

**Biogen Inc.
Healthcare**

Current Price: \$215.63

12M Target Price: \$288.07

Potential upside: 33.6%

Recommendation: BUY

Investment Leader:
Mohsin Ghani

Senior Analysts:
Elvin Chen
Martin Kononenko
Angela Liu



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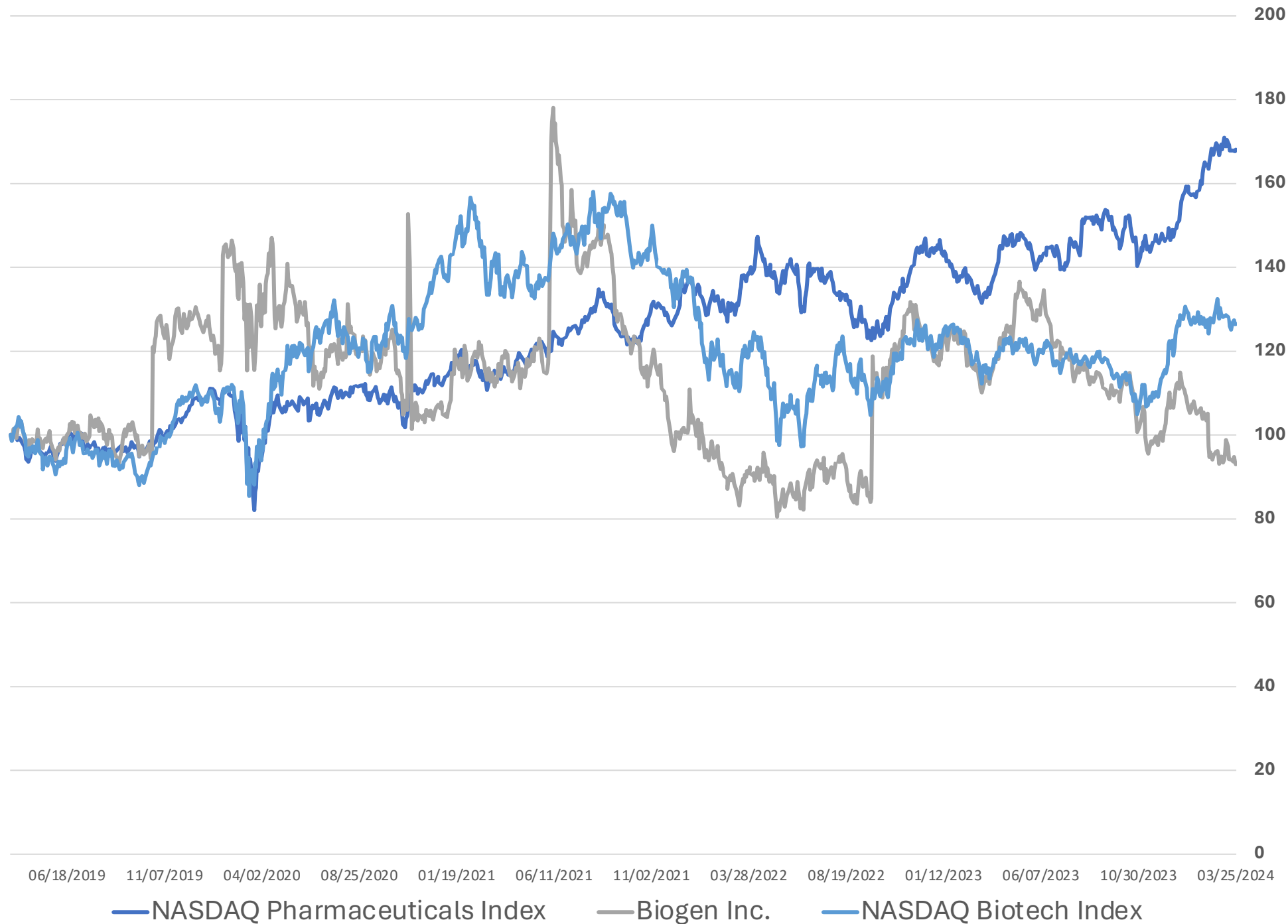


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COMPANY OVERVIEW

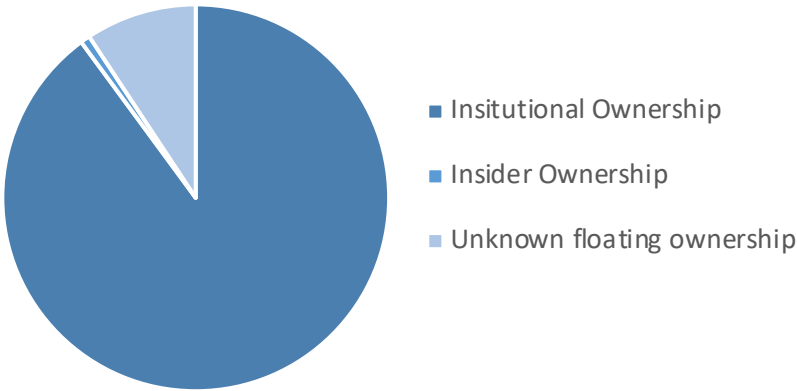
Biogen (NASDAQ:BIIB) is a global biopharmaceutical firm with a focus on biotechnology and neurological diseases.

The company has a broad portfolio of medicines to treat multiple sclerosis (MS), spinal muscular atrophy (SMA), Alzheimer’s, ALS, and other rare diseases.

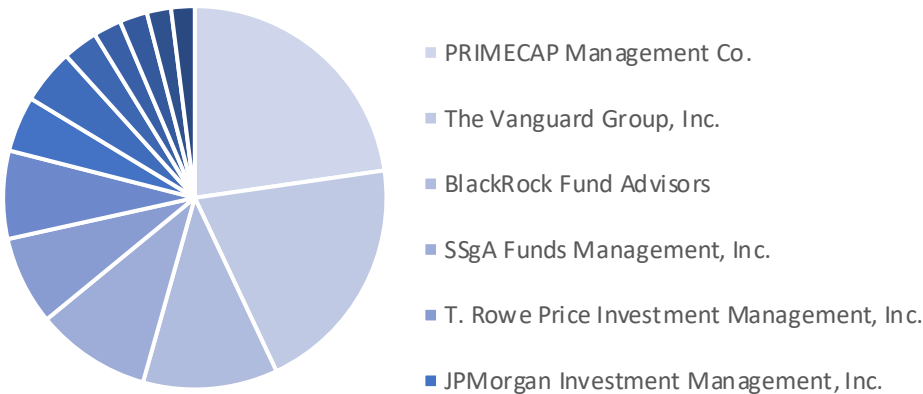
Key Facts and Stats	
Ticker	BIIB
Headquarters	Cambridge, MA
Revenue (2023)	\$9.417B
Share Price	\$215.63
Market Cap	\$31.45B
EV	\$37.93B
Beta (5Y)	0.88
Price Target (12M)	\$288.07

Biogen has a 3.5% share of the global biotechnology market.

Ownership type



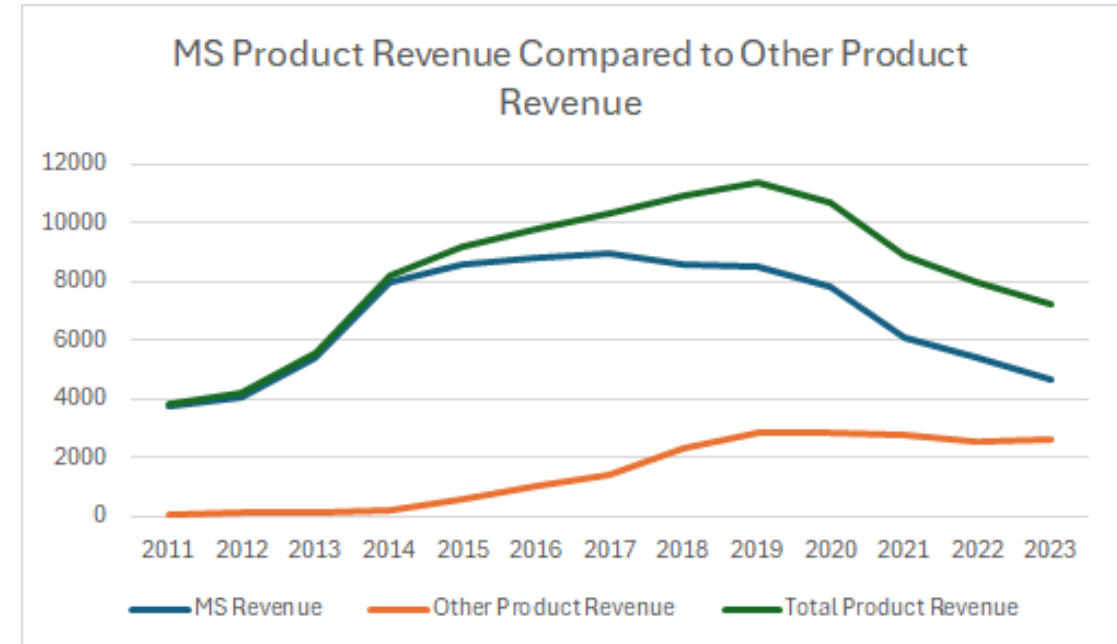
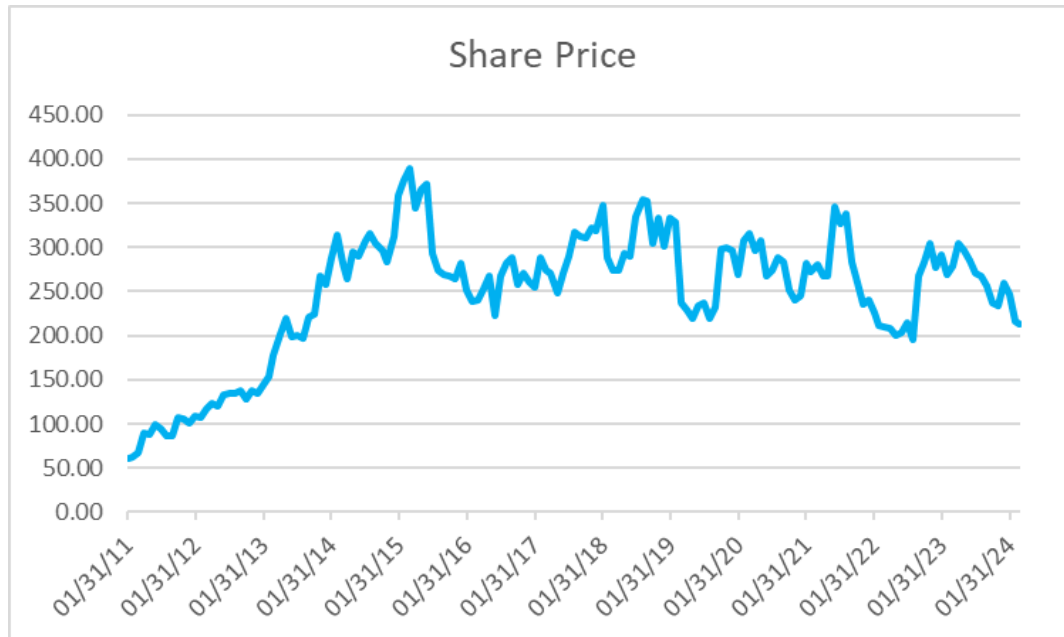
Top Institutional Owners



COMPANY HISTORY



- Specialized and led the Industry in MS products
- MS Drugs came off patents
- Lack of new medication
- Started Aduhelm, but it failed



MANAGEMENT OVERVIEW



Christopher A. Viehbacher joined Biogen as President and Chief Executive Officer in November **2022**. Mr. Viehbacher founded Boston Pharmaceuticals and has served as Chairman of Pfizer Inc. Prior to joining Biogen, he served as global CEO of Sanofi, bringing a wealth of experience.



Nicole Murphy, MBA, MS., is the Executive Vice President, Pharmaceutical Operations and Technology of Biogen. Ms. Murphy joined Biogen in **2015**. Prior to joining Biogen Ms. Murphy spent over 15 years at Amgen as an Executive Director.



Priya Singhal, M.D., M.P.H. is the Executive Vice President and Head of Development at the firm. She also has oversight of Japan and China R&D. She has served multiple stints at Biogen and re-joined in **2020**. She is also the Former VP of Medical Affairs at Vertex Pharmaceutical.



Jane Grogan, Ph.D. is the Executive Vice President of Research. Dr. Grogan joined Biogen in **2023**, bringing nearly two decades of experience leading biotech research. Dr. Grogan most recently served as the Chief Scientific Officer at Graphite Bio and ArsenalBio, both cell and gene therapy companies.

Name	Position	Age	Board Tenure (Years)
Caroline D. Dorsa, MBA	Chairman	64	14
Christopher A. Viehbacher, CPA	President, Chief Executive Officer & Director	64	2
Monish Patolawala, CPA	Independent Director	54	<1
Susan Langer	Independent Director	-	<1
Maria C. Freire, PhD	Independent Director	69	3
William A. Hawkins, III, MBA	Independent Director	70	5
Jesus B. Mantas	Independent Director	55	5
Eric K. Rowinsky, MD	Independent Director	67	14
Stephen A. Sherwin, MD	Independent Director	75	14

RECENT NEWS



26th March: Biogen to collaborate with Indivi, a leading Swiss medical technology company, to develop digital biomarkers for Parkinson's disease.



19th March: Health Canada accepts for review the QALSODY treatment of ALS. If approved, QALSODY will be the first genetic ALS treatment in Canada.



19th March: European Medical Agency deliberated on approval for LEQEMBI. CHMP decision expected by end of month.



12th March: AbCellera (ABCL) and Biogen (BIIB) enter a strategic collaboration to discover antibodies that enables the delivery of biotherapeutics to the brain for indications in neuroscience.

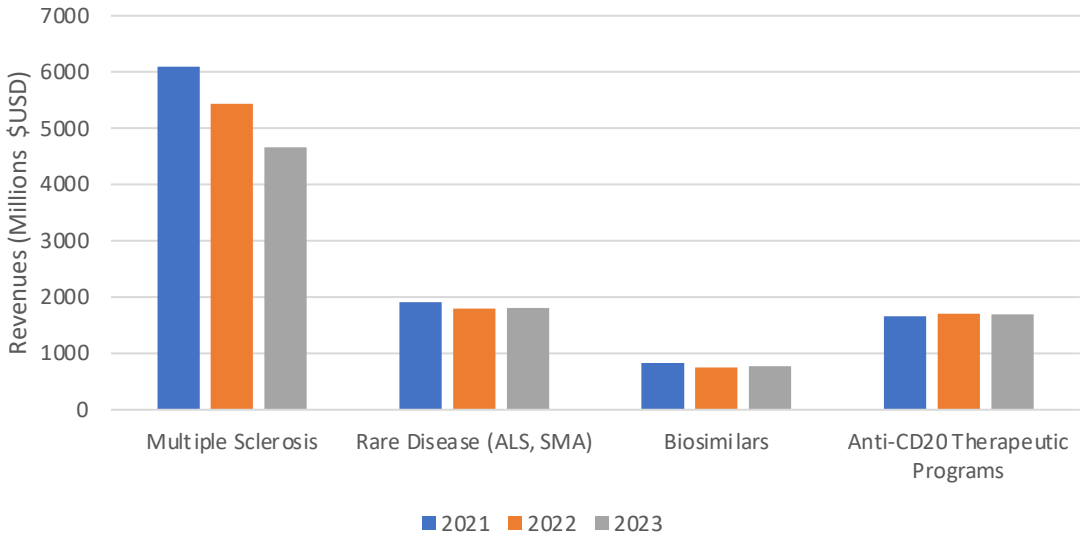


February: Biogen ends production of ADUHELM, a treatment for Alzheimer's due to low-income projections after insurers refused widespread coverage.

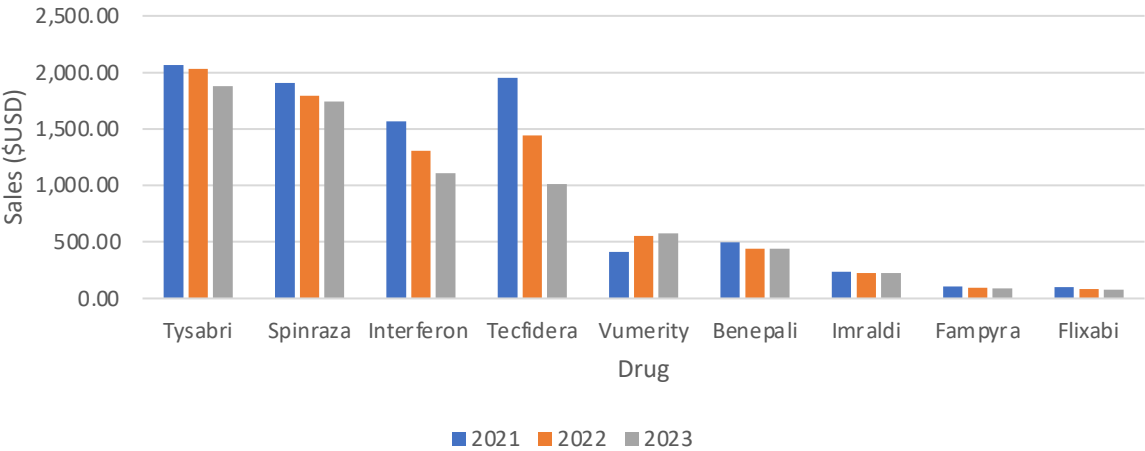
BUSINESS MODEL

- Diagnosis and treatment for rare neurology diseases.
- Collaboration with other pharmaceutical companies to commercialize certain medications to target specific diseases.
- Commercialization of biosimilars
- \$1 billion of cost cuts announced in mid 2022.
 - ~\$200M of savings already achieved and on-track to realize \$400M net savings by end of 2024

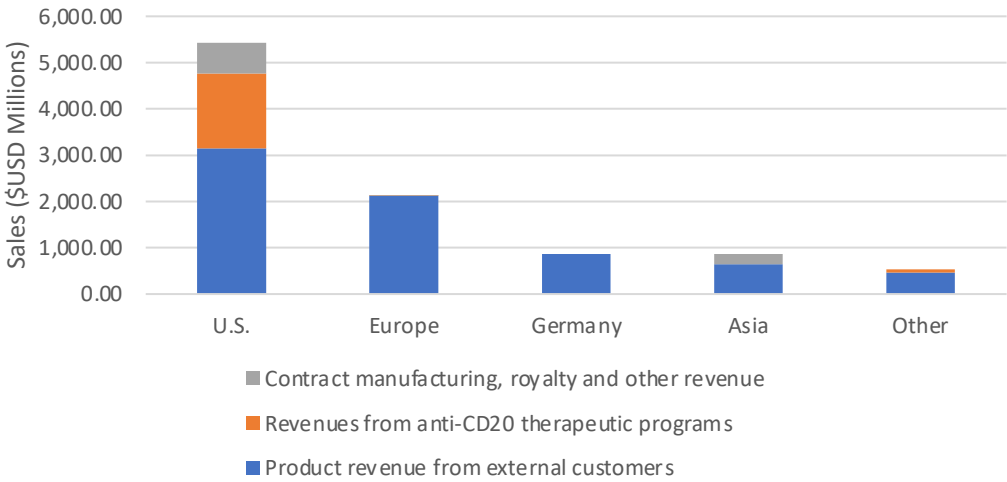
Revenues by product group



Revenues by Drug



2023 Revenue divided by region and type



GROWTH STRATEGIES



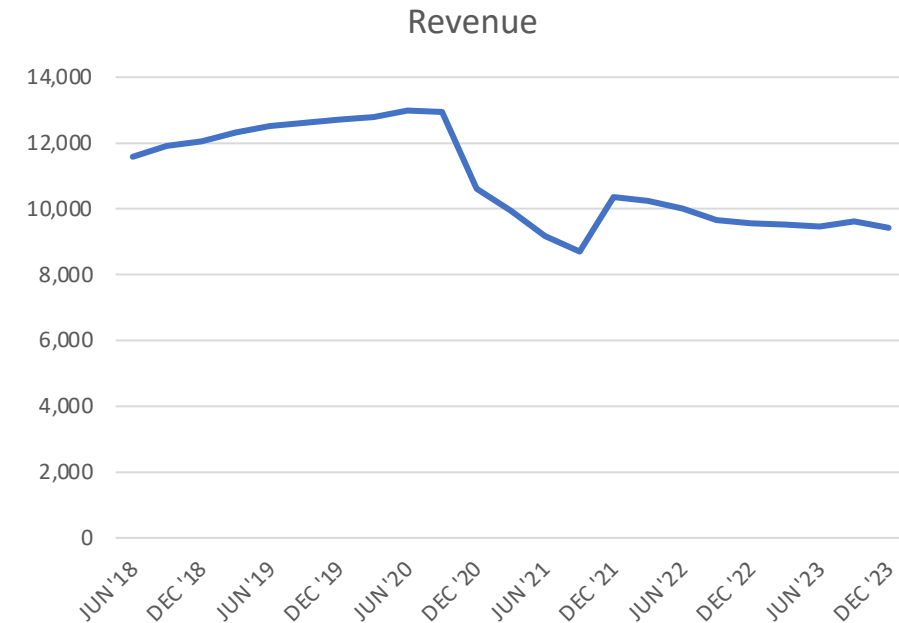
Strong emerging product portfolio – transitioning away from one key product market

New R&D pipeline with focus on specialized immunology and neuromuscular disorders

Expanding past the US market
- US makes up 55.4% of revenue

Acquisition of Reata Pharmaceuticals opens up European market

Collaboration with Eisai in Japan for Leqembi



DESCRIPTION OF ILLNESSES

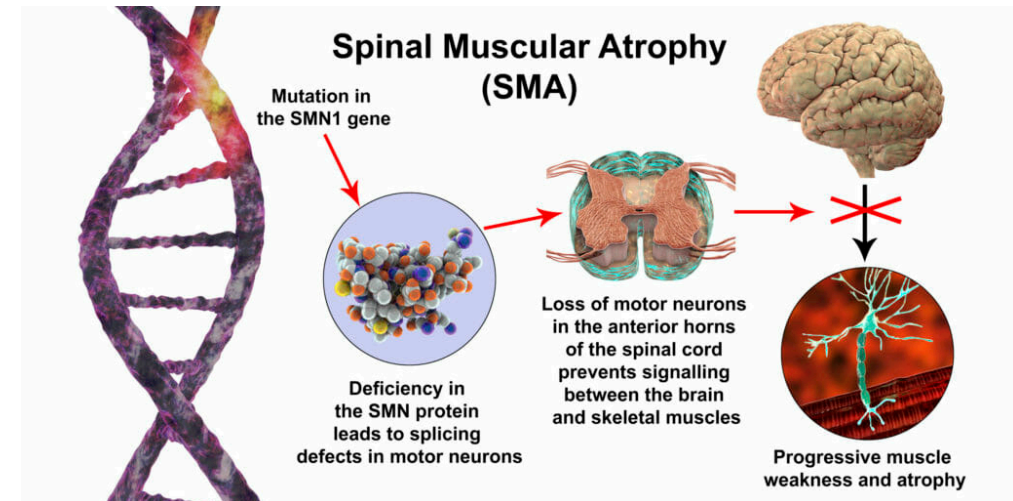
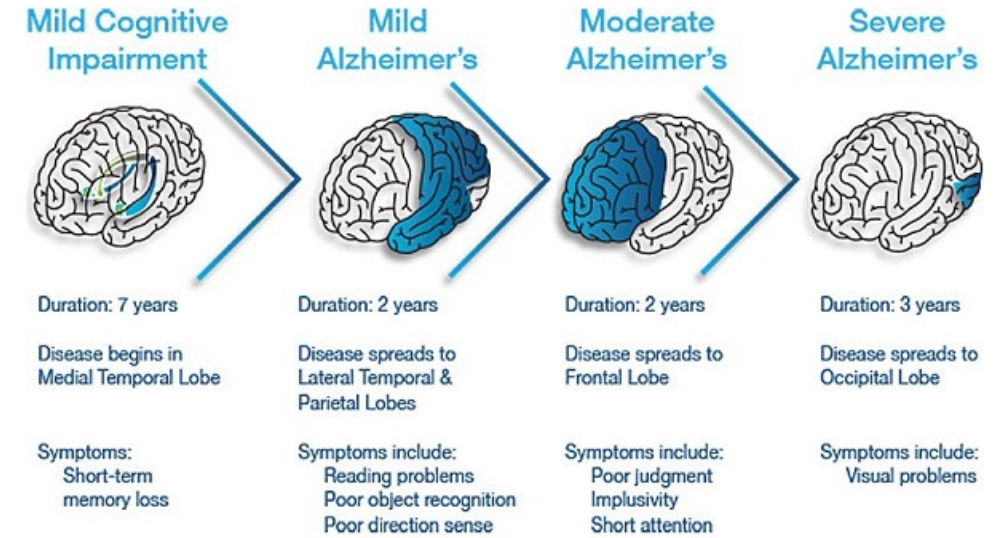
Multiple Sclerosis (MS) is a progressive neurological disease, causing impaired nerve function, and muscle control loss.

Spinal Muscular Atrophy (SMA) is a genetic disorder targeting nerve cells for voluntary muscles, leading to muscle weakening.

Alzheimer's disease is a neurodegenerative condition resulting in dementia, more commonly affecting women and impacting cognitive functions, with late-stage motor function decline.

Friedreich's Ataxia is an inherited, progressive neurological disorder that damages the nervous system, emerging in childhood or adolescence.

Amyotrophic Lateral Sclerosis (ALS) is a rare motor neuron disease marked by the gradual degeneration of nerve cells.



SWOT ANALYSIS



Strengths

- Positioned as sole market leader in Alzheimer's and Friedrich's ataxia – higher EPS prospects in 2025+
- Increasing breadth of portfolio – entering Parkinson's and neuropsychiatry

Weaknesses

- Slower than expected rollout for LEQEMBI
- Deep reliance on product efficiency and positioning

Opportunities

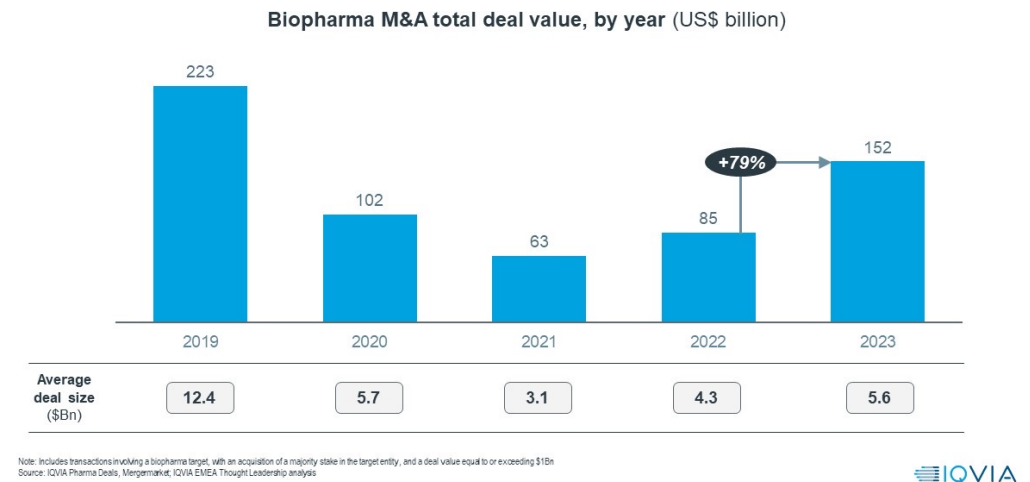
- Expansion into new product and geographical markets
- Zuranolone was the first approved oral medication for PPD

Threats

- MS products face increasing competition from generics and biosimilars that are sold at a lower cost
- Face competition from gene therapy products and oral products for SPINRAZA.
- Regulatory environment is changing and becoming more complex in the US – LLY donanemab regulatory push back

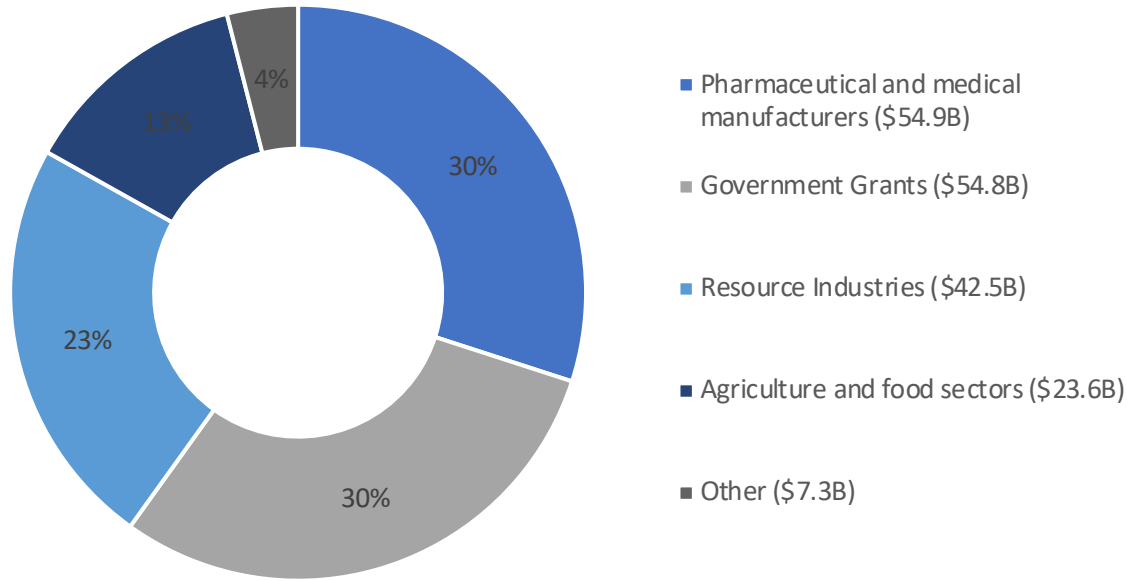
- Healthcare is a defensive sector – demand remains strong in all economic climates
- Biotech's product offerings are diverse – pharmaceuticals, agriculture, industrials.
- According to OECD, about 10% of total business expenditure on R&D occurs in biotechnology
- According to PwC, main areas of Biotech M&A activity will focus on **immunology** and oncology
- Funding is declining, peaked in 2021, expected to pick up with rate cuts

Decisive rebound of biopharma M&A deal value in 2023



INDUSTRY OUTLOOK

US Biotech Industry revenue in 2023 by segment



US Biotech sector: expected CAGR of 8.4% through 2028

Biogen is a biotech firm focusing on neurology – very niche with no direct competitors

Global

- Healthcare application within biotechnology is worth \$246.7bn (51%) of industry revenue
- Global Biotech sector: expected CAGR of 13.1% through 2028

Increasing government initiatives:

- Japan = \$420.0 million investment in 2021
- Canada = CAD\$2.1 billion invested since 2020
- US = \$2.0 billion invested in 2022
- President Biden signed an Executive Order to advance biotechnology in September 2022.
- EU released a new plan to boost biotechnology and biomanufacturing

THE FDA APPROVAL PROCESS



Discovery

- Researchers conduct R&D and discover promising compounds
- Conducting preliminary trials to observe the new drug

Preclinical research

- Further investigation into whether a drug causes harm to decide whether the drug should be empirically tested

Clinical trials

- Trials and tests conducted on human body

FDA Review

- FDA review team assesses its completeness and conducts a detailed review across several months to decide on approval after receiving application

FDA Post-Market Drug Safety Monitoring

- FDA monitors all drug and device safety once products are available for use by the public.

KEY PRODUCTS



- FDA Approved Feb 2023
- Treats **Friedreich's Ataxia**
- Already Contributing \$55.9 million in Revenue in Q4
- PTC Therapeutics and Voyager Therapeutics as competitors



- FDA Accelerated Approval April 2023
 - Treats **ALS**
 - First therapy of SOD1 ALS
- Under review in Europe and Canada

KEY PRODUCTS








- FDA Approved in October 2019
- Approved in the European market November 2021
 - Treats **MS**
- Revenue increased by 4.1% during 2023
 - Ocrevus developed by Roche



- FDA Accelerated Approval Jan 2023, Full Approval July 2023
 - First drug found that slows **Alzheimer's**
- Early stage of Commercial Launch on the global market
 - Slow start due to complications
 - Eli Lilly as a competitor – Donanemab

OTHER PRODUCTS IN CURRENT PIPELINE



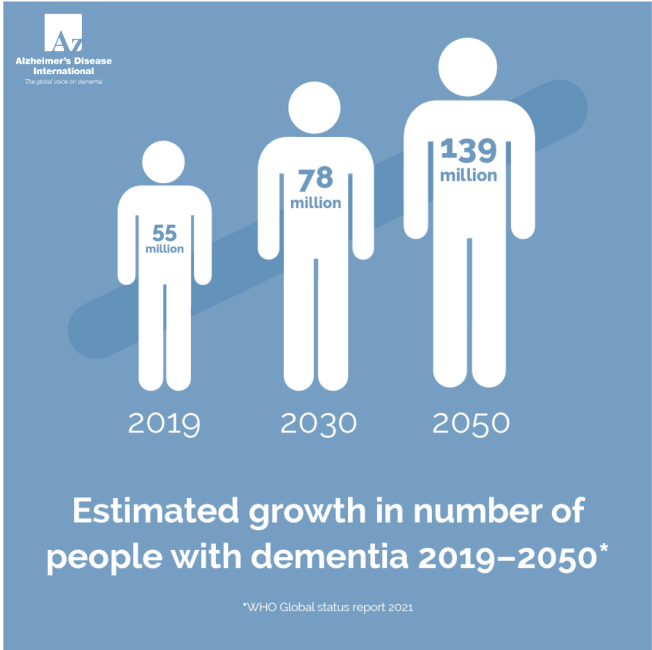
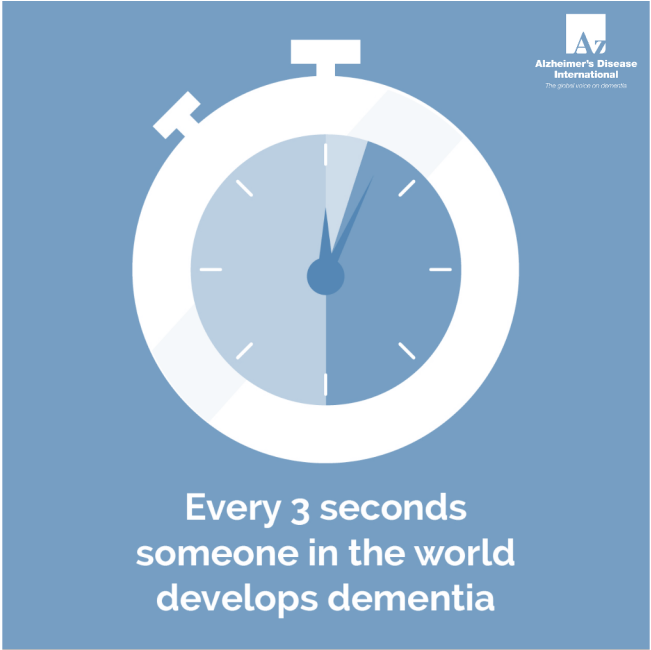
Product	Indication	Collaborator	Major Markets
 ZURZUVAE™ (zuranolone) capsules  20 mg • 25 mg • 30 mg FDA Approved August 2023	PPD in adults	Sage	U.S.
 SPINRAZA™ (nusinersen) injection 12 mg/5 mL	SMA	Ionis	U.S. Brazil Canada China France Germany Italy Japan Spain Turkey
 TYSABRI™ (natalizumab)	RMS RRMS in the E.U. Crohn's disease in the U.S.	None	U.S. France Germany Italy Spain U.K.
 Tecfidera™ (dimethyl fumarate) delayed-release capsules	RMS in the U.S. RRMS in the E.U.	None	U.S. France Germany Italy Japan Spain U.K.
FDA Approved in March 2013			

KEY COMPETITORS

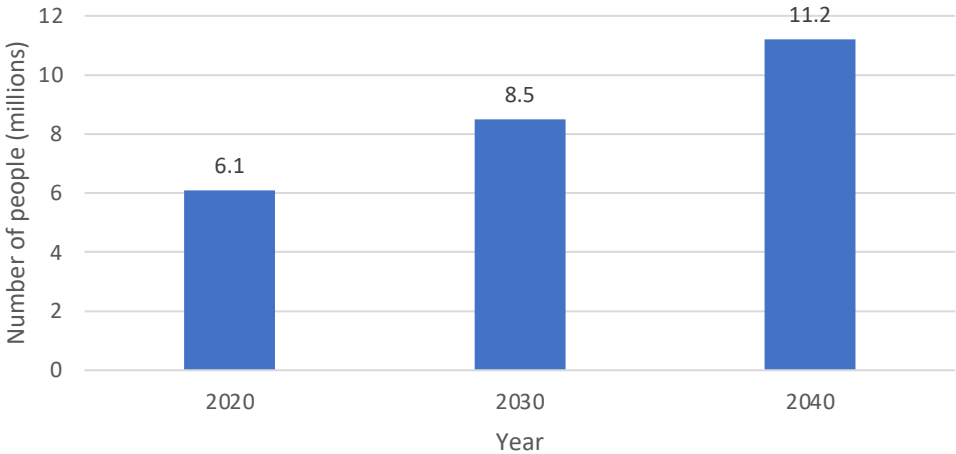


Description	Relevant Drugs	Statistics
Novartis is a global healthcare company specializing in pharmaceuticals, including treatments for neurodegenerative diseases, cancer, and heart conditions.	MS: Kesimpta SMA: Zolgensma	Share Price: \$96.19 2023 Revenue: \$45.4B 12 Price Target: \$110.93 EV: \$203.27B P/E: 13.21
Roche is a multinational healthcare company that specializes in pharmaceuticals. Its diverse portfolio focuses on oncology, immunology, infectious diseases, ophthalmology, and diseases of the central nervous system.	MS: Ocrevus • Biogen receives royalty but this is still a competitor SMA: Evrysdi	Share Price: \$275.07 2023 Revenue: \$65.3B 12 Price Target: \$304.40 EV: \$240.42B P/E: 18.16
Eli Lilly engages in the research, development, manufacture and sale of diabetes, oncology, immunology pharmaceutical products.	Alzheimer's: Donanemab • Approval delayed by FDA	Share Price: \$772.86 2023 Revenue: \$34.1B 12 Price Target: \$798.81 EV: \$757.3B P/E: 100.48
PTC Therapeutics is a biopharmaceutical company that develops therapies for rare genetic disorders, focusing on neuromuscular and neurological diseases.	Friedrich's Ataxia: Vatiquinone • Rejected twice by FDA SMA: Evrysdi	Share Price: \$29.51 2023 Revenue: \$0.94B 12 Price Target: \$29.08 EV: \$1.76B P/S: 2.20

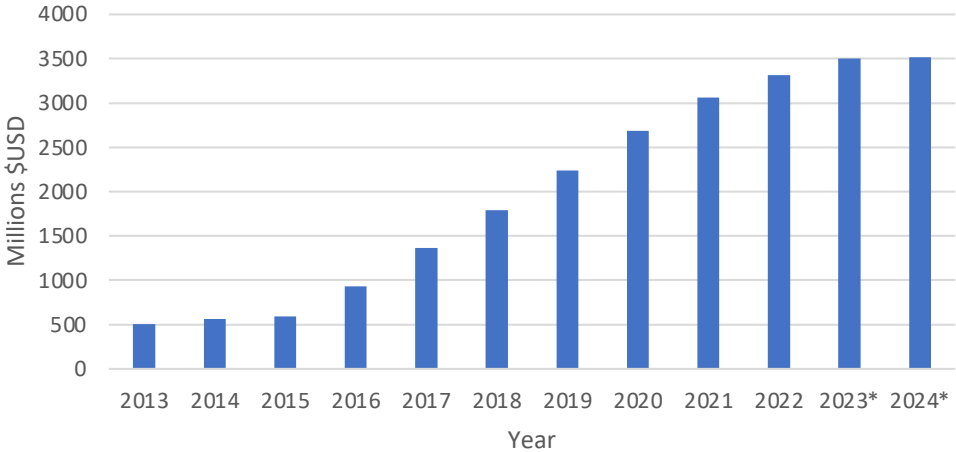
SUPPLY AND DEMAND – ALZHEIMER’S



Projected numbers of people with Alzheimer's in the U.S.



Total Alzheimer's disease funding by the National Institutes for Health (US)



PEST ANALYSIS

Political

- Political decisions can impact patent approval, drug prices, and foreign agreements
- Increasing calls for domestic investment and growth

Economic

- The current economic condition remains vulnerable
- New therapies can be unaffordable

Social

- The global population aged 65 and above is expected to rise from 10% in 2022 to 16% in 2050.
- Company can gain from focus on mental health – PPD

Technological

- Company relies on advanced technologies for clinical trials
- Better identification through medical technologies is expanding markets



PORTER'S FIVE FORCES

1

Threat of New Entrants (Low)

- Capital intensive industry with a reliance on external funding
- Regulatory environment becoming more complex in the US with rapid changes

2

Competitive rivalry (Moderate/High)

- The biotechnology subsector is facing greater competition from larger biopharma firms and international substitutes

3

Threat of substitutes (Moderate)

- No direct substitutes for Biotechnology
- Diverse applications in the pharmaceutical, agricultural and industrial sectors

4

Supplier power (Moderate)

- Biotech firms are reliant on their R&D equipment, some of which is externally produced
- The supplier power can be further reduced diversifying the supply chain and in-house designs

5

Customer power (Low)

- Main buyers are pharmaceutical companies and government health institutions
- Low customer power when patent protected. High customer power when patent expires

COMPANY SPECIFIC RISKS



LEQEMBI and SKYCLARYS are in the early stages of commercial launch in the US.

Leqembi up for EU approval in 1H24, SKYCLARYS approved in EU

Long term success depends on the successful development of new products and additional indications for existing products

99% 1D VaR: 3.55%

99% 1D ES: 6.02%

New facility in Switzerland with no assurance that the additional capacity will be required, or this investment will be recouped

Although the Solothurn facility was approved by the FDA for ADUHELM and LEQEMBI, there can be no assurance that the regulatory authorities will approve the facility for the manufacturing of other products.

INVESTMENT THESIS



Strong market position in neurological disorders

Timing – trading around 52-week low

Management overhaul

New acquisition and collaborations

Industry is a critical national asset

Monopoly in certain product markets- potential blockbusters

First of its kind treatments for Alzheimer's and FA

Increasing breadth of pipeline and R&D portfolio

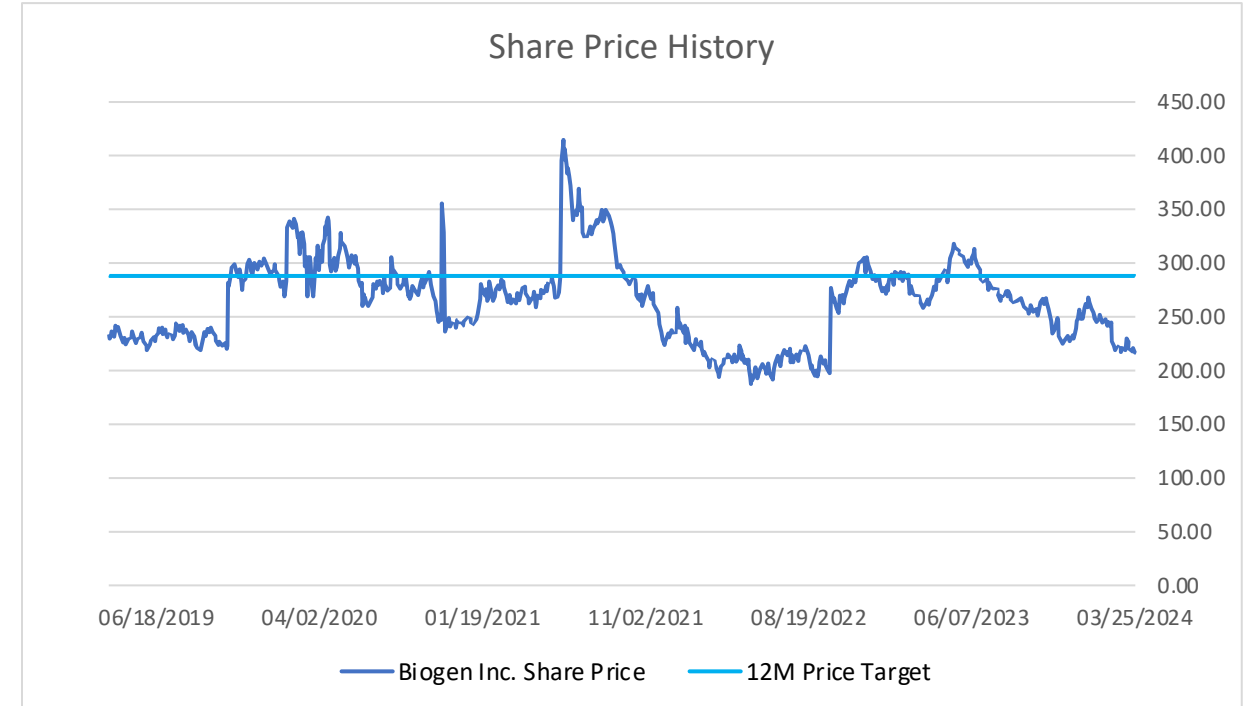
How does it fit into the portfolio?

Portfolio has room for a riskier holding, Biogen can fill that gap. Portfolio also needs more sector diversity.

Innovative pipeline with new developments presents a compelling growth opportunity for the company and is aligned with the goals of UTMCAP's portfolio.

Healthcare firms should be more insulated against economic shocks but note that biotech has greater volatility.

VALUATION



Assumptions:

- WACC: 9.5% in line with broader biotech industry.
- Implied terminal growth rate = 1.8% vs 1.5-2.0% per consensus
- Tax rates: assuming 16% going forward
- Biogen management expects a mid-single digit decline in sales for 2024
- Leqembi sales to pick up in 2025+
- Skyclarys sales to rise this year and grow

MODELLING OUTPUTS

Implied Perpetuity Growth Rate	
Terminal Year Free Cash Flow (2028E)	\$3,949.3
WACC	9.5%
Terminal Value	\$52,066.4

Implied Perpetuity Growth Rate	1.8%
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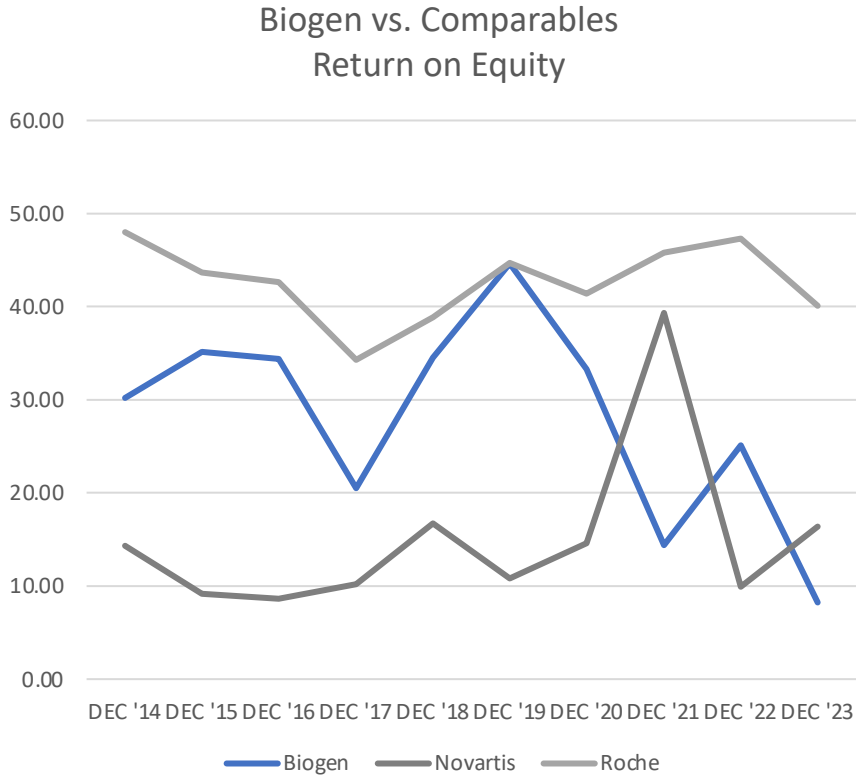
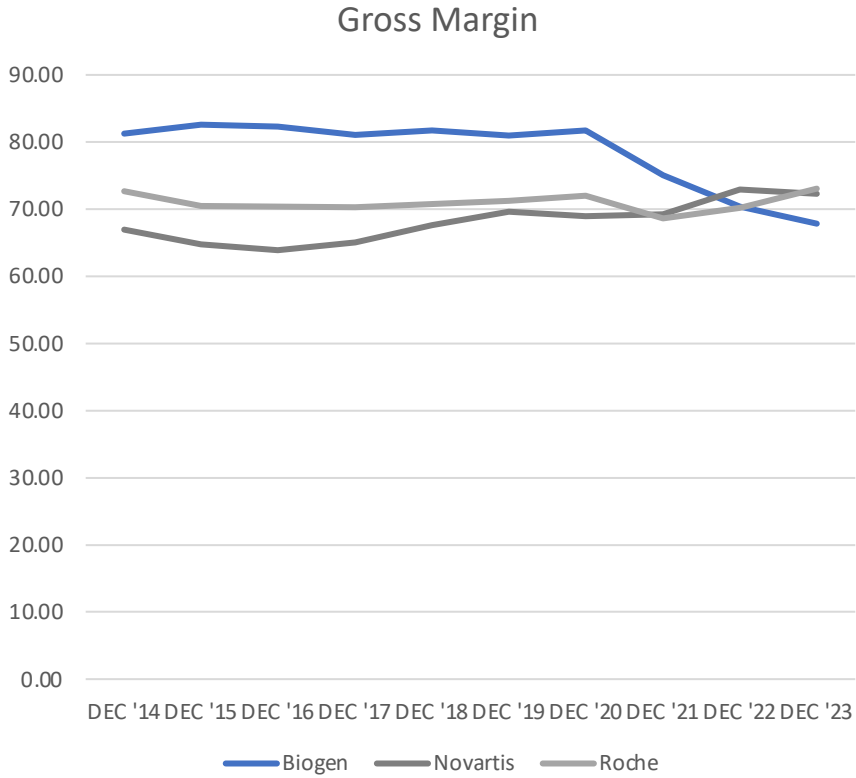
Implied EV/EBITDA	
Enterprise Value	\$48,062.7
LTM 2028 EBITDA	5,206.6

Implied EV/EBITDA	9.2x
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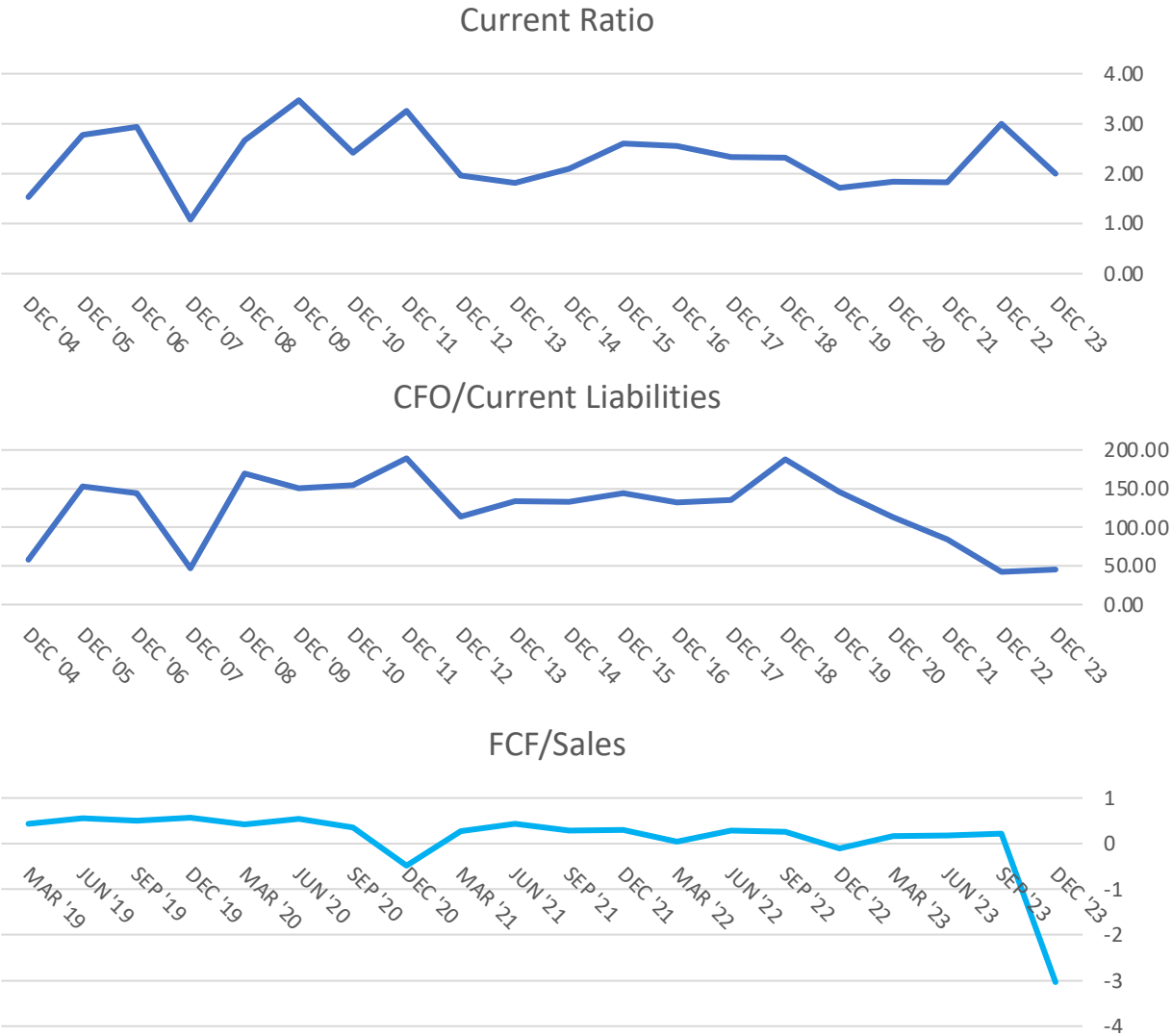
Enterprise Value						
Exit Multiple						
		9.0x	9.5x	10.0x	10.5x	11.0x
WACC	8.0%	47,460	49,232	51,004	52,776	54,547
	8.5%	46,535	48,266	49,998	51,729	53,460
	9.0%	45,633	47,325	\$49,017	50,709	52,401
	9.5%	44,755	46,409	48,063	49,716	51,370
	10.0%	43,900	45,516	47,132	48,749	50,365

Implied Enterprise Value / LTM EBITDA						
Exit Multiple						
		6.5x	7.0x	10.0x	10.5x	11.0x
WACC	8.0%	7.4x	7.8x	9.8x	10.1x	10.5x
	8.5%	7.3x	7.6x	9.6x	9.9x	10.3x
	9.0%	7.1x	7.5x	9.4x	9.7x	10.1x
	9.5%	7.0x	7.3x	9.2x	9.5x	9.9x
	10.0%	6.9x	7.2x	9.1x	9.4x	9.7x

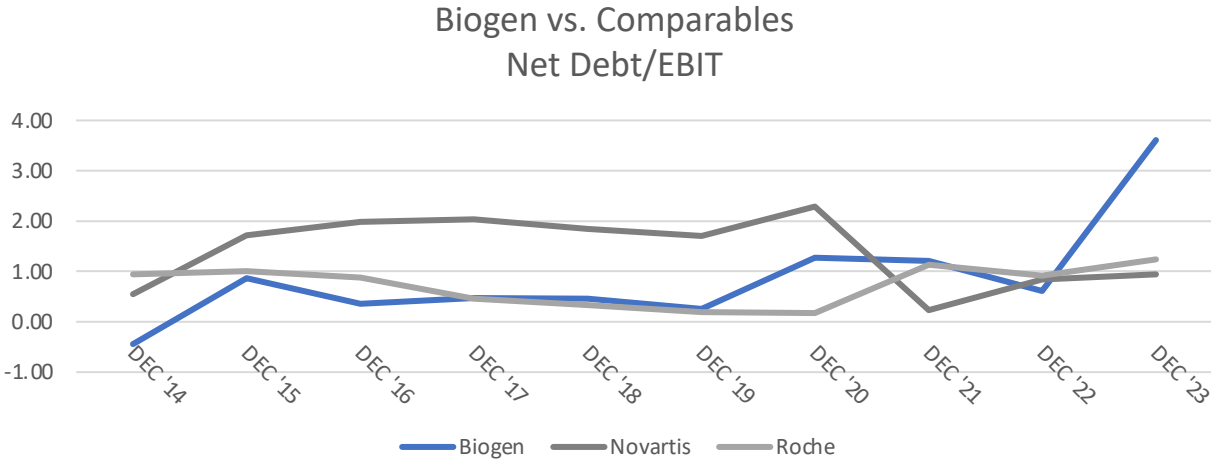
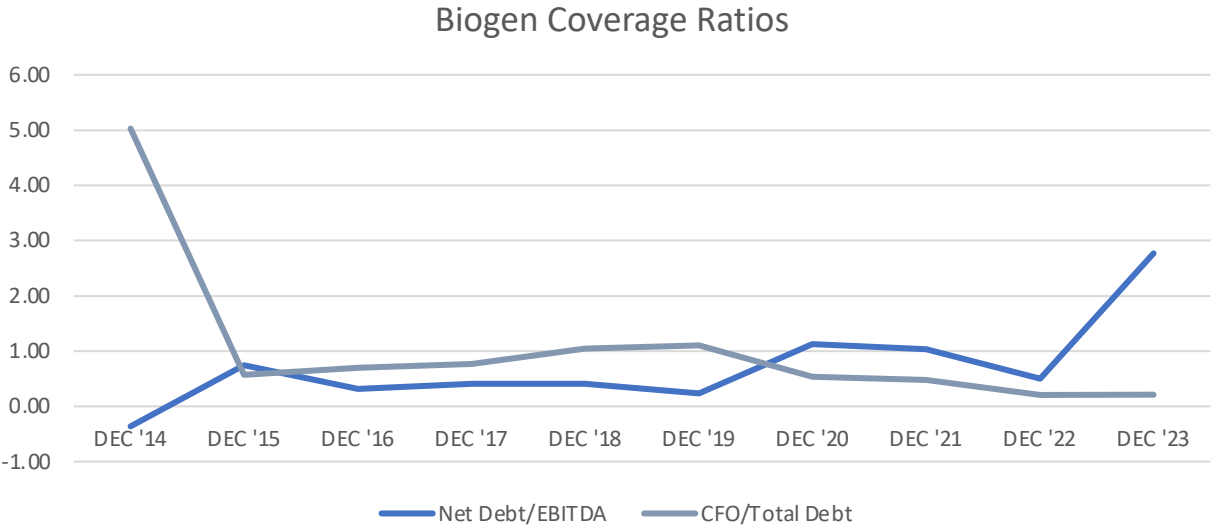
PROFITABILITY ANALYSIS



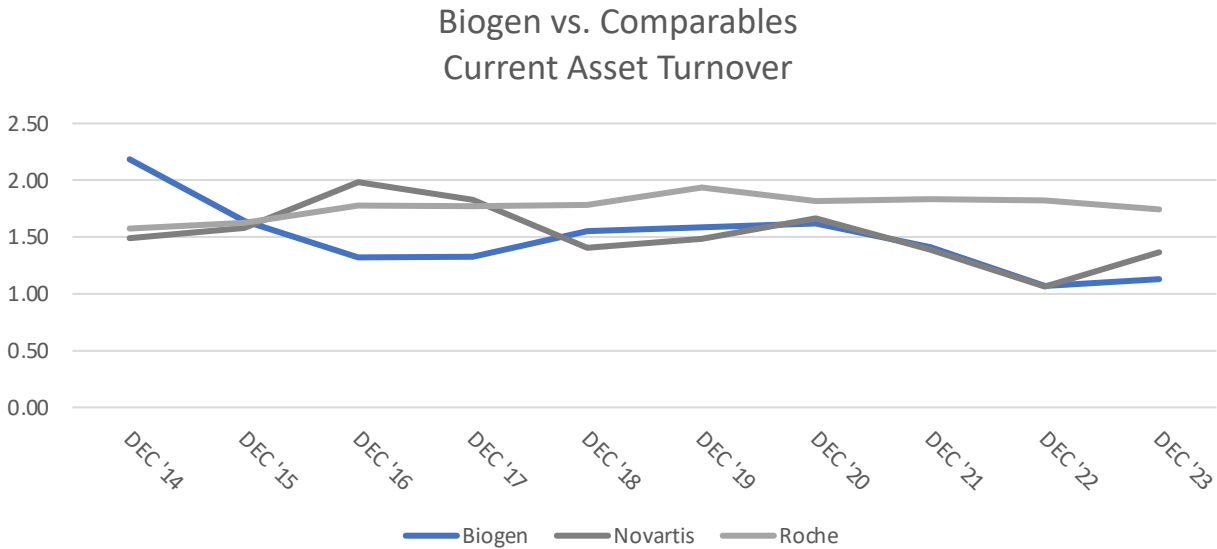
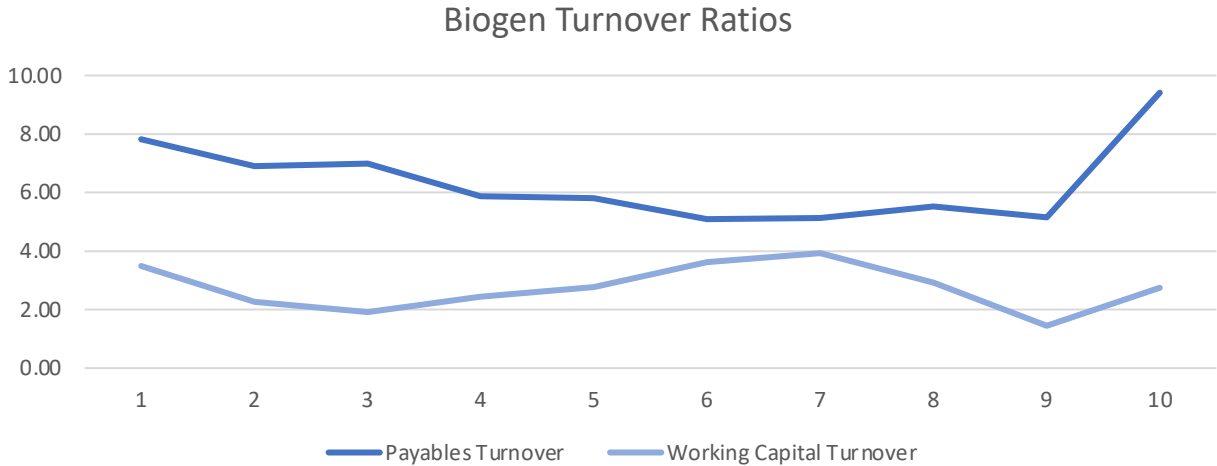
LIQUIDITY AND FREE CASH FLOW



COVERAGE



OPERATING EFFICIENCY



ANALYST TARGETS



Metric	Price
Current Price	\$215.63
Base Case Target Price	\$288.07
Upside Target Price	\$337.72
Downside Target Price	\$260.66
Bloomberg Consensus	\$295.20
Factset Consensus	\$299.20
Goldman Sachs	\$400.00
RBC Capital Markets	\$364.00
Jefferies	\$285.00
Barclays	\$240.00
Wells Fargo	\$230.00

Figure 1 - 2024 EPS Bridge

2024 EPS Bridge	\$M	\$/Sh	Notes
2023 EPS Guidance		\$15.75	\$1 Billion in cost savings, with tilt toward SG&A
<i>Plus:</i>			
Skyclarys Operating Income	\$248M	\$1.44	WFS Est.
Leqembi Gross Margin	\$240M	\$1.39	WFS Est.
Other	\$105M	\$0.61	Reflects OpEx savings
Sage Collaboration	\$75M	\$0.44	WFS Est. - lower collab R&D / PPD launch
Idle Capacity Charges	\$75M	\$0.44	Assumes 50% decrease from 2023
<i>Minus:</i>			
Reata Deal Interest Expense	\$245M	(\$1.42)	WFS Est.
Decline in MS Business	\$240M	(\$1.39)	\$600M decline, 40% decremental margin
Alzheimer's OpEx	\$190M	(\$1.10)	WFS Est.
2024 EPS Estimate		\$16.15	WFS Est.

DCF PROJECTIONS - BASE

Biogen Inc

Discounted Cash Flow Analysis

(\$ in millions, fiscal year ending December 31)

Operating Scenario		Operating Scenario										Base
Operating Scenario	1	Historical Period					Projection Period					CAGR
Mid-Year Convention	N	2020	2021	2022	(20 - '22)	2023	2024	2025	2026	2027	2028	(24 - '28)
Sales		\$12,356.0	\$10,402.4	\$9,433.4	-12.6%	\$9,417.0	\$8,852.0	\$8,586.4	\$8,587.3	\$8,930.8	\$9,466.6	0.1%
% growth		NA	(15.8%)	(9.3%)		(0.2%)	(6.0%)	(3.0%)	0.0%	4.0%	6.0%	
Cost of Goods Sold		2,262.2	2,597.0	2,797.0		3,028.2	2,655.6	2,404.2	2,318.6	2,322.0	2,366.7	
Gross Profit		\$10,093.8	\$7,805.4	\$6,636.4	-18.9%	\$6,388.8	\$6,196.4	\$6,182.2	\$6,268.7	\$6,608.8	\$7,100.0	2.1%
% margin		81.7%	75.0%	70.4%		67.8%	70.0%	72.0%	73.0%	74.0%	75.0%	
Selling, General & Administrative		6,294.0	4,940.0	4,362.0		4,758.0	1,947.4	1,717.3	1,717.5	1,786.2	1,893.3	
EBITDA		\$3,799.8	\$2,865.4	\$2,274.4	-22.6%	\$1,630.8	\$4,249.0	\$4,464.9	\$4,551.3	\$4,822.6	\$5,206.6	26.1%
% margin		30.8%	27.5%	24.1%		17.3%	48.0%	52.0%	53.0%	54.0%	55.0%	
Depreciation & Amortization		457.0	487.0	519.0		495.0	442.6	429.3	429.4	446.5	473.3	
EBIT		\$3,342.8	\$2,378.4	\$1,755.4	-27.5%	\$1,135.8	\$3,806.4	\$4,035.6	\$4,121.9	\$4,376.1	\$4,733.3	33.0%
% margin		27.1%	22.9%	18.6%		12.1%	43.0%	47.0%	48.0%	49.0%	50.0%	
Taxes		657.2	71.6	309.3		118.5	609.0	645.7	659.5	700.2	757.3	
EBIAT		\$2,685.6	\$2,306.8	\$1,446.1	-26.6%	\$1,017.3	\$3,197.3	\$3,389.9	\$3,462.4	\$3,675.9	\$3,976.0	31.3%
Plus: Depreciation & Amortization		457.0	487.0	519.0		495.0	442.6	429.3	429.4	446.5	473.3	
Less: Capital Expenditures		(552.0)	(295.0)	(243.0)		(7,238.0)	(354.1)	(343.5)	(386.4)	(357.2)	(378.7)	
Less: Inc./(Dec.) in Net Working Capital							1,418.5	60.3	(0.1)	(77.8)	(121.4)	
Unlevered Free Cash Flow							\$4,704.3	\$3,536.1	\$3,505.2	\$3,687.4	\$3,949.3	
WACC		9.5%										
Discount Period							1.0	2.0	3.0	4.0	5.0	
Discount Factor							0.91	0.83	0.76	0.70	0.64	
Present Value of Free Cash Flow							\$4,296.2	\$2,949.1	\$2,669.7	\$2,564.9	\$2,508.7	

Enterprise Value	
Cumulative Present Value of FCF	\$14,988.7
Terminal Value	
Terminal Year EBITDA (2028E)	\$5,206.6
Exit Multiple	10.0x
Terminal Value	\$52,066.4
Discount Factor	0.64
Present Value of Terminal Value	\$33,074.0
% of Enterprise Value	68.8%
Enterprise Value	\$48,062.7

Implied Equity Value and Share Price	
Enterprise Value	\$48,062.7
Less: Total Debt	(7,429.0)
Less: Preferred Stock	-
Less: Noncontrolling Interest	-
Plus: Cash and Cash Equivalents	1,050.0
Implied Equity Value	\$41,683.7
Fully Diluted Shares Outstanding	144.7
Implied Share Price	\$288.07

Implied Perpetuity Growth Rate	
Terminal Year Free Cash Flow (2028E)	\$3,949.3
WACC	9.5%
Terminal Value	\$52,066.4
Implied Perpetuity Growth Rate	1.8%
Implied EV/EBITDA	
Enterprise Value	\$48,062.7
LTM 2028 EBITDA	\$5,206.6
Implied EV/EBITDA	9.2x

DCF PROJECTIONS - UPSIDE

Biogen Inc

Discounted Cash Flow Analysis

(\$ in millions, fiscal year ending December 31)

		Operating Scenario										Upside
Operating Scenario	2											
Mid-Year Convention	N	Historical Period			CAGR	2023	Projection Period					CAGR
		2020	2021	2022	('20 - '22)		2024	2025	2026	2027	2028	('24 - '28)
Sales		\$12,356.0	\$10,402.4	\$9,433.4	-12.6%	\$9,417.0	\$8,993.2	\$8,858.3	\$8,992.1	\$9,486.7	\$10,198.2	1.6%
% growth		NA	(15.8%)	(9.3%)		(0.2%)	(4.5%)	(1.5%)	1.5%	5.5%	7.5%	
Cost of Goods Sold		2,262.2	2,597.0	2,797.0		3,028.2	2,608.0	2,391.8	2,337.9	2,371.7	2,447.6	
Gross Profit		\$10,093.8	\$7,805.4	\$6,636.4	-18.9%	\$6,388.8	\$6,385.2	\$6,466.6	\$6,654.2	\$7,115.0	\$7,750.6	3.9%
% margin		81.7%	75.0%	70.4%		67.8%	71.0%	73.0%	74.0%	75.0%	76.0%	
Selling, General & Administrative		6,294.0	4,940.0	4,362.0		4,758.0	1,888.6	1,683.1	1,708.5	1,802.5	1,937.7	
EBITDA		\$3,799.8	\$2,865.4	\$2,274.4	-22.6%	\$1,630.8	\$4,496.6	\$4,783.5	\$4,945.7	\$5,312.5	\$5,813.0	28.9%
% margin		30.8%	27.5%	24.1%		17.3%	50.0%	54.0%	55.0%	56.0%	57.0%	
Depreciation & Amortization		457.0	487.0	519.0		495.0	422.7	416.3	422.6	445.9	479.3	
EBIT		\$3,342.8	\$2,378.4	\$1,755.4	-27.5%	\$1,135.8	\$4,073.9	\$4,367.2	\$4,523.0	\$4,866.7	\$5,333.6	36.3%
% margin		27.1%	22.9%	18.6%		12.1%	45.3%	49.3%	50.3%	51.3%	52.3%	
Taxes		657.2	71.6	309.3		118.5	651.8	698.7	723.7	778.7	853.4	
EBIAT		\$2,685.6	\$2,306.8	\$1,446.1	-26.6%	\$1,017.3	\$3,422.1	\$3,668.4	\$3,799.3	\$4,088.0	\$4,480.3	34.5%
Plus: Depreciation & Amortization		457.0	487.0	519.0		495.0	422.7	416.3	422.6	445.9	479.3	
Less: Capital Expenditures		(552.0)	(295.0)	(243.0)		(7,238.0)	(314.8)	(310.0)	(314.7)	(332.0)	(356.9)	
Less: Inc./(Dec.) in Net Working Capital							3,424.7	-	-	-	-	
Unlevered Free Cash Flow							\$6,954.7	\$3,774.7	\$3,907.2	\$4,201.8	\$4,602.6	
WACC		9.5%										
Discount Period							1.0	2.0	3.0	4.0	5.0	
Discount Factor							0.91	0.83	0.76	0.70	0.64	
Present Value of Free Cash Flow							\$6,351.3	\$3,148.2	\$2,976.0	\$2,922.7	\$2,923.7	

Enterprise Value	
Cumulative Present Value of FCF	\$18,321.9
Terminal Value	
Terminal Year EBITDA (2028E)	\$5,813.0
Exit Multiple	10.0x
Terminal Value	\$58,129.5
Discount Factor	0.64
Present Value of Terminal Value	\$36,925.5
% of Enterprise Value	66.8%
Enterprise Value	\$55,247.4

Implied Equity Value and Share Price	
Enterprise Value	\$55,247.4
Less: Total Debt	(7,429.0)
Less: Preferred Stock	-
Less: Noncontrolling Interest	-
Plus: Cash and Cash Equivalents	1,050.0
Implied Equity Value	\$48,868.4
Fully Diluted Shares Outstanding	144.7
Implied Share Price	\$337.72

Implied Perpetuity Growth Rate	
Terminal Year Free Cash Flow (2028E)	\$4,602.6
WACC	9.5%
Terminal Value	\$58,129.5
Implied Perpetuity Growth Rate	1.5%
Implied EV/EBITDA	
Enterprise Value	\$55,247.4
LTM 2028 EBITDA	5,813.0
Implied EV/EBITDA	9.5x

DCF PROJECTIONS - DOWNSIDE

Biogen Inc

Discounted Cash Flow Analysis

(\$ in millions, fiscal year ending December 31)

Operating Scenario		4											
Mid-Year Convention		N	Historical Period			CAGR		Projection Period					CAGR
			2020	2021	2022	('20 - '22)	2023	2024	2025	2026	2027	2028	('24 - '28)
Sales			\$12,356.0	\$10,402.4	\$9,433.4	-12.6%	\$9,417.0	\$8,663.6	\$8,230.5	\$8,066.7	\$8,228.0	\$8,557.1	-1.9%
% growth			NA	(15.8%)	(9.3%)		(0.2%)	(8.0%)	(5.0%)	(2.0%)	2.0%	4.0%	
Cost of Goods Sold			2,262.2	2,597.0	2,797.0		3,028.2	2,685.7	2,386.8	2,258.7	2,221.6	2,224.9	
Gross Profit			\$10,093.8	\$7,805.4	\$6,636.4	-18.9%	\$6,388.8	\$5,977.9	\$5,843.6	\$5,808.0	\$6,006.4	\$6,332.3	-0.2%
% margin			81.7%	75.0%	70.4%		67.8%	69.0%	71.0%	72.0%	73.0%	74.0%	
Selling, General & Administrative			6,294.0	4,940.0	4,362.0		4,758.0	1,992.6	1,728.4	1,694.0	1,727.9	1,797.0	
EBITDA			\$3,799.8	\$2,865.4	\$2,274.4	-22.6%	\$1,630.8	\$3,985.3	\$4,115.2	\$4,114.0	\$4,278.6	\$4,535.3	22.7%
% margin			30.8%	27.5%	24.1%		17.3%	46.0%	50.0%	51.0%	52.0%	53.0%	
Depreciation & Amortization			457.0	487.0	519.0		495.0	459.2	436.2	427.5	436.1	453.5	
EBIT			\$3,342.8	\$2,378.4	\$1,755.4	-27.5%	\$1,135.8	\$3,526.1	\$3,679.0	\$3,686.5	\$3,842.5	\$4,081.7	29.2%
% margin			27.1%	22.9%	18.6%		12.1%	40.7%	44.7%	45.7%	46.7%	47.7%	
Taxes			657.2	71.6	309.3		118.5	564.2	588.6	589.8	614.8	653.1	
EBIAT			\$2,685.6	\$2,306.8	\$1,446.1	-26.6%	\$1,017.3	\$2,961.9	\$3,090.4	\$3,096.6	\$3,227.7	\$3,428.7	27.5%
Plus: Depreciation & Amortization			457.0	487.0	519.0		495.0	459.2	436.2	427.5	436.1	453.5	
Less: Capital Expenditures			(552.0)	(295.0)	(243.0)		(7,238.0)	(433.2)	(411.5)	(403.3)	(411.4)	(427.9)	
Less: Inc./(Dec.) in Net Working Capital								3,424.7	-	-	-	-	
Unlevered Free Cash Flow								\$6,412.6	\$3,115.1	\$3,120.8	\$3,252.4	\$3,454.3	
WACC			9.5%										
Discount Period								1.0	2.0	3.0	4.0	5.0	
Discount Factor								0.91	0.83	0.76	0.70	0.64	
Present Value of Free Cash Flow								\$5,856.3	\$2,598.0	\$2,377.0	\$2,262.3	\$2,194.3	

Enterprise Value	
Cumulative Present Value of FCF	\$15,287.8
Terminal Value	
Terminal Year EBITDA (2028E)	\$4,535.3
Exit Multiple	10.0x
Terminal Value	\$45,352.8
Discount Factor	0.64
Present Value of Terminal Value	\$28,809.3
% of Enterprise Value	65.3%
Enterprise Value	\$44,097.1

Implied Equity Value and Share Price	
Enterprise Value	\$44,097.1
Less: Total Debt	(7,429.0)
Less: Preferred Stock	-
Less: Noncontrolling Interest	-
Plus: Cash and Cash Equivalents	1,050.0
Implied Equity Value	\$37,718.1
Fully Diluted Shares Outstanding	144.7
Implied Share Price	\$260.66

Implied Perpetuity Growth Rate	
Terminal Year Free Cash Flow (2028E)	\$3,454.3
WACC	9.5%
Terminal Value	\$45,352.8
Implied Perpetuity Growth Rate	1.8%
Implied EV/EBITDA	
Enterprise Value	\$44,097.1
LTM 2028 EBITDA	4,535.3
Implied EV/EBITDA	9.7x

INCOME STATEMENT AND CASH FLOW ASSUMPTIONS

Assumptions Page 1 - Income Statement and Cash Flow Statement											
		Projection Period									
		Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
		2024	2025	2026	2027	2028	2029	2030	2031	2032	2033
Income Statement Assumptions											
Sales (% growth)		(6.0%)	(3.0%)	0.0%	4.0%	6.0%	1.5%	1.5%	1.5%	1.5%	1.5%
Base	1	(6.0%)	(3.0%)	0.0%	4.0%	6.0%	1.5%	1.5%	1.5%	1.5%	1.5%
Upside	2	(4.5%)	(1.5%)	1.5%	5.5%	7.5%	4.0%	4.0%	4.0%	4.0%	4.0%
Management	3										
Downside 1	4	(8.0%)	(5.0%)	(2.0%)	2.0%	4.0%	(1.5%)	(1.5%)	(1.5%)	(1.5%)	(1.5%)
Downside 2	5						(2.5%)	(2.5%)	(2.5%)	(2.5%)	(2.5%)
Cost of Goods Sold (% sales)											
		30.0%	28.0%	27.0%	26.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Base	1	30.0%	28.0%	27.0%	26.0%	25.0%	25.0%	25.0%	25.0%	25.0%	25.0%
Upside	2	29.0%	27.0%	26.0%	25.0%	24.0%	24.0%	24.0%	24.0%	24.0%	24.0%
Management	3						23.0%	23.0%	23.0%	23.0%	23.0%
Downside 1	4	31.0%	29.0%	28.0%	27.0%	26.0%	28.0%	28.0%	28.0%	28.0%	28.0%
Downside 2	5						30.0%	30.0%	30.0%	30.0%	30.0%
SG&A (% sales)											
		22.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Base	1	22.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%	20.0%
Upside	2	21.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%	19.0%
Management	3						- %	- %	- %	- %	- %
Downside 1	4	23.0%	21.0%	21.0%	21.0%	21.0%	21.0%	21.0%	21.0%	21.0%	21.0%
Downside 2	5						- %	- %	- %	- %	- %
Depreciation & Amortization (% sales)											
		5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Base	1	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Upside	2	4.7%	4.7%	4.7%	4.7%	4.7%	4.7%	4.7%	4.7%	4.7%	4.7%
Management	3						- %	- %	- %	- %	- %
Downside 1	4	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%	5.3%
Downside 2	5						- %	- %	- %	- %	- %
Cash Flow Statement Assumptions											
Capital Expenditures (% of sales)		4.0%	4.0%	4.5%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Base	1	4.0%	4.0%	4.5%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%	4.0%
Upside	2	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
Management	3						- %	- %	- %	- %	- %
Downside 1	4	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%	5.0%
Downside 2	5						- %	- %	- %	- %	- %

CURRENT R&D PIPELINE – CLINICAL TRIALS

Alzheimer's Disease and Dementia	Lecanemab (Aβ mAb) ⁽¹⁾⁽²⁾ - Alzheimer's	Filed in the E.U. and Other Markets
	Lecanemab (Aβ mAb) ⁽¹⁾ - Preclinical Alzheimer's	Phase 3
	BIIB080 (tau ASO) ⁽¹⁾ - Alzheimer's	Phase 2
	BIIB113 (OGA inhibitor) - Alzheimer's	Phase 1
Neuropsychiatry	Zuranolone (GABA _A PAM) ⁽¹⁾⁽⁴⁾ - MDD	Phase 3
	Zuranolone (GABA _A PAM) ⁽¹⁾ - PPD	Approved in the U.S.
Specialized Immunology	Dapirolizumab pegol (anti-CD40L) ⁽¹⁾ - SLE	Phase 3
	Litifilimab (anti-BDCA2) - SLE	Phase 3
	Litifilimab (anti-BDCA2) - CLE	Phase 2/3
Neuromuscular Disorders	Omaveloxolone (Nrf2 activator) - FA	Approved in the U.S. and the E.U.
	Tofersen (SOD1 ASO) ⁽¹⁾⁽³⁾ - SOD1 ALS	Approved in the U.S.; Filed in the E.U.
	BIIB105 (ataxin-2 ASO) [#] - ALS	Phase 1b
	BIIB115 (SMN ASO) ⁽¹⁾ - SMA	Phase 1b
Parkinson's and Movement Disorders	BIIB122 (LRRK2 inhibitor) ⁽¹⁾ - Parkinson's	Phase 2
	BIIB124 (GABA _A PAM) ⁽¹⁾ - Essential Tremor	Phase 2
	BIIB094 (LRRK2 ASO) [#] - Parkinson's	Phase 1b
	BIIB101 (α-syn ASO) [#] - Multiple System Atrophy	Phase 1b
Multiple Sclerosis	BIIB091 (peripheral BTK inhibitor) - MS	Phase 2
	BIIB107 (anti-VLA4) - MS	Phase 1
Genetic Neurodevelopmental Disorders	BIIB121 (UBE3A ASO) [#] - Angelman Syndrome	Phase 1b
Neuropathic Pain	Cemdomespib (Hsp90 modulator) - DPNP	Phase 2

PATENT EXPIRIES

Product	Patent Expiry
TECFEDIRA	2025
PLEGRIDY	2026
LEQEMBI	2027
ADUHELM	2028/2032
SKYCLARYS	2029/2033
SPINRAZA	2029
ZURZUVAE	2034
QALSODY	2035