



*March 16th,  
2020*

**Public Note 3:**

## **Analysis of COVID-19 Contagion & Outlook**

This report focuses on the ongoing epidemiological trajectory of the coronavirus COVID-19 disease, with a particular focus on what measures are most likely to encourage business continuity of operations and spur a shift in the disease's trajectory outside of China.

In addition to a review of market responses to emerging data, data analysis of the trajectory of infections by jurisdiction is provided.

### **SUMMARY**

**In our initial public tear sheet of Feb. 13**, we highlighted that the epidemiological trajectory of COVID-19 cases in China had turned a corner and that **we saw risk turning to a spike of cases internationally**. That spike emerged initially in NE Asia (not SE Asia, as we had identified as a high-risk region) and then subsequently in Europe and the Middle East (notably Italy and Iran).

The trajectory of COVID-19 cases stabilizing in China and risk shifting to other nations has since accelerated. **There are currently almost no new infections from domestic community contagion within China**. Of the diagnosed cases of COVID-19 in China, **97% of all cases outside of Hubei have already been classified as fully recovered**.\*

- **85% of active COVID-19 cases are now outside Mainland China**
  - 64% of these active cases outside China are in Europe
    - of which 45% are in Italy
  - 16% of active cases outside China are in the Middle East
    - of which 82% are in Iran
  - 12.4% of active cases outside China are in NE Asia
    - of which 92% are in South Korea
  - only 4% of active cases outside China are in the United States

### **NE ASIA OFFERS OPTIMISM**

**The success of China in defeating the COVID-19 threat**, and progress over the last ten days in markedly flattening the infection curve elsewhere in NE Asia, **offers significant grounds for optimism regarding the ability of COVID-19 to be overcome rapidly as a debilitating public health threat**.

Our assessment is that this rapid shift of COVID-19 infections to outside of East Asia reflects the success of policy measures in East Asia vs. a failure to implement similar measures elsewhere. **This report focuses on best practices as identified in East Asia**.

*Such policies are most likely to limit the current global health and economic threat. They differ substantially from what is currently being implemented in the United States.*

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\* All statistics are based on reported data as of March 14, 2020. We acknowledge doubts regarding the full veracity of data in multiple jurisdictions but believe critical trends in data are definable.

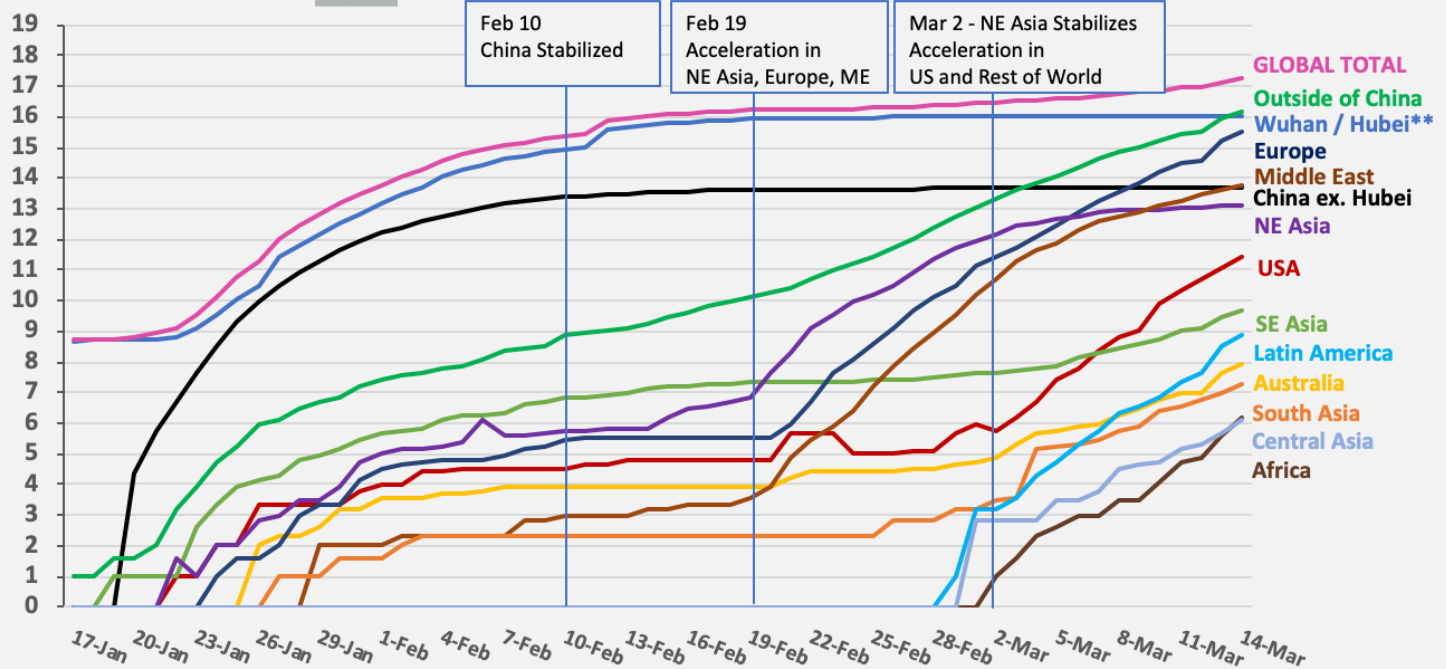


Number of Cases  
Log Base 2



### Coronavirus Infections Rate of Doubling

each increase of 1 represents a doubling of cases



### FACE MASKS EMERGING AS CRITICAL

Perhaps the largest difference in approaches is the widespread use of face masks for COVID-19 mitigation in East Asia vs. their lack of use in the US and other Western nations. Our assessment is that **universal face mask usage represents a critical shift that will offer dramatic benefits in the US from both an epidemiological and business continuity perspective.**

Policies focused on encouraging face mask production (including capital investments and purchase guarantees) have been a critical element of success in East Asia. Our assessment is that **such policies should be rapidly implemented in Europe and the US – as should programs to distribute face masks to high-risk populations and areas.**

*Face mask implementation represents the key not only to minimizing the extent and severity of COVID-19 infections but also enabling business continuity. (discussed in detail below)*

### CONTINUED DETERIORATION OUTSIDE EAST ASIA

**Our second public note of March 1 highlighted the rapidly deteriorating COVID-19 epidemiological trajectory globally and the risk of a similar deterioration in the US.** It emphasized the need for substantially tightened international travel restrictions. Though significant travel restrictions have since emerged, our current assessment is that they will need to continue to tighten and will be extended to apply internally within jurisdictions.

In that March 1 note, we highlighted how **the market sell-off which began on Feb. 20<sup>th</sup>**





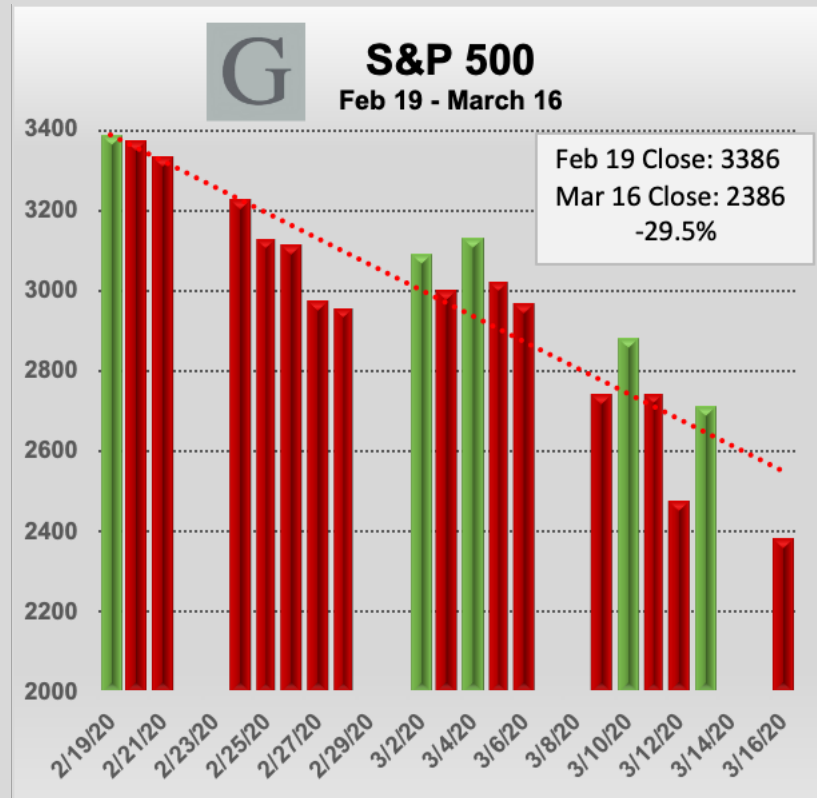
coincided with a global deterioration of the epidemiological trajectory of COVID-19 cases. We advised, however, that significant further epidemiological deterioration in the US did not yet appear priced into markets.

**UNDERSTANDING  
THE  
MARKET  
RESPONSE**

The concerning epidemiological trends and potential trajectory highlighted in that note have since developed rapidly in the US, and the market has followed a cyclical pattern we suggested was likely to emerge:

- **equity market deterioration** in tandem with any further epidemiological deterioration in the US and globally,
- **counterbalanced cyclically** by policy expectations of economic stimulus and the implementation of aggressive policy to stabilize the epidemiological trajectory

This pattern continues, but volatility in policy responses has in itself become a driver of market volatility – notably the sudden Fed 100-basis-point rate cut of March 15th.



**PHASED  
PROGRESSION**

Since our March 1 note, a further shift in market dynamics has emerged. To understand this evolving shift in risks - and to best assess the different policy measures needed to address them - the market selloff that began Feb 20 can be understood in terms of 3 progressive phases:

- **PHASE 1:**  
a recognition that the **international impact of COVID-19 was likely to**



**counterbalance the bullish factors** driving positive momentum coming into 2020

- PHASE 2:  
a recognition that the **epidemiological trajectory in the US was significantly more negative than had been expected**, leading to a growing appreciation that policies to address this trajectory were likely to be severe and have a significant macroeconomic impact
- PHASE 3:  
a recognition that the **significant suspension of economic activity required to fight COVID-19's epidemiological trajectory in the US could spark a liquidity crisis** in multiple sectors of the economy as cash flows evaporated

Stemming and reversing the market losses suffered thus far depends upon policies which address each of these underlying phases: international; US epidemiological; and liquidity.

*This report covers each of these phases.*

## LIQUIDITY CRISIS PHASE

As the above phased progression has developed, **the single greatest threat that has emerged – greater than the health threat of COVID-19 itself – is the potential for a full-blown market liquidity crisis to take hold.** This threat is driven by:

- liquidity pressures related to a dramatic evaporation of cash flows in sectors of the economy hit by COVID-19 mitigation measures
  - initially in the travel and services sector (ex. Boeing, -62% since Feb 19), but now extending to broad sectors of the economy as the prospect of “sustained social distancing” emerges
- a major shift to risk-off assets as overall projections of economic growth are rapidly revised downward and institutions set aside capital to deal with defaults from COVID-19-spurred liquidity issues

The strength of these liquidity pressures is intimately linked to the scale of the COVID-19 challenge and the duration that COVID-19 preventive actions impact economic activity. This makes **effective shifting of the epidemiological trajectory in the US of primary importance.**

**The potential for COVID-19 to spark a liquidity crisis that takes on a life of its own** due to structural financial dynamics and vulnerabilities within the US system is significant. However, even if an immediate liquidity crisis is averted and COVID-19 issues are resolved, **financial dynamics that have developed over the last two weeks will have a legacy effect that is likely to long survive the virus.**

*This may be particularly pronounced in terms of sovereign credit and monetary policy.*

## IMMENSE STIMULUS IN PIPELINE

Given the immense stimulus measures being discussed to counter COVID-19 dynamics, inter-meeting actions by the Federal Reserve in the first two weeks of March (including a 50-basis-point cut on March 3; and another 100-basis-point cut on Sunday March 15) are **noteworthy not only for immediate effects but in terms of implications for any further policy measures that might be needed to stimulate the economy hereafter.**



**RECENT FED  
ACTION  
AGGRESSIVE**

Fed actions have been pre-emptive in terms of counterbalancing the negative direct macroeconomic impact of COVID-19 on the economy (i.e. Phase 2 of the market selloff framework above). They are also, however, designed to **stabilize financial markets by injecting liquidity and preventing a “Minsky moment” from developing** (i.e. an acceleration of Phase 3 in the market selloff framework above).

The potential for a liquidity crisis to accelerate is significant given the timing of the COVID-19 impact. It comes **at the tail end of an exceptionally extended business cycle**, during which levels of global leverage have risen to historic highs alongside asset prices.

To counteract macroeconomic pressures and stabilize the financial system, the Fed’s aggressive measures have included:

- a 150-basis-point total reduction in the Fed Funds rate since March 1 to a targeted lower bound of 0%
- launching of a \$700 billion quantitative easing program focused on purchase of Treasuries and Asset-backed securities
- additional overnight repo operations of \$500 billion

**Even amidst the scale of the recent equity market decline, this is an exceptional amount of monetary stimulus.** It comes amidst financial conditions that have tightened but are still relatively loose by historical measures. For reference, the table below highlights the extent to which the corporate bond market has tightened since Feb 19<sup>th</sup>.

US CREDIT CONDITIONS	Feb 19th	March 15th	GFC Extreme
Fed Funds Lower Target	1.5 %	0%	0%
AA Corporate Spreads	0.56%	1.49%	5.15%
BBB Corporate Spreads	1.31%	2.84%	8.04%
CCC Corporate Spreads	9.84%	15.05%	44.29%

Even prior to the 150 basis-point cut in the Fed Funds rate, the increase in borrowing costs for AA and BBB corporate borrowers due to **widening spreads had been offset by decreasing Treasury yields** (10 year 0.73% as of March 16). CCC spreads have widened more substantially, but credit spreads overall are nowhere near the level they widened to at the height of the Global Financial Crisis (2008-2009).

Despite the rapid recent drop in US equity markets, tightening of credit conditions, and market liquidity concerns, **financial conditions currently appear nowhere near as tight as they were at the height of the 2008-2009 Financial Crisis.**

The scale of any liquidity crisis that might continue to evolve is directly related not only to financial structural pressures and the potential for a “Minsky moment” to emerge.

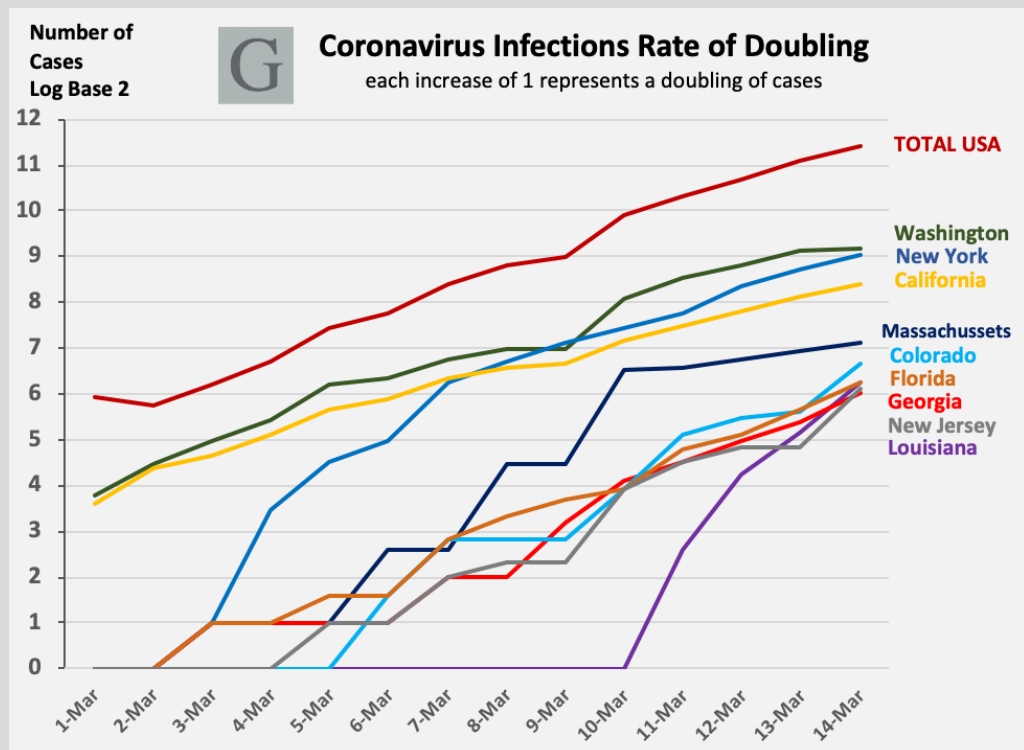
**The speed with which COVID-19 mitigation measures can be effectively implemented in a way that minimizes the impact on the macro economy and the duration of cash flow evaporation - thus reducing liquidity pressures - is critical.**



*The remainder of this report is focused on the COVID-19 epidemiological trajectory and critical policy recommendations to stabilize and reverse that trajectory.*

## KEYS TO FIGHTING THE EPIDEMIOLOGY OF COVID-19

Since our March 1<sup>st</sup> note, **the United States has advanced rapidly along the epidemiological trajectory** outlined in that report, moving from a few isolated clusters to more broad general transmission. From 75 cases as of March 1<sup>st</sup>, the US has over 2,700 cases as of March 14<sup>th</sup>. These cases have spread across the United States, but the most serious clusters continue to be in just a few states: Washington, New York, and California; and to a lesser extent Massachusetts, Colorado, Florida, Louisiana, New Jersey, Georgia, and Illinois.



As we noted in that March 1<sup>st</sup> analysis, every delay in implementing aggressive international and now domestic travel restrictions and monitoring has an outsized effect in terms of the cost of subsequent actions required.

**“SOCIAL  
DISTANCING”  
IS  
NOT ENOUGH**

**The policy response thus far has been insufficient in terms of what will be needed to reverse COVID-19’s epidemiological evolution.**

**The primary strategy being implemented to stop this epidemiological trajectory is “social distancing.”** Guidance as of 16 March indicates that individuals should avoid gathering in groups of more than 10. Work and social gatherings have been broadly suspended across the economy in favor of remote work from home. Restaurants, bars, and



other social establishments have been ordered closed in multiple jurisdictions (unevenly, but typically concentrated in areas where outbreak has already emerged).

**This approach does not incorporate best practices as have been demonstrated to effectively stop transmission in East Asia.** Social distancing can be expected to slow transmission beyond what would have been likely without any such efforts. But it is sub-optimal both in terms of halting COVID-19 contagion and in terms of its benefits relative to the economic hit entailed.

**This approach and other events during the last week as relate to testing have parallels with what were some of the major mistakes in East Asia that led to rapid spikes in cases:**

**NEGATIVE PARALLEL 1:**

- During the initial Wuhan outbreak, as the health system was faced with larger numbers of individuals seeking treatment and testing for symptoms than could be handled, authorities advised potential patients to remain at home and self-isolate. **The result was a dramatic spike in the development of infections as “family clusters” emerged** – infected individuals staying at home infected the family members with whom they were in close contact. This led to a swift spike in case numbers both within families and amongst close personal contacts.
- Policies being pursued in the US that focus on “social distancing” from strangers and limiting social gathering to groups of 10 or less are not only likely to be insufficient in keeping COVID-19 cases down. **These policies have significant parallels with the above key error made in Wuhan.** We anticipate a **high potential for current guidance to actually lead to a rapid expansion of cases due to family clusters of infection developing.**

**NEGATIVE PARALLEL 2:**

A second critical error that appears to have been made relates to testing – and specifically the large queues of individuals waiting for testing at airports.

- **A key issue that has caused infection numbers to rise dramatically in multiple jurisdictions has been people infected with COVID-19 intermingling with others during the testing process.**
- In China, this related to both a slow testing process and especially crossover with the flu season as the novel coronavirus began to spread. All individuals who presented flu-like symptoms were forced to wait in close proximity for COVID-19 testing.
- This led to a dramatic spike in COVID-19 cases as individuals who were only infected with influenza were infected with COVID-19 while waiting.
- **This situation has significant parallels with what has been reported in terms of large clusters of incoming travelers from overseas waiting for examination at US airports.**

**FAMILY  
CLUSTERS  
LIKELY TO  
DEVELOP**

**APPROACHES TO  
TESTING  
COUNTER-  
PRODUCTIVE**



- The result is likely to be a spike in infected individuals and an expansion of infection node clusters.

**Other than for individuals at highest risk of severe complications, a focus on complex and definitive COVID-19 testing is highly misplaced.**

## OPTIMAL TESTING APPROACHES MINIMIZE DELAYS

### FEVER SCREENING OPTIMAL

East Asian best practices have demonstrated that screening for fever is an optimal means of quick diagnosis to prevent infectious individuals from carrying COVID-19 from jurisdiction to jurisdiction. This can be done with minimal delay in public and at public transit points, which limits the amount of interaction between potentially infected individuals and others.

### TREAT SYMPTOMATIC AS IF INFECTED

As fever is an initial symptom of COVID-19, this best practice from Asia of screening for fever highlights another best practice that has proven critical in thwarting COVID-19's epidemiological spread:

- **treat all individuals demonstrating COVID-19 symptoms as though they were COVID-19 positive**

**The best practice initial intervention for anyone infected with COVID-19 is ensuring they immediately and at all times wear a face mask.** This prevents the infected individual from further contaminating the environment around them with coronavirus-infected body fluids (which are expelled through their mouth and nose unless covered by a face mask).

### FACE MASKS!

The simplicity and effectiveness of treating any individual that shows symptoms of COVID-19 with the immediate intervention of having them don a face mask highlights **the critical factor we see limiting effective thwarting of the COVID-19 virus – an insufficient supply of face masks.**

Per best practices implemented in East Asia, any individual demonstrating symptoms of COVID-19 – including those identified in public screenings with even minor fevers and also those who develop symptoms in their home environment – should immediately be provided a face mask.

*Confirming whether a person showing symptoms is actually infected via a formal COVID-19 test is only critical for those at risk of severe complications.*

### HIGH RISK POPULATION TESTING

**Elderly and other individuals at high risk for severe COVID-19 complications should determine if they have COVID-19 via a formal test as soon as any symptoms appear.** These individuals are most likely to benefit from early intervention and are at greatest need of health system services. Early intervention to prevent severe cases from developing has the added benefit of limiting the overall burden on the health care system.

**For all other individuals, testing serves minimal clinical purposes initially and in fact**





**can be counterproductive from a public health perspective due to the risk of further contagion during the testing process.**

Testing may offer some peace of mind in terms of the uncertainty of knowing whether symptoms are COVID-19 related, but **there are very few clinical interventions that can be expected for individuals who show COVID-19 symptoms but are not at high risk of severe complications.**

*Any individual with COVID-19 symptoms who is not at high risk of severe complications should simply assume they have COVID-19 and adopt the appropriate infection and treatment protocols.*

This highlights a key benefit of the US epidemiological trajectory taking place at the end of the flu season rather than at its height – the relatively low likelihood that symptoms are from the common flu vs. COVID-19.

**Treatment protocols for low risk cases of COVID-19 are similar to how someone with the flu would be treated:** ensure proper sustenance and treat symptoms using over the counter remedies.

**Contagion prevention protocols should be much more severe based on assumption of COVID-19 infection.** This includes constant wearing of a face mask as well as isolation in a dedicated room that minimizes interaction with other individuals in a household.

*Failure to adopt such protocols is likely to lead to the develop of a family infection cluster.*

## SYMPTOMS TREATMENT

## PROTECTING HIGH RISK FACTOR INDIVIDUALS

Individuals at highest risk for severe complications from COVID-19 should protect themselves and be protected from others through strict protocols.

This is not only to limit these individuals' personal risk of severe complications, permanent lung damage, and death (approx. 1 out of every 8 individuals suffering severe complications from COVID-19 has died). **Minimizing the incidence of severe cases is also critical to prevent the health care system from being flooded.**

**Strict infectious disease protocols that include wearing a mask and severely limiting public interaction are appropriate for high risk individuals for the above reasons.**

Given the extreme contagious nature of COVID-19, isolation and strict protocols to prevent contact with family members who might be infectious carriers also makes sense.

*A best practice community response is to have high-risk individuals remain essentially quarantined at home while young individuals of low risk run errands and deliver essentials to them.*

**When COVID-19 is prevalent in an environment, best practices require following infection protocols any time seemingly healthy individuals (who may be asymptomatic carriers) interact with high risk-individuals.** This includes all parties



wearing masks.

This approach of healthy individuals maintaining the economy running even as they might become infected by COVID-19 with minimal personal consequences – while high-risk individuals remain isolated from exposure to the virus – **offers a potential path to developing “herd immunity.”**

## HIGH RISK FACTORS

Advanced retro-viral medicines and other aggressive clinical interventions for COVID-19 infections are reserved for the most at-risk populations. These include:

- elderly individuals, particularly those with underlying health conditions
- individuals with compromised immune systems
- individuals with compromised lungs
- individuals with other serious health issues

A basic understanding of the clinical progression of COVID-19 – as covered in detail in our March 1 note – can help understand why the above categories of individuals are at high risk:

- individuals with compromised immune systems are less likely to be able to prevent the initial process by which COVID-19 replicates itself
- once COVID-19 virus levels have reached critical levels, this compromises the infected person’s lung functions, exacerbating any pre-existing lung issues
- as compromised lungs begin to fill with fluid during COVID-19’s clinical progression, this results in the lungs having a significantly reduced ability to transfer oxygen into the blood stream (or carbon dioxide out of the blood stream), which limits the availability of oxygen for other internal organs and exacerbates underlying health conditions

Elderly individuals have proven at high risk due to a confluence of the above factors. However, COVID-19 has had severe complications in a wide range of ages.

## TRACKING CASES REMOTELY

**Treating COVID-19 symptoms in low-risk individuals like a bout of the flu– albeit with infectious disease protocols of a much higher level to minimize environmental contamination - does not mean there is no benefit in contacting health authorities when symptoms appear.**

In part, contacting health authorities helps ensure a presumed-infected person might best understand how at-risk they are, as well as how to properly pursue treatment and infectious disease protocols.

**Contact with public health authorities can also ensure that the disease’s progression is understood and monitored for severe complications.** Should severe complications develop, it is critical from a clinical and logistical aspect to have a clear understanding of actions to be taken for treatment of severe symptoms.

Implementation of such “tele-diagnosis and treatment” systems is already underway in many jurisdictions. They should be expected to be rolled out and centralized in terms of



data exchange for optimal benefit, per best practices as established in East Asia.

**A practice that was helpful in East Asia was aggressive testing to identify and isolate clusters of cases.** This helps explain why there has been a media emphasis on headline testing numbers. There is, however, an important distinction between targeted testing driven by the health sector and mass testing of everyone who fears they have COVID-19.

**Treating presentation of COVID-19 symptoms as a presumptive case and reporting cases via tele-medicine can enable health officials to identify potential cluster development,** even without testing-confirmed diagnosis.

Having such systems in place can allow health officials to **identify areas where COVID-19 might be prevalent as multiple cases emerge and focus confirmed testing and other resources on high risk individuals and those infection nodes.** This was an effective best practice in East Asia.

*Such contact will also allow health authorities to distribute masks for their most efficient use – preventing infected individuals from contaminating their environments.*

**FACE MASK  
DISTRIBUTION  
CRITICAL**

In all of the above scenarios, **a critical factor which has been central to best practices in East Asia is the widespread use of face masks to prevent COVID-19 transmission.**

The use of face masks has been minimized in the US and other Western countries outside of clinical hospital settings. Our assessment is that **the minimization of face mask usage is a major strategic error that is resulting in dramatically increased risk of an accelerating COVID-19 epidemiological trajectory in the US.**

**FACE MASK  
PRODUCTION  
CRITICAL**

*Policies which encourage a massive increase in face mask production are a critical element to fight COVID-19 in the US and globally.*

## **WHY FACE MASKS ARE ESSENTIAL**

As noted in our March 1 discussion of clinical characteristics of COVID-19, at a fundamental level the virus can be understood as targeting the lungs and using infected lungs to spread itself.

- **Preventing material from exiting an infected human via the nose and mouth is the primary action that can be taken to stop transmission.**
- **Preventing the virus from entering and infecting a human via entry through the nose and mouth is the next most effective means to stop viral transmission.**

*Both of these actions are accomplished through the effective use of face masks.*



**DEVELOPED  
CONVENTIONAL  
WISDOM  
MISLEADING**

Current public health guidance has focused on hand washing - to prevent infected body fluids in an environment from being transferred to your nose, mouth, or eyes by your hands.

- this addresses only one risk element
- another key transmission risk is inhaling infected respiratory droplets before they settle on environmental surfaces
  - this risk increases substantially as the number of infected individuals increases in any enclosed space

Prevailing conventional wisdom that minimizes the importance of face masks for reducing inhalation risk is based on:

- earlier guidance from health authorities that healthy individuals could gain little benefit from wearing face masks
- analysis that the size of the COVID-19 virus is so small that common masks would be unable to filter it

*These assertions are misleading, particularly as COVID-19 prevalence increases.*

**SUPPLY  
IS THE ISSUE**

Earlier guidance issued by health authorities was - and continues to be - driven by a desire to most efficiently use what is a recognized limited supply of face masks.

**Given a limited supply of protective gear, the priority of health authorities has been ensuring sufficient essential gear is available within the health care system.**

- Infectious disease protocols require the voluminous use of protective masks, which are discarded after a single use to ensure a mask does not become a vector of contagion.
- Any infection of a health care worker can have significant systemic and treatment capacity effects within a health care system that already faces significant pressures.

**MASK DEMAND  
POISED TO  
BOOM**

Our assessment is that **increasing the supply of masks should be a primary focus of the public and private sector.** This is in part because a shift in the epidemiological trajectory of COVID-19 is poised to lead to a much greater (and justified) demand for masks outside of the hospital setting.

Maximum efficient use of a limited supply of masks requires a careful balance of priorities that considers not only prioritizing protection of health workers involved in treatment and diagnosis of COVID-19. Using masks to limit the load of infected patients on the health care system is another optimization priority.

**The single most effective way to stop the virus is by halting environmental contamination by infected individuals.**

This is achieved most readily by implementing mask usage to prevent respiratory droplets and mucous from exiting the system of infected individuals.



- “social distancing” does not have the same impact
- hand washing has no impact on preventing environmental contamination

*The fundamental problem with COVID-19 is that individuals who are infected but relatively asymptomatic can be highly contagious.*

## PREVIOUS GUIDANCE TO BE UPDATED

**Previous guidance that masks offered little benefit to healthy humans was based on when there was a low prevalence of COVID-19 in the US environment.** With little risk of exposure to COVID-19 or of being an unwitting carrier, there was little reason to encourage healthy humans to wear masks. In this context, concerns about the availability of supply for high risk medical personnel outbalanced the return to random individuals of purchasing and wearing masks.

Due to a failure to instill sufficient controls and minimize the introduction of COVID-19 clusters within the US from abroad, the environment is rapidly changing. As the prevalence of COVID-19 in multiple communities increases, **the current situation is significantly different than earlier dynamics where the benefits of seemingly healthy individuals wearing a mask was limited.**

*Solving supply and distribution issues related to face masks should be a critical public and private priority.*

## KEYS TO STOPPING COVID-19

Based on best practices established in East Asia, our assessment is that the current keys to halting the spread of COVID-19 are:

- minimizing travel of infected individuals to communities where the virus is not prevalent (achieved through travel restrictions and monitoring)
- extensive usage of masks throughout environments/communities where COVID-19 is prevalent

The importance and likelihood of travel restrictions was covered at length in our March 1 note.

Given the significant misinformation and cultural and institutional resistance to mask usage, further clinical details on why mask distribution is essential is provided here.

Epidemiological data from outside the US that indicates both the scale of looming demand for masks and the scale of international financial and macroeconomic challenges concludes this report.

## ADDRESSING A MAJOR STRATEGIC ERROR

Our assessment is that, **in striving to defend the available stock of masks for health care workers, health authorities have fostered a situation where strain on existing resources is likely to grow much more quickly:**

- the increased prevalence of infection is poised to drive a much greater need and demand for masks in communities where COVID-19 is now a prevalent threat

Fundamentally, the usage of masks should be understood in terms of minimizing exposure to environmental contamination. The wearing of masks by infectious individuals limits the introduction of contaminated body fluids in an environment. The wearing of masks by



non-infected individuals, however, also reduces their exposure to environmental contamination. The net is a dramatic reduction in environmental infection risk.

**MASKS  
OFFER  
BUSINESS  
CONTINUITY**

**An environment that has been sanitized and where only individuals who are wearing masks are allowed to enter is a much lower risk environment for COVID-19 to spread.** This is the potential key to business continuity and minimizing the economic disruption of COVID-19.

These principles embody how environmental contamination and contagion is prevented in hospitals, where continuity is essential for public health. In our assessment, **this approach offers the optimal chance of simultaneously minimizing COVID-19 infections and also minimizing the economic impact of COVID-19.** Universal mask usage has the potential to allowing individuals to continue to work in close proximity, being both far more effective from a public health perspective than self-distancing and also entailing significantly less economic disruption.

**The existing mask supply is insufficient to allow environments such as the above to be set up on a wide scale beyond hospitals.**

**RISK  
VS.  
REWARD**

An environment:

- that has been sanitized
- where all individuals are wearing masks
- where all individuals have been screened for fever prior to entry

is **not a zero-risk environment.**

It is, however, **a relatively low risk environment for COVID-19 infection**, particularly if all individuals effectively practice infectious disease protocols.

It also **offers potential significant benefits** in terms of the amount of economic and social activity that can continue to be pursued vs. the impact of sustained “social distancing.”

**RISKS  
CITED  
AGAINST  
MASK USAGE**

Beyond concerns relating to the supply of masks, key risks cited to minimize the utility of masks have been:

“the COVID-19 virus is so small it cannot be effectively filtered by masks”

- though the virus itself is very small, it travels only via body fluids and respiratory droplets that are significantly larger<sup>†</sup>
  - different masks offer different filtering capabilities
    - N95 level masks are highly effective at filtering out respiratory particles when properly worn with a tight seal on the face
      - this is why N95 is the standard used in hospitals
      - insufficient N95 mask supply represents a critical health system concern and drove guidance against public purchase

<sup>†</sup> Stilianakis, Nikolaos I, and Yannis Drossinos. “Dynamics of infectious disease transmission by inhalable respiratory droplets.” *Journal of the Royal Society, Interface* vol. 7,50 (2010): 1355-66. doi:10.1098/rsif.2010.0026



- lower level masks have decreasing levels of effectiveness in terms of the percentage of particles filtered, but can in fact be helpful
- masks that are improperly worn or that are not designed for a full seal leave avenues open for infection to enter
- though 100% prevention of potential exposure is optimal, the benefit of lower percentage masks is still significant
  - this percentage reduction impact is particularly important when multiplied across a health system to reduce overall infection levels
  - when used in an environment where environmental contamination is minimal (due to universal mask usage), the net result is a dramatic reduction in risk and improved epidemiological trajectory
- “improperly worn masks encourage people to touch their face, increasing the risk of contamination of the mouth, nose, or eyes via the hands”
  - this is an issue, but one which can be trained
  - simply touching your face does not cause the virus to enter your system; direct contact of infected body fluids with the eyes, nose, or mouth is needed (which a mask can discourage)
- “masks can absorb environmental contamination and become a vector”
  - it is better that the mask has absorbed that contamination rather than your lungs
  - one time use and discard is optimal (as is standard in health care settings) but training and sanitizing of masks can reduce this threat

## INTERNATIONAL DYNAMICS: RETURN TO PHASE 1

Having covered key aspects of Phase 2 (epidemiological deterioration) and Phase 3 (liquidity) drivers of the recent market selloff, the final section of this note covers international aspects related to initial Phase 1 pressures. **In order for the market to fully recover from the recent downturn, the drivers of all three phases must be addressed.**

### INTERNATIONAL COOPERATION ESSENTIAL

International cooperation and global stabilization must represent a critical goal even as nations focus on domestic crisis stabilization. A key positive outcome we see likely to emerge (which we believe US officials should be doggedly pursuing) is the **shifting of mask capacity developed in China to provide masks globally, even as the US and others aggressively develop internal mask production capacity.**

*Stabilization and mask production in East Asia can be leveraged to progressively eliminate COVID-19 across the globe.*



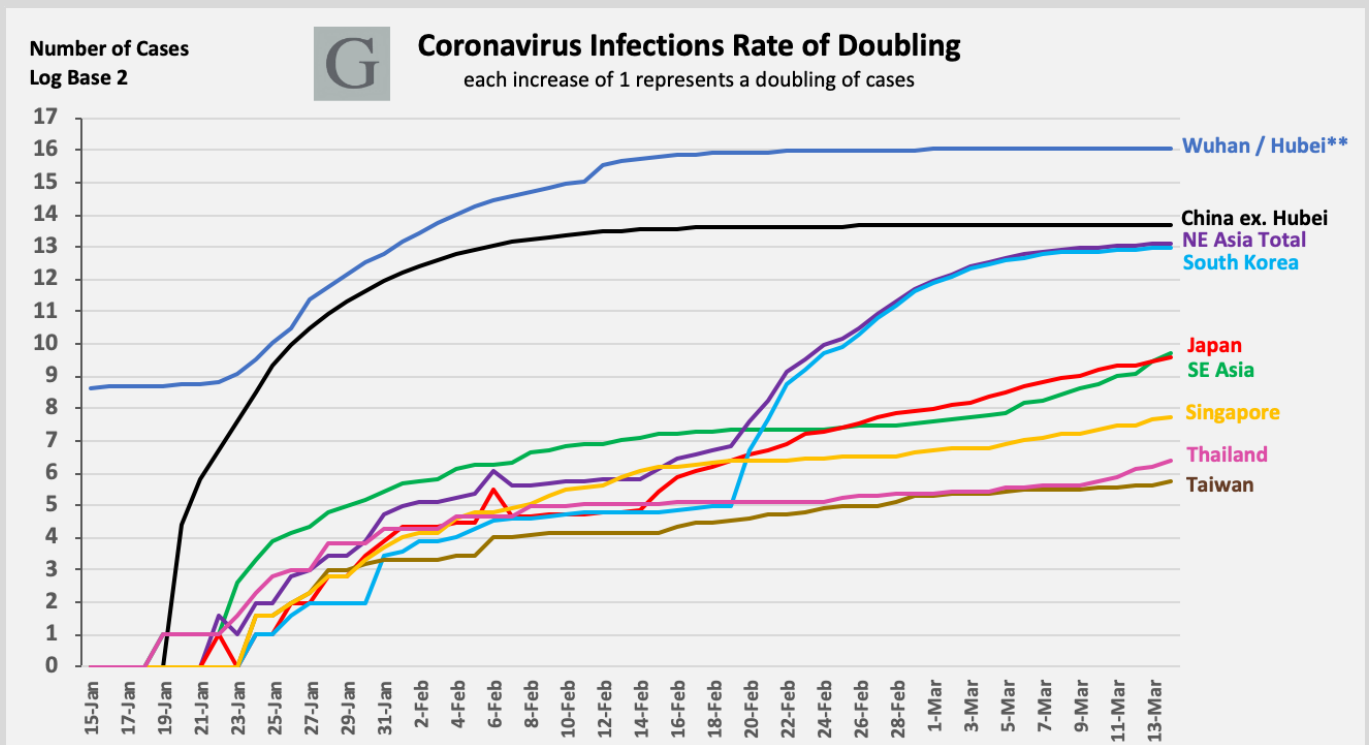
**CAPITAL  
FLOWS  
TRACKING  
EPIDEMIOLOGY  
TRENDS**

Not only does international epidemiological data offer insight into both the need for expanded limits on international travel as well as the trajectory of increasing demand for masks globally (reinforcing our assessment that face mask production should be a critical public and private priority).

Phase 1, 2, and 3 market pressures as outlined in the US context are at work in international markets, too. Investors might assess international epidemiological trends to consider where capital is most likely to flow during this period of global volatility and balance their portfolios for risk.

China and Korea may present interesting opportunities in this context.

### EAST ASIA STABILIZATION



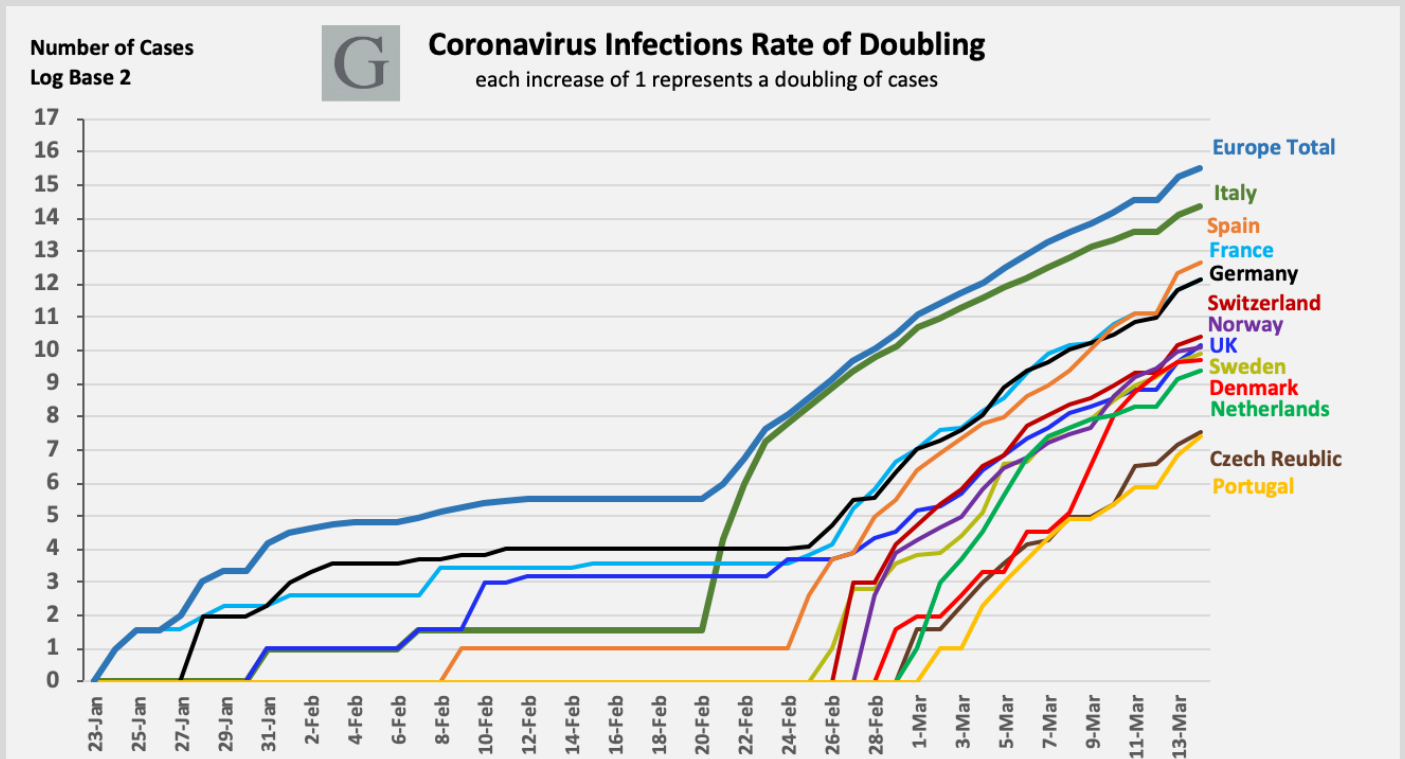
- China and South Korea have successfully flattened their epidemiological trajectory.
- China’s evolution is particularly impressive when looking at the total number of currently active cases:
  - China currently has only 12,000 active cases vs. an epidemic high of 58,000 cases on February 17<sup>th</sup>
    - of these active cases, only 300 are outside of the Hubei epicenter
    - of China’s 13,000 total infections outside of Hubei, 97% have recovered
- Singapore, Thailand, and Southeast Asia as a whole have seen a recent increase in the trajectory of new case diagnosis after having flattened their curves, but overall remain relatively stable





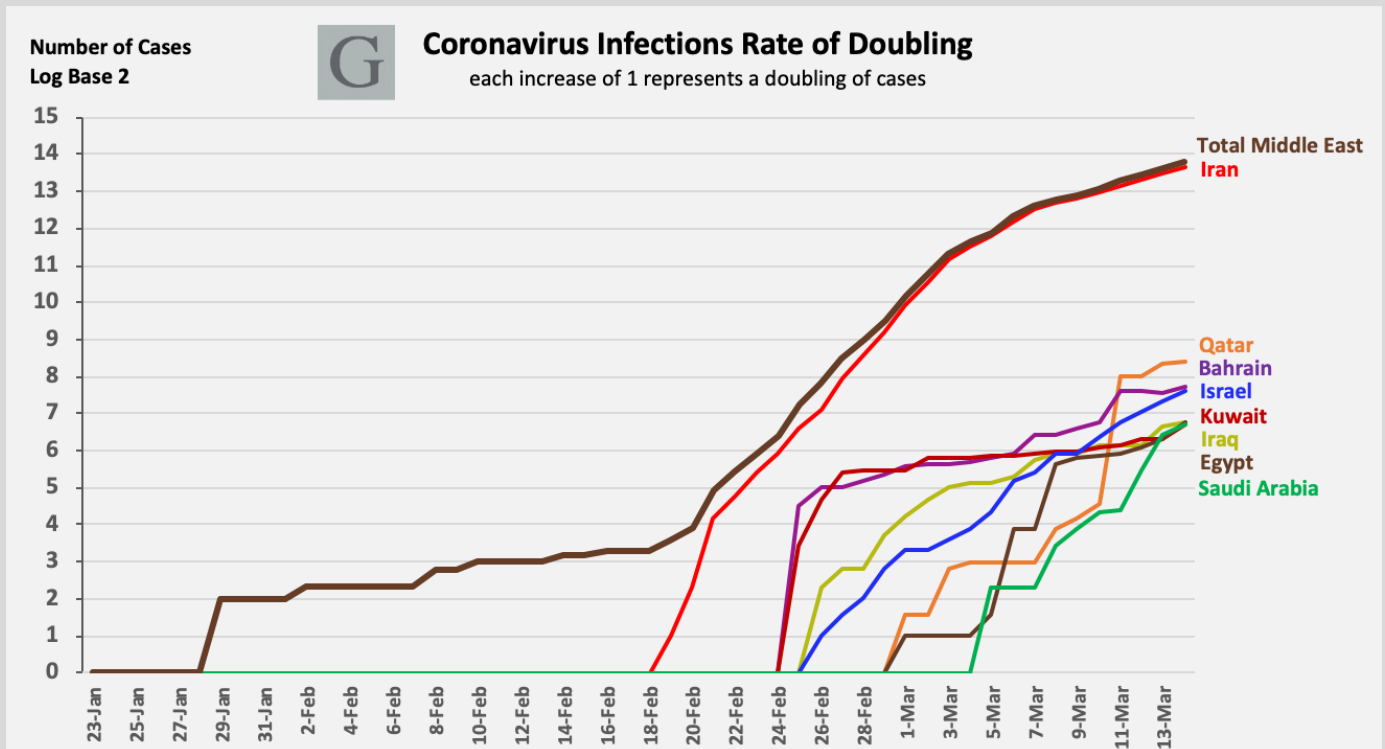
- Japan continues to have challenges in flattening its curve but is relatively stable

## COVID-19 IS EXPLODING IN EUROPE



- After an initial explosion of cases in Italy beginning February 20<sup>th</sup>, cases began to explode across Europe within the next one to two weeks.
- Spain's epidemiological deterioration is progressing more rapidly than Italy's did, but Germany and France have seen cases grow nearly as fast.
- Across all major European nations, COVID-19 is advancing at an exceptional rate, from Scandinavia to the Netherlands and Belgium, to Switzerland, the Czech Republic and Portugal.
- This graph highlights only the most severe epidemiological trajectories and countries with the largest number of cases, but COVID-19 is exponentially increasing in nearly all European nations.

## IRAN IS EPICENTER IN MIDDLE EAST BUT COVID-19 IS SHIFTING



- After an explosion in cases during the last 10 days of February, Iran’s epidemiological trajectory continues to increase but at a slower pace of acceleration.
- Iran still accounts for the vast bulk (82%) of COVID-19 infections in the Middle East and North Africa. But Qatar, Israel, Egypt, and Saudi Arabia have seen a rapid increase in cases in recent weeks.
- Kuwait and Bahrain had both managed to stabilize their epidemiological trajectory after an initial explosion of cases. Bahrain, however, has recently seen a further uptick alongside Gulf neighbors.
- Iraq has had some success in flattening its infection curve during March, while infections in Saudi Arabia are accelerating rapidly.



For further epidemiological analysis or detail on other emerging markets, please contact us directly.

*This report is part of the analysis and advisory service we provide clients on COVID-19 dynamics. That service and access to all of our data is available to private sector clients for \$375, and to government and public health entities for free. Bespoke research tailored to client interests and portfolios is also available on contract. Contact us at [client.relations@greygcapital.com](mailto:client.relations@greygcapital.com) for further details.*

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## **ABOUT OUR BACKGROUND IN PREPARING THIS REPORT**

In leading the preparation of our COVID-19 analysis, Director of Research Mark Reedy draws on extensive field and analytical experience with pandemic prevention programs.

Mr. Reedy was a team leader for the United Nations on the ground in Equatorial Guinea, Central Africa, where he led the development of infectious-disease prevention and treatment programs on behalf of the Global Fund to Fight AIDS, Tuberculosis, and Malaria. Following this field leadership experience, Mr. Reedy worked on a Gates Foundation / Clinton HIV-AIDS Initiative co-project called the Consortium for Strategic HIV Operations Research, where he designed systems to apply advanced data analysis for the assessment of epidemiological trajectory, clinical operations, and best practices in the fight against the Human Immunodeficiency Virus pandemic.

For details on material in this report, or to contract specific bespoke research of interest to you, please contact [reedy@greygcapital.com](mailto:reedy@greygcapital.com)