

Crohn's Disease: What do we expect to see next?

Exhibit 36: Upcoming catalysts in CD and UC

Crohn's Disease (CD)/ Ulcerative Colitis (UC)				
Company (Drug)	Phase	Readout	US Approval	EU Approval
ABBV (Upadacitinib)				
	Initiate phase 3 (CD)	2H 2017		
	Phase 2b data in (UC)	2H 2018		<i>est. 2022</i>
ABBV (Risankizumab)				
	Initiate phase 3 (CD)	2H 2017		<i>est. 2022</i>
	Initiate phase 3 (UC)	1H 2018		<i>est. 2023</i>
GILD/GLPG (Filgotinib)				
	DIVERSITY-1 (CD)	2H 2019		
	SELECTION-1 (UC)	2H 2019		<i>est. 2020/2021</i>
JNJ (Tremfya)				
	Planned phase 3 (CD)	---		<i>est. 2022</i>
	Planned phase 3 (UC)	---		<i>est. 2023</i>
JNJ (Stelara)				
	UNIFI-Phase 3 (UC)	2H 2018		<i>est. 2019</i>
PFE (Xeljanz)				
	PDUFA (UC)	March 2018 (PDFUA)		<i>est. 2018</i>

Source: Company data, Goldman Sachs Global Investment Research

Atopic Dermatitis

Exhibit 37: Snapshot of Atopic dermatitis

Atopic Dermatitis (AD)

Current Therapies:

Dupilumab launched in 2017 as the first targeted biologic therapy for adults with moderate-to-severe AD (peak sales estimated by our REGN analyst are \$3.8bn in 2029E). Dupi is an injectable, and we expect the newer JAKs to have a commercial advantage given their better efficacy profile (still needs to be confirmed in later trials) and more convenient oral dosing.

How big is JAK opportunity?

~\$5bn in 2027*

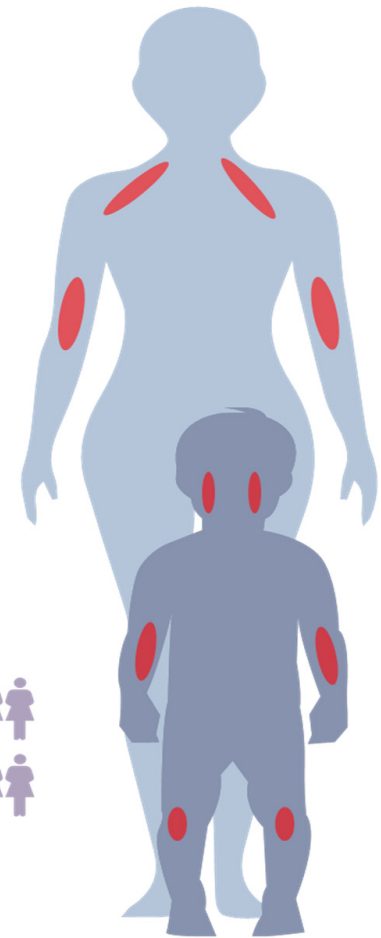
*Numbers not reflected in our model pending further data readouts

What is AD?

AD is a chronic, skin condition that results in itchy, red, swollen and cracked skin. It is common in children but can occur at any age. In AD the skin barrier is weak and further weakened by the immune system and is commonly associated with the “atopic march” which is the development of subsequent asthma, allergic rhinitis and other infectious complications.

How is it treated?

The goals of treatment aim to reduce symptoms of pruritus (itch) and dermatitis, prevent flare ups and minimize therapeutic risks. Patients are commonly treated with topical anti-inflammatory medications and moisturization of the skin, while those with more severe cases require phototherapy or systemic biologic therapy.



Source: Company data, Goldman Sachs Global Investment Research

Other indications

Across other indications, we currently give credit to existing assets such as Stelara and IL-17's where Cosentyx is approved and Taltz is coming to market. In comparison we give modest credit to the next generation assets (Jaks and IL-23's) and acknowledge there is room for upside as the landscape evolves and data matures.

Exhibit 38: Additional Indications

	Ulcerative Colitis (UC)	Psoriatic Arthritis (PsA)	Ankylosing Spondylitis (AS)	Axial Spondyloarthritis (axSpA)
What is it?	An inflammatory bowel disease causing long-lasting inflammation and development of ulcers in the innermost lining of the large intestine and rectum	A form of arthritis that affects some people who have psoriasis, and features inflammation of the skin (psoriasis) and joints (arthritis). Typically, diagnosed initially with psoriasis followed by PsA	A form of arthritis that causes pain and inflammation of the spine	A subset of AS which affects mainly the spine and pelvic joints
Prevalence- US	900K	1.6M (2016)	1.13M (2016)	625K
Prevalence- EU	0.9-24/100,000 PY	1.5M (2016)	1.1M (2016)	650K
Drug Treated- US	678K	559K	440k (2016)	200K
Drug Treated- EU	533K	536K	430 (2016)	208K
Biologic Penetration-US	20%	30%	19% (2016)	32%
Biologic Penetration-EU	11%	30%	24% (2016)	33%
Biologic Treated-US	135K	168K	84K	65K
Biologic Treated-EU	59K	162K	103K	68K
Approved Drugs	--	Stelara (2013)	Cosentyx (2016)	--
	--	Taltz (2017)	--	--
	--	Cosentyx (2016)	--	--
Drugs in Development	Upadacitinib (est. 2022)	Upadacitinib (est.2021)	Upadacitinib (est 2022)	Taltz (est. 2020)
	Filgotinib (est. 2020/2021)	Filgotinib (est. 2021)	Filgotinib (est. 2021)	Cosentyx (est. 2020)
	Xeljanz (March 2018)	Risankizumab (est. 2021)	Taltz (est. 2021)	Stelara (est. 2021)
	Tremfya (est. 2023)	Baricitinib (est. 2022)	--	--
	Risankizumab (est. 2023)	Xeljanz (Dec 2017)	--	--
	Stelara (est. 2019)	Tremfya (est. 2021)	--	--
GS Next-Gen Asset Estimates 2027 (\$mn)	\$2,250	\$5,150	\$3,450	\$1,800

Source: Company data, Goldman Sachs Global Investment Research

Market model summary

Exhibit 39: Revenue summary of JAKs/IL-23s and IL-17s

Sales in \$mns

	2016	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E
Xeljanz (PFE)	\$876	\$1,187	\$1,491	\$1,501	\$1,378	\$1,321	\$1,296	\$1,324	\$1,416	\$1,464	\$732	\$220
RA	\$876	\$1,187	\$1,391	\$1,301	\$1,078	\$1,021	\$996	\$1,024	\$1,116	\$1,164	\$582	\$175
Other indications			\$100	\$200	\$300	\$300	\$300	\$300	\$300	\$300	\$150	\$45
% sales growth											(50%)	(70%)
UC (March 2018)			\$50	\$100	\$150	\$200	\$225	\$225	\$200	\$150	\$75	\$23
PsA (Dec 2017)			\$50	\$100	\$150	\$200	\$200	\$175	\$150	\$150	\$75	\$23
Upadacitinib (ABBV)	\$0	\$0	\$0	\$300	\$620	\$1,107	\$1,799	\$2,707	\$4,014	\$5,238	\$6,277	\$7,456
RA (2019)	\$0	\$0	\$0	\$300	\$620	\$957	\$1,275	\$1,609	\$1,998	\$2,397	\$2,823	\$3,358
CD (2022)	\$0	\$0	\$0	\$0	\$0	\$0	\$49	\$178	\$441	\$690	\$903	\$1,148
UC (2022)							\$30	\$120	\$275	\$400	\$500	\$600
PsA (2021)						\$50	\$125	\$150	\$300	\$450	\$550	\$650
AS (2022)							\$70	\$150	\$300	\$400	\$500	\$600
AD (2021)						\$100	\$250	\$500	\$700	\$900	\$1,000	\$1,100
Filgotinib (LPG/GILD)	\$0	\$0	\$0	\$0	\$171	\$511	\$1,111	\$1,864	\$2,709	\$3,462	\$4,357	\$5,322
RA (2020)	\$0	\$0	\$0	\$0	\$161	\$319	\$598	\$975	\$1,293	\$1,644	\$2,039	\$2,474
CD (2020/2021)	\$0	\$0	\$0	\$0	\$10	\$62	\$164	\$289	\$441	\$618	\$817	\$1,048
UC (2020/2021)						\$30	\$100	\$200	\$325	\$400	\$500	\$600
AS (2021 est)						\$50	\$125	\$250	\$350	\$400	\$500	\$600
PsA (2021 est)						\$50	\$125	\$150	\$300	\$400	\$500	\$600
Baricitinib (LLY)	\$0	\$37	\$190	\$400	\$620	\$993	\$1,416	\$1,868	\$2,319	\$2,744	\$3,054	\$3,432
RA (US 2H18)	\$0	\$37	\$190	\$400	\$620	\$893	\$1,116	\$1,268	\$1,469	\$1,644	\$1,804	\$2,032
PsA (2022 est)							\$50	\$100	\$150	\$200	\$250	\$300
AD (2021)						\$100	\$250	\$500	\$700	\$900	\$1,000	\$1,100
Stelara (JNJ)	\$3,218	\$3,624	\$4,147	\$4,757	\$5,330	\$6,121	\$6,905	\$7,008	\$6,059	\$4,996	\$3,969	\$2,993
Psoriasis	\$1,632	\$1,473	\$1,284	\$1,105	\$856	\$597	\$559	\$580	\$511	\$490	\$461	\$435
PsA (2013)	\$350	\$450	\$600	\$700	\$800	\$900	\$1,000	\$900	\$800	\$600	\$500	\$400
CD (2016)	\$1,186	\$1,551	\$1,963	\$2,452	\$2,974	\$3,624	\$4,146	\$4,453	\$3,798	\$3,132	\$2,408	\$1,683
UC (2019)	\$50	\$150	\$300	\$500	\$700	\$900	\$1,000	\$900	\$800	\$650	\$500	\$400
AxSpA (2021)						\$100	\$200	\$175	\$150	\$125	\$100	\$75
Tremfya (JNJ)	\$0	\$42	\$248	\$584	\$950	\$1,366	\$1,811	\$2,475	\$3,058	\$3,986	\$4,731	\$5,485
Psoriasis (2017)	\$0	\$42	\$248	\$584	\$950	\$1,316	\$1,683	\$2,112	\$2,236	\$2,674	\$2,890	\$3,126
PsA (2021 est)						\$50	\$100	\$200	\$300	\$400	\$500	\$600
CD (2022 est)	\$0	\$0	\$0	\$0	\$0	\$0	\$28	\$112	\$396	\$612	\$941	\$1,259
UC (2023 est)							\$50	\$125	\$300	\$400	\$500	\$600
Risankizumab (ABBV)	\$0	\$0	\$0	\$233	\$678	\$1,134	\$1,777	\$2,650	\$3,426	\$4,612	\$5,605	\$6,663
Psoriasis (2019)	\$0	\$0	\$0	\$233	\$678	\$1,084	\$1,595	\$2,112	\$2,431	\$2,995	\$3,352	\$3,751
CD (2022)	\$0	\$0	\$0	\$0	\$0	\$0	\$83	\$262	\$545	\$918	\$1,303	\$1,762
UC (2023)							\$50	\$100	\$150	\$300	\$450	\$550
PsA (2021)						\$50	\$100	\$200	\$300	\$400	\$500	\$600
Taltz (LLY)	\$96	\$525	\$907	\$1,385	\$1,906	\$2,612	\$3,069	\$3,447	\$3,758	\$3,915	\$4,334	\$4,768
Psoriasis (March 2016)	\$96	\$525	\$857	\$1,235	\$1,631	\$2,087	\$2,219	\$2,222	\$2,158	\$2,065	\$2,234	\$2,418
PsA (EOY 2017)			\$50	\$150	\$225	\$350	\$450	\$550	\$650	\$700	\$750	\$800
AS (2021)						\$50	\$150	\$300	\$450	\$550	\$650	\$750
AxSpA (2020)					\$50	\$125	\$250	\$375	\$500	\$600	\$700	\$800
Cosentyx (NVS)	\$1,182	\$2,032	\$2,875	\$3,445	\$4,045	\$4,651	\$5,402	\$5,495	\$5,445	\$5,628	\$5,816	\$6,000
Psoriasis (Jan 2015)	\$982	\$1,432	\$1,875	\$2,045	\$2,120	\$2,201	\$2,352	\$2,095	\$1,845	\$1,828	\$1,866	\$1,900
PsA (Jan 2016)	\$100	\$300	\$500	\$700	\$900	\$1,100	\$1,250	\$1,400	\$1,450	\$1,500	\$1,550	\$1,600
AS (Jan 2016)	\$100	\$300	\$500	\$700	\$900	\$1,100	\$1,300	\$1,400	\$1,450	\$1,500	\$1,500	\$1,500
Ax Spa (2020)					\$125	\$250	\$500	\$600	\$700	\$800	\$900	\$1,000
Total Product Sales	\$5,371	\$7,447	\$9,857	\$12,605	\$15,699	\$19,815	\$24,586	\$28,837	\$32,204	\$36,045	\$38,874	\$42,338
Growth		39%	32%	28%	25%	26%	24%	17%	12%		8%	9%
Incumbents	\$4,094	\$4,811	\$5,638	\$6,258	\$6,708	\$7,442	\$8,201	\$8,332	\$7,476	\$6,461	\$4,701	\$3,212
Growth		18%	17%	11%	7%	11%	10%	2%	-10%	-14%	-27%	-32%
New agents	\$1,278	\$2,636	\$4,219	\$6,347	\$8,990	\$12,373	\$16,385	\$20,504	\$24,729	\$29,584	\$34,173	\$39,126
Growth		106%	60%	50%	42%	38%	32%	25%	21%	20%	16%	14%

Source: Company data, Goldman Sachs Global Investment Research

Exhibit 40: Cumulative new agent sales by indication

Sales in \$mns

	2016	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E
New agent sales	\$1,278	\$2,636	\$4,219	\$6,347	\$8,990	\$12,373	\$16,385	\$20,504	\$24,729	\$29,584	\$34,173	\$39,126
PS	\$1,078	\$1,999	\$2,979	\$4,097	\$5,380	\$6,686	\$7,848	\$8,541	\$8,671	\$9,562	\$10,342	\$11,195
RA	\$0	\$37	\$190	\$701	\$1,401	\$2,169	\$2,989	\$3,852	\$4,759	\$5,685	\$6,667	\$7,864
CD	\$0	\$0	\$0	\$0	\$10	\$62	\$323	\$842	\$1,824	\$2,837	\$3,965	\$5,217
PsA	\$100	\$300	\$550	\$850	\$1,125	\$1,650	\$2,200	\$2,750	\$3,450	\$4,050	\$4,600	\$5,150
AS	\$100	\$300	\$500	\$700	\$900	\$1,200	\$1,645	\$2,100	\$2,550	\$2,850	\$3,150	\$3,450
UC	\$0	\$0	\$0	\$0	\$0	\$30	\$130	\$445	\$875	\$1,400	\$1,850	\$2,250
AxSpa	\$0	\$0	\$0	\$0	\$175	\$375	\$750	\$975	\$1,200	\$1,400	\$1,600	\$1,800
AD	\$0	\$0	\$0	\$0	\$0	\$200	\$500	\$1,000	\$1,400	\$1,800	\$2,000	\$2,200

Source: Company data, Goldman Sachs Global Investment Research

Exhibit 41: Summary of market model assumptions across the "big 3" indications - RA, Psoriasis and Crohn's

Model Assumption								
Rheumatoid Arthritis			Psoriasis		Crohn's Disease			
	2017	2027	2017	2027	2017	2027		
Patient share assumptions			Patient share assumptions		Patient share assumptions			
Biologic penetration			Biologic penetration		Biologic penetration			
US	39%	49%	US	10%	15%	US	43%	60%
EU	20%	28%	EU	9%	14%	EU	30%	45%
In play patients								
Bio naïve patients	13%	14%	1L market share	20%	24%	1L market share	18%	25%
Switching	13%	20%	2L market share	14%	21%	2L market share	10%	20%
Continuing JAK	1%	5%	Continuing IL	38%	52%	Continuing JAK	1%	10%
JAK class share			IL inhibitor share		JAK/IL inhibitor share			
IL	10%	20%	1L	25%	40%	1L	3%	16%
2L+	23%	70%	2L	58%	85%	2L	38%	65%
Key players market share			Key players market share		Key players market share			
Xeljanz (PFE)	97%	11%	Stelara (JNJ)	50%	9%	Stelara (JNJ)	100%	20%
Baricitinib (LLY)	3%	23%	Cosentyx (NVS)	36%	16%	Filgotinib (GLPG/GILD)	0%	21%
Upadacitinib (ABBV)	0%	38%	Taltz (LLY)	13%	20%	Upadacitinib (ABBV)	0%	23%
Filgotinib (GLPG/GILD)	0%	28%	Risankizumab (ABBV)	0%	30%	Risankizumab (ABBV)	0%	21%
			Tremfya (JNJ)	1%	25%	Tremfya (JNJ)	0	15%
Pricing assumptions			Pricing assumptions		Pricing assumptions			
Annual Price growth			Annual Price growth		Annual Price growth			
US		2%	US		2%	US		2%
EU		0%	EU		0%	EU		0%
Avg gross to net rebate in the US		30%	Avg gross to net rebate in the US		30%	Avg gross to net rebate in the US		30%
Avg EU price discount to US		20%	Avg EU price discount to US		20%	Avg EU price discount to US		20%

Source: Company data, Goldman Sachs Global Investment Research

Exhibit 42: Market model for Rheumatoid Arthritis (RA)

Sales in \$mns

		2016	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	'16-22 CAGR	'22-27 CAGR
Biologic Treated-US		601,920	630,000	646,400	660,186	692,362	715,936	739,911	764,295	789,092	814,308	839,950	866,024	3%	3%
Penetration		38%	39%	40%	41%	42%	43%	44%	45%	46%	47%	48%	49%		
Biologic Treated-EU		263,340	275,000	291,500	308,990	327,629	347,161	368,012	379,052	390,424	402,137	414,201	426,627	6%	3%
Penetration		19%	20%	21%	22%	23%	24%	25%	26%	26%	27%	27%	28%		
Total Biologic treated Population-US & EU		865,260	905,000	937,900	978,176	1,019,992	1,063,117	1,107,923	1,143,347	1,179,516	1,216,445	1,254,151	1,292,651	4%	3%
In Play Patients															
		2016	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	'16-22 CAGR	'22-27 CAGR
1L Biologic Patients - US & EU		112,484	117,650	121,927	128,141	134,626	141,395	149,570	156,639	162,773	169,086	175,581	180,971		
% of Biologic Treated		13.0%	13.0%	13.0%	13.1%	13.2%	13.3%	13.5%	13.7%	13.8%	13.9%	14.0%	14.0%	1%	1%
Biologic Switch Patients (2L+) - US & EU		112,484	117,650	126,617	136,945	147,884	159,468	177,268	194,369	212,313	231,125	244,559	258,530		
% of Biologic Treated		13.0%	13.0%	13.5%	14.0%	14.5%	15.0%	16.0%	17.0%	18.0%	19.0%	19.5%	20.0%	4%	5%
Patients continuing on therapy - US & EU	74.0%	640,292	669,700	694,046	723,850	754,720	786,706	819,863	846,077	872,842	900,169	928,072	956,561	4%	3%
Patients Continuing on JAK Therapy		3,201	4,688	6,940	9,410	11,321	15,734	20,497	25,382	30,549	36,007	41,763	47,828		
% of Continuing patients		0.5%	0.7%	1.0%	1.3%	1.5%	2.0%	2.5%	3.0%	3.5%	4.0%	4.5%	5.0%	31%	15%
Total In-Play Patients- US & EU		228,169	239,968	255,494	274,496	293,931	316,996	347,334	376,390	408,635	436,217	461,904	487,528	7%	7%
US	70%	158,726	166,948	177,728	190,953	204,404	220,241	241,624	261,836	282,181	303,455	321,324	339,012		
EU	30%	69,443	73,040	77,756	83,542	89,427	96,355	105,710	114,553	123,454	132,762	140,579	148,318		
In play as a % of biologic treated		26.4%	26.5%	27.2%	28.1%	28.8%	29.9%	31.4%	32.9%	34.4%	35.9%	36.8%	37.7%		
JAK-Inhibitor market share		2016	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	'16-22 CAGR	'22-27 CAGR
JAK-Inhibitor market share		35,034	42,924	54,586	68,057	82,999	105,169	129,322	155,781	184,795	212,051	238,978	264,993	24%	15%
1L Biologic Patients		10,124	11,177	12,993	13,455	15,482	17,674	20,192	23,496	26,858	30,435	33,360	36,194		
JAK as a %		9.0%	9.5%	10.0%	10.5%	11.5%	12.5%	13.5%	15.0%	16.5%	18.0%	19.0%	20.0%		
Biologic Switch Patients (2L+)		21,709	27,060	35,453	45,192	56,196	71,760	88,634	106,903	127,388	145,608	163,855	180,971		
JAK as a %		19%	23%	28%	33%	38%	45%	50%	55%	60%	63%	67%	70%		
Patients Continuing JAK Therapy		3,201	4,688	6,940	9,410	11,321	15,734	20,497	25,382	30,549	36,007	41,763	47,828		
JAK as a %		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%		
Total In-Play Patients		35,034	42,924	54,586	68,057	82,999	105,169	129,322	155,781	184,795	212,051	238,978	264,993	24%	15%
US		24,372	29,860	37,973	47,344	57,738	73,161	89,963	108,369	128,553	147,514	166,246	184,343		
EU		10,663	13,064	16,613	20,713	25,260	32,008	39,359	47,412	56,242	64,537	72,733	80,650		
Key Players market share															
Xeljanz (PFE)		100%	97%	88%	65%	44%	32%	25%	21%	19%	17%	15%	11%		
Baricitinib (LLY)		0%	3%	12%	20%	25%	28%	28%	26%	25%	24%	23%	23%		
Upadacitinib (ABBV)		0%	0%	0%	15%	25%	30%	32%	33%	34%	35%	36%	38%		
Filgotinib (GLPG/GILD)		0%	0%	0%	0%	7%	10%	15%	20%	22%	24%	26%	28%		
Sales for Key Players (\$m)		2016	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E		
Xeljanz (PFE)		\$876	\$1,187	\$1,391	\$1,301	\$1,078.38	\$1,021	\$996	\$1,024	\$1,116	\$1,164	\$582	\$175		
% sales growth												(50.0%)	(70.0%)		
Baricitinib (LLY)		\$0	\$37	\$190	\$400	\$620	\$893	\$1,116	\$1,268	\$1,469	\$1,644	\$1,804	\$2,032		
Upadacitinib (ABBV)		\$0	\$0	\$0	\$300	\$620	\$957	\$1,275	\$1,609	\$1,998	\$2,397	\$2,823	\$3,358		
Filgotinib (GLPG/GILD)		\$0	\$0	\$0	\$0	\$161	\$319	\$598	\$975	\$1,293	\$1,644	\$2,039	\$2,474		
JAK-Inhibitor Total Addressable Market (\$bn)		\$876	\$1,224	\$1,581	\$2,002	\$2,479	\$3,190	\$3,985	\$4,876	\$5,876	\$6,850	\$7,249	\$8,039		

Source: Company data, Goldman Sachs Global Investment Research

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Exhibit 43: Market model for Psoriasis

Sales in \$mns

		2016	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	16-22 CAGR	22-27 CAGR
Biologic Treated- US		122,245	125,000	132,500	140,450	148,877	157,810	169,507	173,969	180,926	188,165	195,692	203,206	6%	4%
Penetration		9.8%	9.9%	10.4%	10.9%	11.5%	12.0%	12.8%	13.0%	13.4%	13.8%	14.2%	14.6%		
Biologic Treated- EU		107,722	110,000	116,600	123,596	131,011.76	138,872	150,021	153,093	159,217	165,585	172,209	179,644.70	6%	4%
Penetration		9.3%	9.4%	9.9%	10.4%	10.9%	11.4%	12.2%	12.3%	12.7%	13.1%	13.5%	13.9%		
Total Biologic Treated Population-US & EU		229,967	235,000	249,100	264,046	279,889	296,682	319,528	327,062	340,145	353,751	367,901	382,851	6%	4%
In Play Patients															
		2016	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	16-22 CAGR	22-27 CAGR
1L Biologic Patients - US & EU		43,694	45,825	49,820	54,658	60,176	65,270	71,894	75,224	79,254	83,131	87,192	91,884		
% of Biologic Treated		19%	19.5%	20.0%	20.7%	21.5%	22.0%	22.5%	23.0%	23.3%	23.5%	23.7%	24.0%	3%	1%
Biologic Switch Patients (ZL+) - US & EU		29,896	32,900	37,365	43,568	48,981	54,886	62,308	65,412	69,049	72,873	76,523	80,399		
% of Biologic Treated		13%	14.0%	15.0%	16.5%	17.5%	18.5%	19.5%	20.0%	20.3%	20.6%	20.8%	21.0%	7%	1%
Patients continuing on therapy - US & EU	68%	156,378	159,800	169,388	179,551	190,324	201,744	217,279	222,402	231,298	240,550	250,172	260,339	6%	4%
Patients continuing on IL-Inhibitor Therapy		54,732	60,724	67,755	75,412	83,743	90,785	99,948	104,529	111,023	120,275	127,588	135,376		
% of continuing patients		35%	38.0%	40.0%	42.0%	44.0%	45.0%	46.0%	47.0%	48.0%	50.0%	51.0%	52.0%	5%	2%
Total In-Play Patients- US & EU		128,322	139,449	154,940	173,637	192,899	210,941	234,150	245,166	259,326	276,279	291,304	307,659	11%	6%
US	53%	68,213	74,128	82,363	92,301	102,541	112,131	124,469	130,325	137,852	146,864	154,850	163,544		
EU	47%	60,109	65,321	72,578	81,335	90,359	98,810	109,681	114,841	121,474	129,416	136,453	144,115		
In play as a % of biologic treated		55.8%	59.3%	62.2%	65.8%	68.9%	71.1%	73.3%	75.0%	76.2%	78.1%	79.2%	80.4%		
IL-Inhibitor market share		78,973	91,262	106,241	123,732	142,100	160,223	181,188	194,013	194,104	210,892	225,107	240,469	15%	6%
1L Biologic Patients		8,695	11,456	14,946	19,130	24,070	29,372	34,509	39,117	43,531	47,850	52,075	56,204		
IL-Inhibitor as a %		20%	25%	30%	35%	40%	45%	48%	52%	53%	55%	57%	59%		
Biologic Switch Patients (ZL+)		15,546	19,082	23,540	29,190	34,286	40,067	46,731	50,388	54,549	59,027	63,514	68,339		
IL-Inhibitor as a %		52%	58%	63%	67%	70%	73%	75%	77%	79%	81%	83%	85%		
Patients Continuing IL-Inhibitor Therapy		54,732	60,724	67,755	75,412	83,743	90,785	99,948	104,529	111,023	120,275	127,588	135,376		
IL-Inhibitor as a %		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%		
Total In-Play Patients		78,973	91,262	106,241	123,732	142,100	160,223	181,188	194,013	194,104	210,892	225,107	240,469	15%	6%
US		41,980	48,513	56,475	65,773	75,537	85,171	96,316	103,133	103,181	112,105	119,662	127,828		
EU		36,993	42,749	49,766	57,959	66,563	75,052	84,873	90,880	90,923	98,787	105,445	112,641		
Key Players market share															
Stelara (JNJ)		67%	50%	37%	27%	18%	11%	9%	9%	9%	9%	9%	9%		
Cosentyx (NVS)		30%	36%	40%	37%	33%	30%	28%	23%	20%	18%	17%	16%		
Taltz (LLY)		3%	13%	18%	22%	25%	28%	26%	24%	23%	20%	20%	20%		
Risankizumab (ABBV)		0%	0%	0%	4%	10%	14%	18%	22%	25%	28%	29%	30%		
Tremfya (JNJ)		0%	1%	5%	10%	14%	17%	19%	22%	23%	25%	25%	25%		
Sales for Key Players (\$mn)															
Stelara (JNJ)		\$1,632	\$1,473	\$1,284	\$1,105	\$856	\$597	\$559	\$580	\$511	\$490	\$461	\$435		
Cosentyx (NVS)		\$982	\$1,432	\$1,875	\$2,045	\$2,120	\$2,201	\$2,362	\$2,095	\$1,845	\$1,828	\$1,866	\$1,900		
Taltz (LLY)		\$96	\$525	\$857	\$1,235	\$1,631	\$2,087	\$2,219	\$2,222	\$2,158	\$2,065	\$2,234	\$2,418		
Risankizumab (ABBV)		\$0	\$0	\$0	\$233	\$678	\$1,084	\$1,595	\$2,112	\$2,431	\$2,995	\$3,352	\$3,751		
Tremfya (JNJ)		\$0	\$42	\$248	\$584	\$950	\$1,316	\$1,683	\$2,112	\$2,236	\$2,674	\$2,890	\$3,126		
New Agent Total Addressable Market (\$bn)		\$2,710	\$3,472	\$4,264	\$5,201	\$6,236	\$7,284	\$8,408	\$9,121	\$9,182	\$10,051	\$10,803	\$11,630		

Source: Company data, Goldman Sachs Global Investment Research

Exhibit 44: Market model for Crohn's disease

Sales in \$mns

		2016	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	'16-22 CAGR	'22-27 CAGR
Biologic Treated- US		247,757	250,000	260,000	270,400	281,216	296,750	305,844	321,258	336,951	352,925	369,184	385,734	4%	5%
Penetration		43%	43%	44%	46%	47%	49%	50%	52%	54%	56%	58%	60%		
Biologic Treated- EU		150,579	150,000	157,500	166,375	173,643.75	182,326	199,823	216,276	222,864.78	221,618	232,699	252,019.54	5%	5%
Penetration		30%	30%	31%	32%	33%	35%	38%	40%	41%	40%	42%	45%		
Total Biologic Treated Population-US & EU		398,336	400,000	417,500	435,775	454,860	479,085	505,667	536,535	559,815	574,543	601,884	637,754	4%	5%
In Play Patients															
		2016	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	'16-22 CAGR	'22-27 CAGR
1L Biologic Patients - US & EU		67,717	70,000	75,150	80,618	86,423	95,817	106,190	118,038	128,758	137,890	147,461	159,438		
% of Biologic Treated		17.0%	17.5%	18.0%	18.5%	19.0%	20.0%	21.0%	22.0%	23.0%	24.0%	24.5%	25.0%	4%	4%
Biologic Switch Patients (2L+) - US & EU		35,850	38,000	41,750	45,756	50,035	57,490	65,737	80,480	95,169	109,163	117,367	127,651		
% of Biologic Treated		9.0%	9.5%	10.0%	10.5%	11.0%	12.0%	13.0%	15.0%	17.0%	19.0%	19.5%	20.0%	6%	9%
Patients continuing on therapy -US & EU	74%	294,769	296,000	308,950	322,474	336,696	354,523	374,194	397,036	414,263	425,162	445,394	471,938	4%	5%
Patients Continuing on JAKi/iL Therapy		884	2,072	3,090	4,837	6,732	8,863	13,097	17,867	24,856	31,887	40,085	47,194		
% of continuing patients		0.3%	0.7%	1.0%	1.5%	2.0%	2.5%	3.5%	4.5%	6.0%	7.5%	9.0%	10.0%	51%	23%
Total In-Play Patients- US & EU		104,452	110,072	119,990	131,212	143,190	162,170	185,024	216,364	248,782	278,941	304,914	334,183	10%	13%
US	62%	64,967	68,463	74,631	81,611	89,061	100,867	115,081	134,587	154,738	173,496	189,651	207,855		
EU	38%	39,485	41,609	45,358	49,601	54,129	61,304	69,943	81,798	94,044	105,445	115,264	126,328		
In play as a % of biologic treated		26.2%	27.5%	28.7%	30.1%	31.5%	33.9%	36.6%	40.3%	44.4%	48.6%	50.7%	52.4%		
		2016	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E	'16-22 CAGR	'22-27 CAGR
JAK-inhibitor market share		14,711	18,262	22,796	28,086	33,933	42,495	54,865	73,505	95,840	116,690	136,146	155,612	25%	23%
1L Biologic Patients -JAK as a %		513	1,750	3,006	4,031	5,185	7,186	9,557	12,964	18,738	19,305	22,719	29,510		
JAK as a %		1.2%	2.5%	4.0%	5.0%	6.0%	7.5%	9.0%	11.0%	13.0%	14.0%	16.0%	18.0%		
Biologic Switch Patients (2L+) -JAK as a %		13,014	14,440	16,700	19,218	22,015	26,446	32,211	42,655	54,246	65,498	73,941	82,908		
JAK as a %		36%	38%	40%	42%	44%	46%	49%	53%	57%	60%	63%	65%		
Patients Continuing JAKi/iL Therapy -JAK as a %		884	2,072	3,090	4,837	6,732	8,863	13,097	17,867	24,856	31,887	40,085	47,194		
JAK as a %		100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%		
Total In-Play Patients		14,711	18,262	22,796	28,086	33,933	42,495	54,865	73,505	95,840	116,690	136,146	155,612	25%	23%
US		9,150	11,359	14,178	17,469	21,105	26,431	34,125	45,719	59,611	72,579	84,680	96,788		
EU		5,561	6,903	8,617	10,617	12,827	16,064	20,740	27,786	36,230	44,111	51,466	58,824		
Key Players market share															
Stelara (JNJ)		100%	100%	100%	100%	99%	95%	83%	69%	51%	39%	29%	20%		
Filgotinib (GLPG/GILD)						1%	5%	10%	13%	15%	17%	19%	21%		
Upadacitinib (ABBV)							3%	8%	15%	19%	21%	23%			
Risankizumab (ABBV)							3%	7%	11%	15%	18%	21%			
Tremfya (JNJ)							1%	3%	8%	10%	13%	15%			
		2016	2017E	2018E	2019E	2020E	2021E	2022E	2023E	2024E	2025E	2026E	2027E		
Sales for Key Players (\$mn)															
Stelara (JNJ)		\$1,186	\$1,551	\$1,963	\$2,452	\$2,974	\$3,624	\$4,146	\$4,453	\$3,798	\$3,132	\$2,408	\$1,683		
Filgotinib (GLPG/GILD) -2020/2021		\$0	\$0	\$0	\$0	\$10	\$62	\$164	\$289	\$441	\$618	\$817	\$1,048		
Upadacitinib (ABBV) - 2022		\$0	\$0	\$0	\$0	\$0	\$49	\$178	\$441	\$660	\$903	\$1,148			
Risankizumab (ABBV) -2022		\$0	\$0	\$0	\$0	\$0	\$83	\$262	\$545	\$918	\$1,303	\$1,762			
Tremfya (JNJ) -2022		\$0	\$0	\$0	\$0	\$0	\$28	\$112	\$396	\$612	\$941	\$1,260			
New Agent Total Addressable Market (\$bn)		\$1,186	\$1,551	\$1,963	\$2,452	\$2,984	\$3,688	\$4,468	\$5,295	\$5,622	\$5,969	\$6,372	\$6,899		

Source: Company data, Goldman Sachs Global Investment Research