

# Healthcare PRM COVID update

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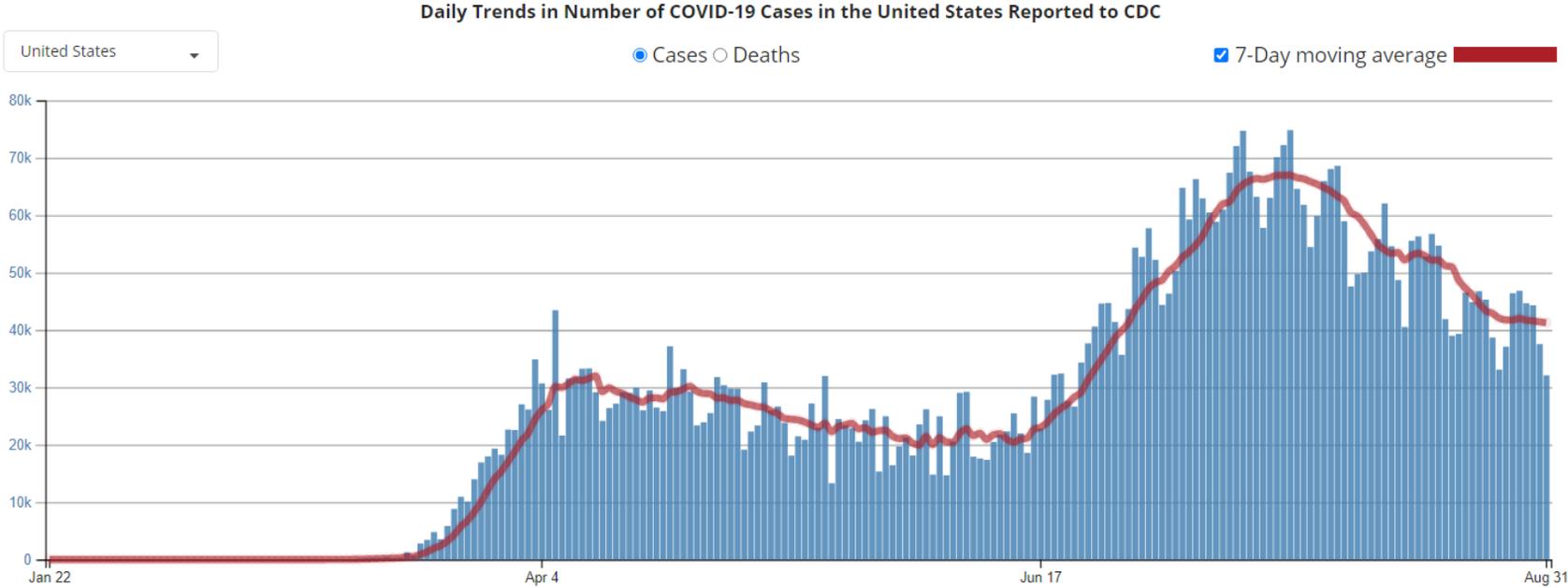
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# Agenda for COVID discussion

- Where we are today
- Outlook for treatment options
- Update on testing and key milestones
- The timeline to vaccination/herd immunity
- Global Health Care Fund

# Where we are today/what we know



<b>Vaccine progress</b>	<ul style="list-style-type: none"> <li>• Early data</li> <li>• Accelerated development</li> <li>• Scale challenges</li> </ul>
<b>Treatment challenges</b>	<ul style="list-style-type: none"> <li>• Early failures</li> <li>• Antibodies</li> </ul>
<b>Testing demand</b>	<ul style="list-style-type: none"> <li>• Test capacity</li> <li>• Sustainable demand</li> </ul>

# Where we are today/what we know

## Reasons for optimism

- Hospital treatment algorithm: Early treatment failures were disappointing; patient management has improved
- Vaccine progress: Early efficacy data is encouraging. Several programs moving forward across different platform approaches
- Herd immunity: An estimated 30%–40% of the population may have T-cell immunity, in addition to recovered COVID-19 patients testing positive for antibodies
- Reduced mortality rate

## Remaining challenges

- Drug treatments: Difficulty in patient enrollment given rapidly changing viral load
- Vaccine progress: Mass inoculation could be further out given risk/benefit and scale considerations. AstraZeneca adverse event highlights risk of accelerated timelines
- Herd immunity: T-cell responses are critical to immunity but are much harder to measure versus antibody levels
- Mortality rate decline could be misleading given average age of current cases

# Vaccine considerations

Vaccine platform approach	Companies	Efficacy	Safety	Distribution/storage
<b>mRNA</b>	Moderna and Pfizer/Biontech	Encouraging early data	Unknown, no large database exists	Rapid scale-up with storage challenges
<b>Non-replicating viral vector</b>	AstraZeneca/Oxford and Johnson & Johnson	Proven technology	Questions on immune response, AZN paused for safety event	Reasonable cost, sufficient capacity
<b>Protein-derived recombinant approach</b>	GlaxoSmithKline/Sanofi and Novavax	Longest track record of efficacy	Longest track record of safety with some open questions about pediatric safety	Long development cycle, but advantageous storage and distribution

## Key challenges, questions

- 10-year average timeline for a vaccine
- Immediate demand for billions of doses (given need for second booster dose)
- Manufacturing: scale challenge for all approaches
- Distribution: cold storage constraints, commercial, DoD
- Administration: on site, multi-dose vials, follow up for second dose
- Regulatory path: EUA (“potential effectiveness,” lower standard for approval)
- Significant/sustainable profit?

As of July 31, 2020, Putnam Global Health Care Fund had the following top 10 holdings: Unitedhealth Group (5.98%), Abbvie (5.67%), Roche Holding Ag (4.95%), Astraxeneca (4.02%), Merck (3.98%), Novartis Ag (3.85%), Danahr Corp (3.84%), Thermo Fisher Scientific (3.83%), Ascendis Pharma A/S (3.23%)

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## Available treatments

Treatments offer incremental improvement and yet are significantly supply-constrained

	First POC data	Supply	Dosing	Comments
<b>Antivirals</b>				
Remdesivir	April/May	1M–1.5M courses in 2H20 (+500K cumulative courses vs. prior expectations)	IV	Potential 30% improvement in clinical outcomes based on reported data in moderate and severe patients
Convalescent plasma	Summer	Purified from patients	IV	Positive trend in patients receiving a high dose within 3 days of diagnosis, data from a meta-analysis was otherwise inconclusive
<b>Immunomodulatory</b>				
Dexamethasone	Summer	Millions of doses	Oral/IV	~20–30% improvement in mortality in hospitalized COVID-19 patients

Sources: Company filings, NEJM; Effect of Convalescent Plasma on Mortality among Hospitalized Patients with COVID-19: Initial Three-Month Experience <https://www.medrxiv.org/content/10.1101/2020.08.12.20169359v1>; Dexamethasone in Hospitalized Patients with COVID-19 — Preliminary Report <https://www.nejm.org/doi/full/10.1056/NEJMoa2021436>.

## Pipeline treatments

- Pipeline treatments offer some reason for optimism although the ultimate solution is a vaccine
- Conducting these trials is challenging for a variety of reasons

	First POC data	Supply	Dosing	Comments
<b>Antivirals</b>				
Hydroxychloroquine	April/May	Millions of doses	Oral	Failed
Monoclonal antibodies	September	>>100K doses/month prophylaxis, >>10K doses/month treatment	IV	REGN is in the lead, phase 2/3 expansion initiated in July. Potential passive vaccination strategy and potential to reduce mortality and length of stay
<b>Immunomodulatory</b>				
Actemra/Kezvara	April/May	>100K doses	IV/subcutaneous	Failed
Baricitinib/ruxolitinib	2H20	>100K doses	Oral	Potential to reduce mortality and length of stay. Similar mechanism to Actemra/Kezvara

Sources: Company filings, NEJM.

## Vaccine/Therapeutic production

- While there is uncertainty around which vaccines/therapeutics will be successful, Life Science Tools offer a way to benefit regardless of who “wins”
- Some companies, like Danaher and Thermo Fisher, provide the tools and materials used to produce vaccines/therapeutics, and others like Lonza provide manufacturing capabilities
- Ultimate impact is unknown, but will be meaningful; companies’ backlogs were +40% in 2Q
- Putnam’s diversified, global focus allows us to find opportunities across the industry

### Framing the monoclonal antibody opportunity for tools

2019 Global bioproduction market (\$M)	\$12,500
2019 Global Mabs cell culture capacity (kL)	2,800
REGN COVID Mabs cell culture capacity (kL)	140
<i>% of total market</i>	<i>5.00%</i>

*\* Total bioproduction market should be haircut as it encompasses more than just Mabs.*

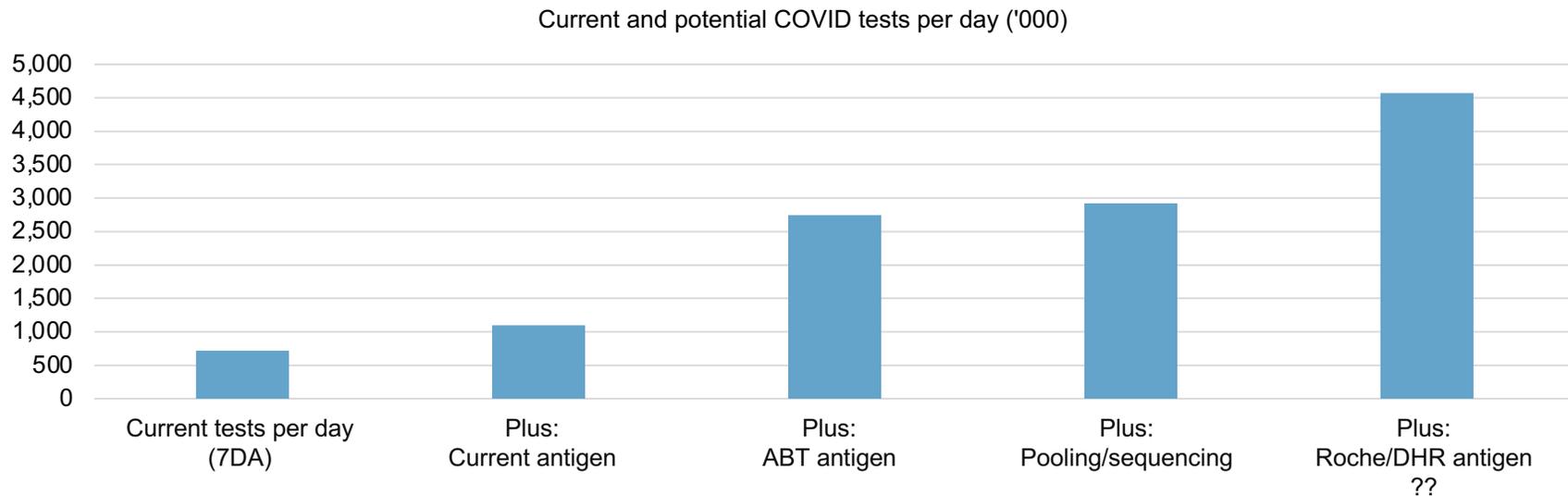
### Framing the vaccine revenue opportunity for tools

	Low	Middle	High
Price per vaccine	\$0.10	\$0.50	\$0.85
Number of doses (millions)	2,000	4,000	8,000
Total revenues (\$M)	\$200	\$2,000	\$6,800
<i>% of bioproduction market</i>	<i>1.60%</i>	<i>16.00%</i>	<i>54.40%</i>

Sources: Company reports, Putnam Estimates, BioProcess Technology Group, Clendinen et al.

## Testing: Rapid tests to solve bottlenecks

- The introduction of rapid antigen tests (Abbot, Quidel, Becton Dickinson, possible Roche and Danaher soon) will be key to solving the testing issue in the country
  - Antigen tests can deliver results in minutes and require much less manual labor than PCR tests
- News headlines report 700K tests per day, BUT the data does not include antigen tests, which have ~300K per day, and can now scale to 2M per day with Abbot's announcement
- More rapid antigen tests are coming; major manufacturers Roche and Danaher likely to be involved, among others



Source: Company reports.

## Testing: Not all tests are created equal

- While antigen tests will be key to increased testing, existing testing methods will still be utilized; a toolbox approach is needed
- PCR testing will remain a critical tool for COVID, especially in the hospital and healthcare settings where accuracy is more important than speed
- Expect antigen tests to be used more for mass screening, given their ease of use and low price point
- Accuracy claims can be somewhat misleading; PCR tests can detect the virus at concentrations 10,000x lower than instrumented antigen tests (Quidel, Becton Dickinson) and 100,000x lower than visual antigen tests (Abbot)

	PCR test	Instrumented antigen test	Visual antigen test	Next-gen sequencing
<b>Key players</b>	HOLX, Roche, TMO, DHR	QDEL, BDX	Abbot, Roche	ILMN
<b>Accuracy</b>	High	Medium	Medium	High
<b>Price</b>	\$20–\$40	\$20	\$5	Potentially \$1
<b>Turnaround time</b>	3–6 hours	15 minutes	15 minutes	8–24 hours
<b>Workflow complexity</b>	Medium/high	Medium/low	Low	High
<b>Key use cases</b>	Hospital, clinical settings	Symptomatic screening, nursing homes, schools	Symptomatic screening, nursing homes, schools	High-volume testing locations

Source: Company reports.

## Outlook, investments post-COVID

- Expect COVID testing to have durability
  - There are 35M flu cases, 50M respiratory infections, ~240M visits to the doctors for a “new problem,” and nearly 1 billion colds every year!
  - We expect the pandemic will change healthcare practice and consumer behavior toward more frequent testing over time
- Portfolio positioned to benefit from longer-term demand in testing (Quidel) and the derivative impacts of vaccine and treatment manufacturing (Lonza, Danaher)
- Limited direct exposure to vaccine companies given premium valuations, binary data risk (Moderna), and commercial model questions.
  - Prefer to own strong underlying franchises that have optionality from a positive vaccine (AstraZeneca) or treatment outcome (Regeneron)

## Why invest in the healthcare sector?

- ~17% of GDP and growing given the aging demographic in the U.S. and developed countries. Opening of China healthcare market unappreciated
- Unprecedented scientific advances in early stages of addressing several large markets (oncology, diabetes, cardiovascular, gene therapy)
- Idiosyncratic investment returns: Strong potential for positive returns given innovation regardless of economic conditions
- Defensive characteristics of market leaders complemented by innovation cycle creates perfect storm for consolidation
- Complexity and inefficiency of delivery and payment models ripe for technology innovation

# Why active health care investing?

## Investment considerations

- Challenging to predict when the sector may play offense or defense
- Technical expertise and experience critical to evaluate early stage science
- Active monitoring of company models, scientific innovation, and regulatory changes balanced against subsector allocation difficult to replicate

## Category considerations

- More than half of Morningstar's Health Care universe is composed of passive strategies with a narrow investment focus
  - Out of 36 actively managed mutual funds, 12 are specialized in one area and 24 are diversified across the sector like Putnam
  - Of the diversified funds, Putnam ranks #6 in performance since PM's inception on the fund

## Global Health Care Fund: Outlook/themes

- Innovation remains critical; first-in-class or best-in-class drugs/devices with high unmet medical need are essential for pricing power and adequate returns
- Pipeline M&A has been below recent history and expectations given pharma/biotech need for commercial and pipeline assets with durability. Innovation rarely on discount and protected by a M&A put
- Financing window for early-stage biotech, medtech, and disruptive delivery models has been historically accommodative, and subsector valuations can get challenging post inflections
- Pricing pressure will continue. Probability remains low for draconian measures such as direct government negotiation of drug prices or an international pricing benchmark
- Med tech/life sciences a potential safe-haven from regulatory risk: Accelerating growth rates and margin expansion driven by shift in treatment paradigms and the shift to biologics in cell and gene therapy increases demand for tools and analytical equipment

## Putnam Global Health Care Fund

Portfolio is constructed to maximize stock-specific risk and to minimize exposure to style factors

- Since PM inception, the portfolio has averaged 78% active stock-specific risk relative to the benchmark
  - The majority of active return has been derived from stock-specific exposure
- Up/Down capture ratio of 109%/91% displays the strategy's ability to weather volatility in down markets and participate in upside

8/31/2020	# holdings	Up-capture ratio	Down-capture ratio	Average stock-specific risk	Beta	Net return since Mike Maguire's inception date
Putnam Global Health Care Fund	55	109%	91%	>70%	0.99	19.27%
MSCI World Health Care Index	153	n/a	n/a	n/a	n/a	15.94%

8/31/2020	# holdings	Annual turnover	1-year return	1-year return rank	Return since Mike Maguire's inception date	Return rank since Mike Maguire's inception date	Net expense ratio
Putnam Global Health Care Fund	55	81%	22.87%	14 of 24	19.27%	6 of 23	1.09%
Average of comparable peers	103	53%	23.39%	n/a	17.37%	n/a	1.03%

Mike Maguire became sole portfolio manager on January 18, 2019. The first trading day of the manager inception performance period is January 21, 2019.

## Top sub-industry active weights as of August 31, 2020

Industry	Active weight	Underweight	Overweight	Active weight	Industry
Healthcare equipment and supplies	-9.54%			5.75%	Biotechnology
Pharmaceuticals	-1.13			1.15	Life sciences tools and services
Healthcare technology	-.80			0.83	Diversified financial services
				0.73	Healthcare providers and services

Absolute industry weights	Global Health Care Fund
Pharmaceuticals	39.4%
Biotechnology	19.9
Healthcare providers and servicers	14.2
Healthcare equipment and supplies	13.7
Life sciences tools and services	8.1
Diversified financial services	0.8
Healthcare technology	0.8

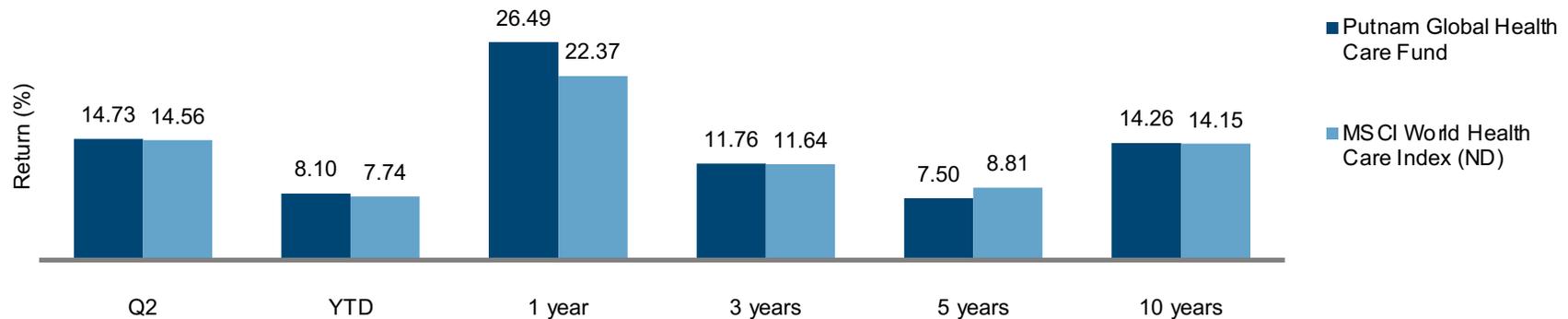
Allocations will vary over time.

Source: Putnam Investments.

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# Performance (Y shares)

Annualized performance at net asset value as of August 31, 2020



## Calendar-year performance at net asset value (%)

Inception date: Apr 4, 2000	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010
Putnam Global Health Care Fund	30.58	-0.38	15.55	-11.47	7.81	27.79	42.08	22.31	-1.19	2.32
MSCI World Health Care Index (ND)	23.24	2.51	19.8	-6.81	6.60	18.10	36.27	17.54	9.46	2.41

Expense ratio: 0.84%

Periods less than one year are not annualized.

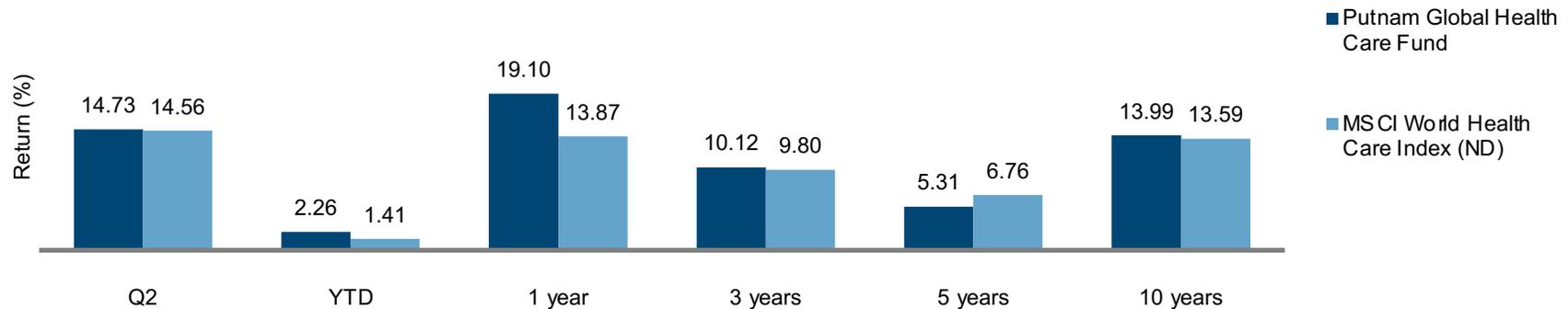
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Indexes are unmanaged and used as a broad measure of market performance. It is not possible to invest directly in an index.

Past performance is not indicative of future results.

# Performance (Y shares)

Annualized performance at net asset value as of June 30, 2020



## Calendar-year performance at net asset value (%)

Inception date: Apr 4, 2000	2019	2018	2017	2016	2015	2014	2013	2012	2011	2010
Putnam Global Health Care Fund	30.58	-0.38	15.55	-11.47	7.81	27.79	42.08	22.31	-1.19	2.32
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