. This analysis is intended to be an illustrative representation, and much further analysis is needed to conduct a thorough projection of the impact of climate change.

Results (Cont'd)



Modelled increase in respiratory agent use due to bushfires in Australia, 2023-2032

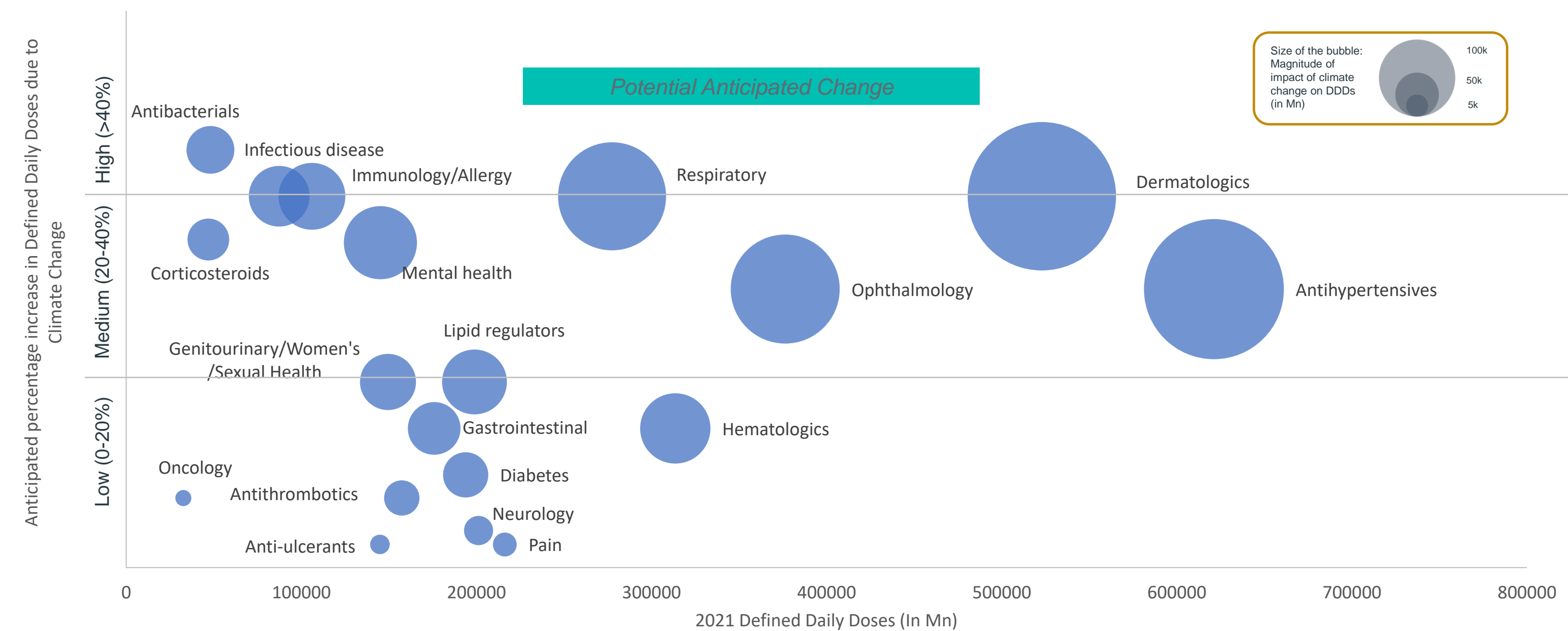
Exhibit 5: Modelled Respiratory Agent Volume for Australia in defined daily dose (in Mn), 2023-2032



- Utilizing the preliminary data on use of respiratory agents during the 2019-20 bushfires, respiratory agent use is expected to increase by an additional 5.5% in Australia overall between 2023 and 2032 due to bushfires linked to climate change
- This increase due to bushfires and poor air quality results in 1.2Bn additional DDDs in Australia
- Similar increases may take place in other regions which are prone to wildfires such as California. Further research is needed to understand the impact of respiratory agent use in other regions
- Most of these incremental DDDs of respiratory therapeutics will be dispensed by retail pharmacists

Potential anticipated change in medicine use linked to climate change across therapeutic areas

Exhibit 6: Developed markets volume (prescription and OTC drugs) in defined daily doses 2021 and projected incremental impact from climate change (Illustrative)



- Climate change is likely to impact several therapy areas through acute and long-term events. Health impacts associated with climate change are still being studied and initial literature suggests a medium to high degree of impact in certain therapy areas such as infectious diseases, respiratory conditions, cardio-metabolic diseases, dermatology, ophthalmology and others
- This effect of climate change will likely lead to increasing medicine requirements which will vary by region

Results



Exhibit 1: Respiratory agent volume growth in Australia from 2017/2018 levels indexed to other developed countries

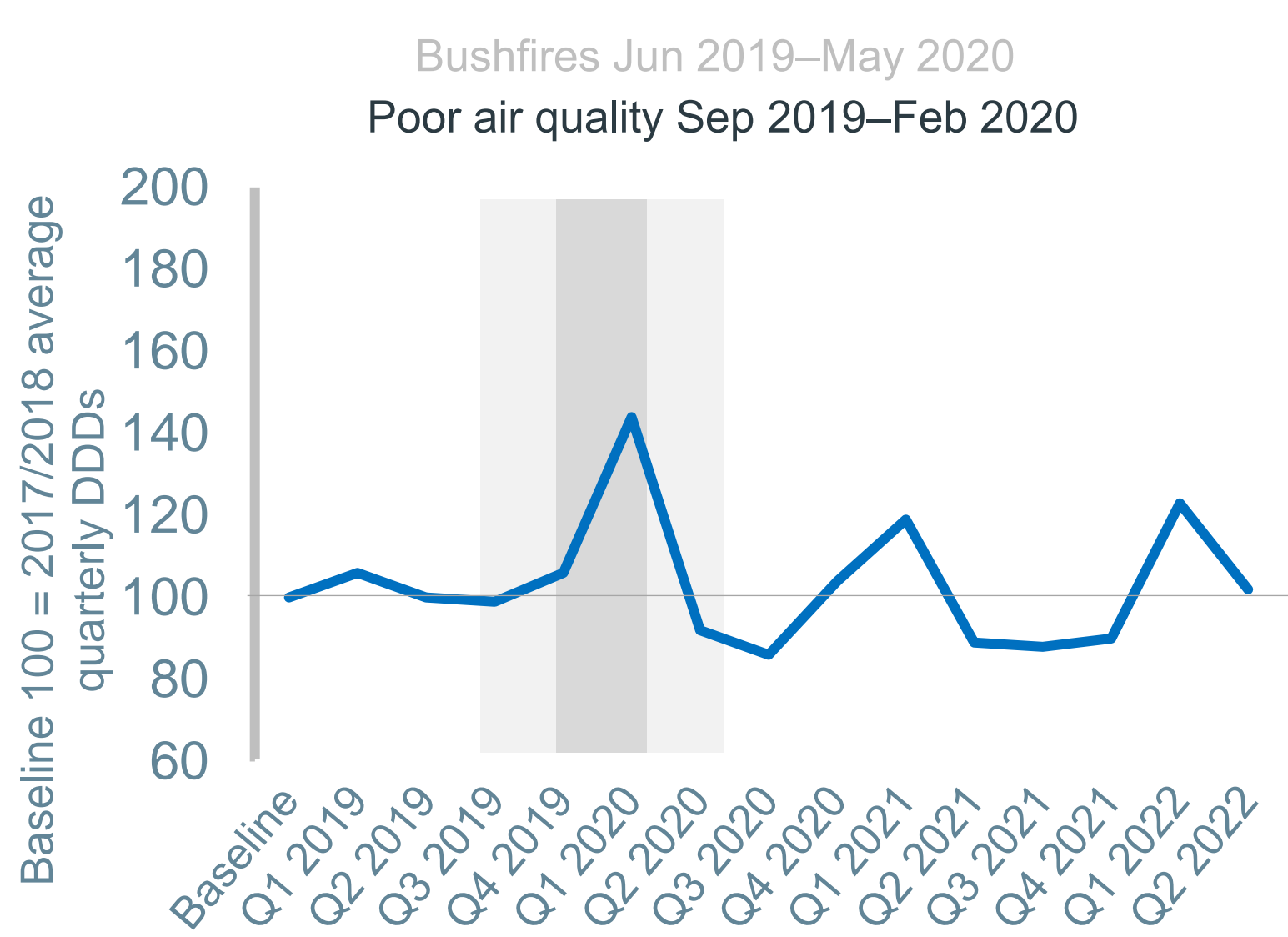


Exhibit 2: Prescription volume in Puerto Rico

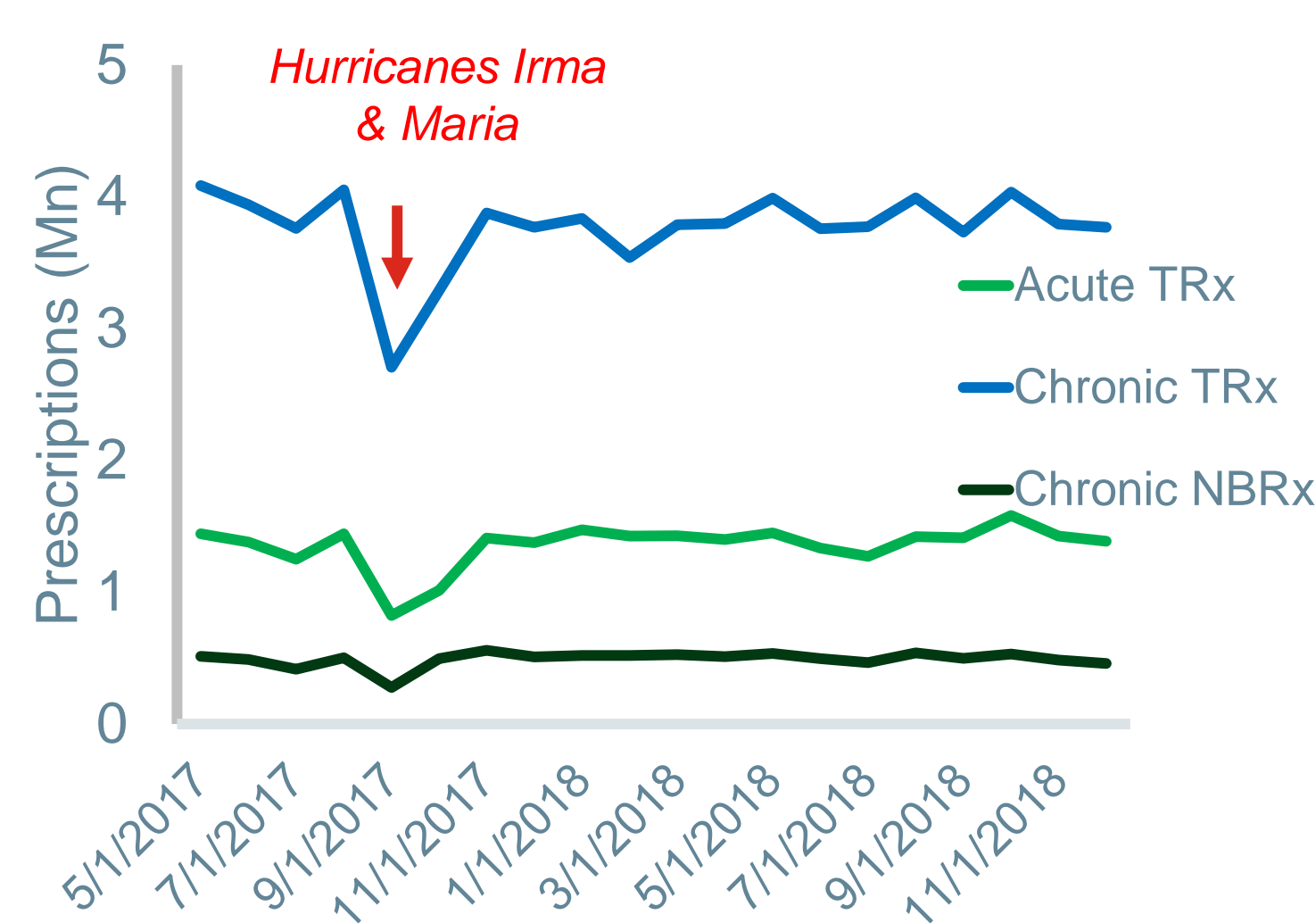


Exhibit 3: Anti-infective volume use in Pakistan

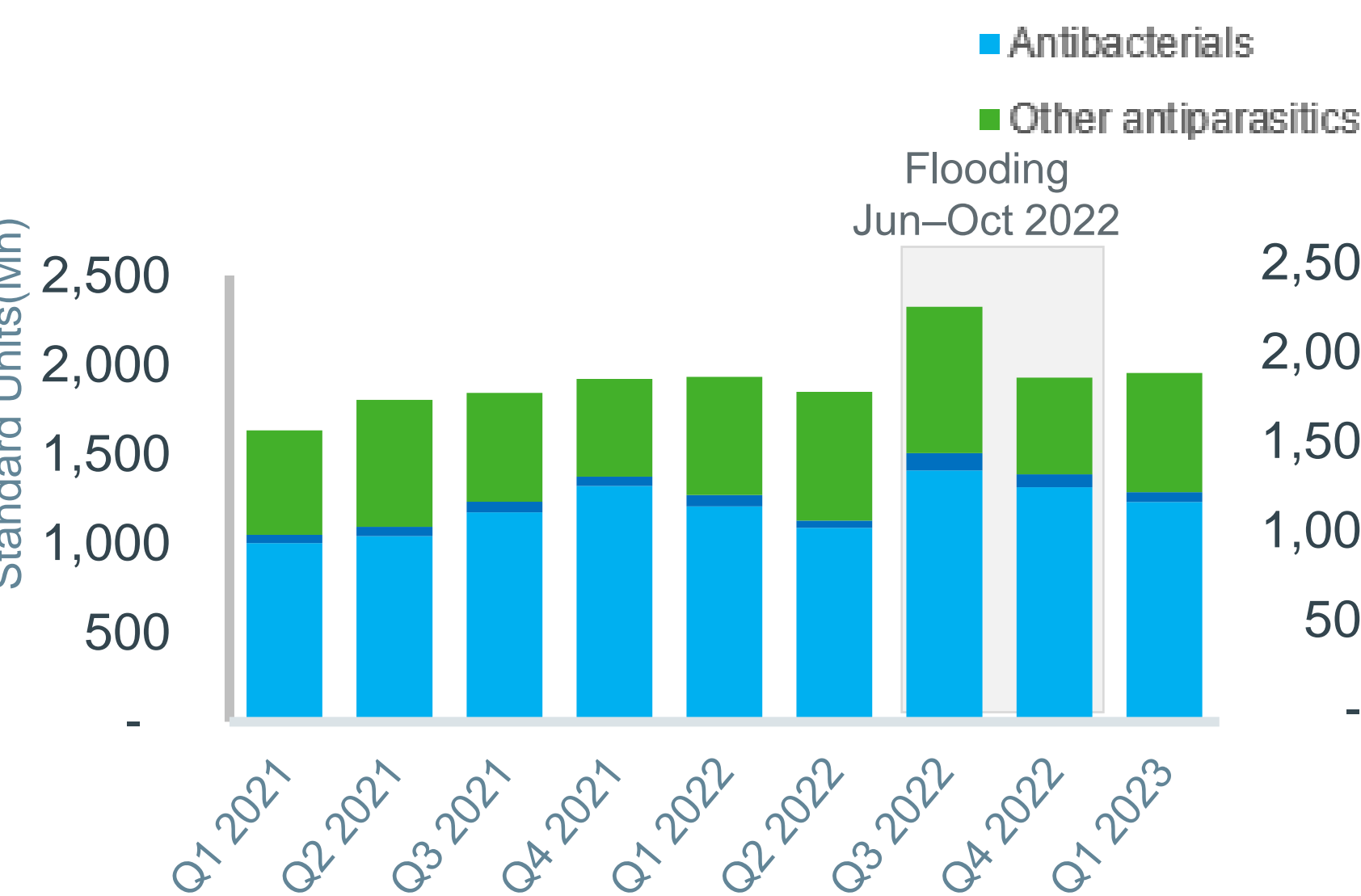
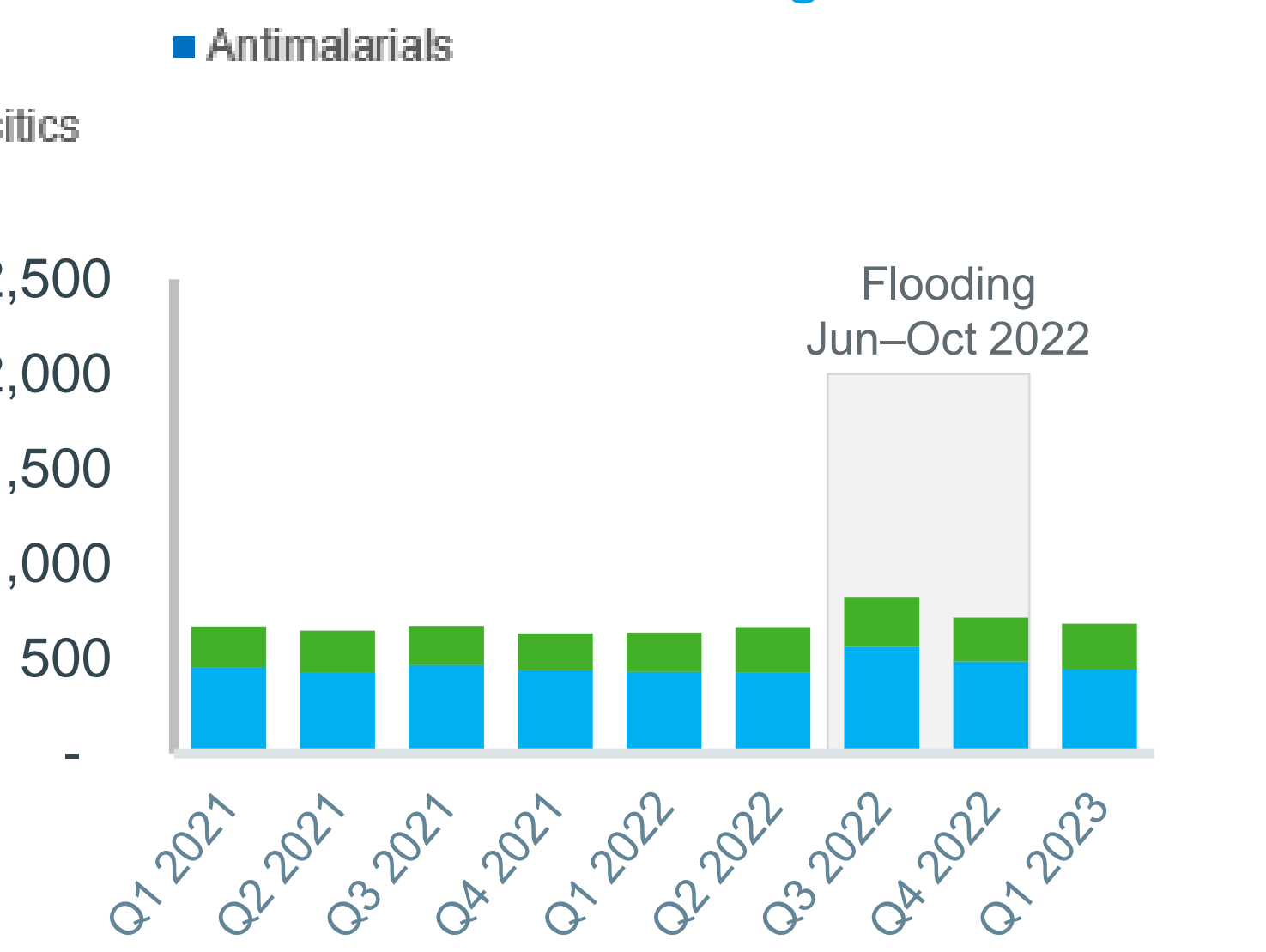


Exhibit 4: Anti-infective volume use in Bangladesh



- Acute events that are impacted by climate change such as floods, hurricanes and bushfires have had a measurable impact on medicine use
- Preliminary data indicate an increased use of respiratory agents following an acute weather event such as wildfires in Australia. Respiratory agents increased by 44% more compared to other developed countries in Q4 2019
- Use of anti-infectives increased 26% over the prior monsoon season during the 2022 floods in Pakistan. Similarly, in Bangladesh, anti-infective use grew 22% in 2022 over the prior monsoon season.
- Additionally, Hurricanes Irma and Maria impacted access to both acute and chronic medicines in Puerto Rico signaling the need for emergency preparation that will enable patients to receive critical medicines in a timely manner.

Abbreviations: TRx= total prescriptions; NBRx= new to brand prescriptions
Notes: Other developed includes the 9 other largest developed markets excluding Australia: Canada, France, Germany, Italy, Japan, South Korea, Spain, UK, and U.S. Growth is compared to same quarter in prior year. Australia index to 2017/2018 levels indexed to other developed index to 2017/2018 levels to adjust for COVID-19 stockpiling impacts in Q1 2020.
References: [1] EPA.gov: Climate Change Impacts, accessed Aug 2023; [2] Ademi et al, *Curr Probl Cardiol* 2023; [3] Oldenborgh et al, *Nat. Haz Earth System*. Sci 2021

Discussion

- Pharmacists have a vital role to play in light of the rapid shift of global medicinal needs that may be linked to the acute and/or long-term healthcare events resulting from climate change. Their interactions with patients, prescribers and other stakeholders will need to adapt over the next few years in anticipation of a more profound set of changes that can be expected.
- Pharmacies and pharmaceutical scientists have multiple roles to play in addressing the next global crisis, including:
 - Contributing to the global disease mapping and surveillance activities. Surveillance is needed to track the unevenly distributed global disease burden and how this will be affected by changes in temperature, rainfall, air quality and other consequences of climate change. Pharmacies will also be on the front-lines of identifying and tracking the emergence of new pathogens as climate change brings pathogens closer to people, including mosquito and other vector-borne infectious diseases.
 - Responding to changes in disease prevalence across climate zones to ensure availability of appropriate medicines. As the incidence and prevalence of both communicable and non-communicable diseases shift due to climate change impact, pharmacies will be tasked with ensuring the right medicines and formulations are available in the right parts of a country and world according to the new distribution of disease. Pharmacotherapy expertise will also be needed as patients look to manage their health changes that are directly or indirectly caused by climate change.
 - Providing vaccination and immunization services to patients. Additional potential pandemics are expected to emerge over the next decades, precipitated in part by zoonotic transfers and new pathogens as populations of animals, insects and humans undertake new movement patterns. As with the COVID-19 vaccines, community pharmacies will play a critical role in providing widespread access to vaccines that will be a critical part of the response to these new threats to human health.
 - Protecting the supply chain. As climate change precipitates population shifts, new demands for specialized storage and handling of medicines, and protection from extreme weather events, pharmacies will have a major role to play in protecting the integrity of the supply chain, in conjunction with pharmaceutical wholesalers, manufacturers and other stakeholders. Anticipating surges in demand to ensure patients can be fully supported will require new skills and forecasting capabilities for pharmacies in both hospital and community settings.
- Further research is needed to understand the evolving medicine demands as the climate crisis continues. Impact of climate change needs to be assessed by region and climate zones, and further studies are needed to establish changes in epidemiology, as well as whether medicinal needs can be met with existing drugs or if new medicines will need to be developed. The pharmacy sector will need to be prepared to deliver diagnostics, therapeutics, vaccines and medical care in an optimal manner to the patients. This will require significantly closer engagement between pharmacists and other healthcare professionals, as well as with public health leaders and payers to ensure their role in responding to this global crisis is well defined, understood, and supported.

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