PATIENTS FOR AFFORDABLE DRUGS™

ESTIMATES OF PATIENT DEMAND FOR KYMRIAH
January 9, 2018

1. Future approved indications

Demand for Kymriah over the next decade will be driven by its future approved indications in addition to by pediatric and young adult relapsed/refractory (RR) acute lymphoblastic leukemia (ALL). These future indications will hinge on the outcomes of ongoing clinical trials, which we identified searching for "CTL-019" using ClinicalTrials.gov. Our findings and analysis follow:

- In total, we identified 35 clinical studies, including 3 trials supporting the recently approved pediatric and young adult RR ALL indication.
- Of the other 32 studies, we excluded 2 that assessed 4S-CTL019, Novartis's fourth-generation CAR-T.
- We excluded 20 Phase I or Phase I/II trials as being too early-stage.
- We excluded 2 studies that were halted.
- We excluded 1 Phase II trial in high-risk multiple myeloma based on our belief that Kymriah will not be able to generate as much clinical benefit as second-generation CAR-Ts like bb2121.
- Finally, we excluded 1 expanded treatment protocol and 1 Phase II trial in mantle cell lymphoma in China that had enrolled only 2 patients.
- The remaining 5 studies were Phase II trials targeting the following conditions.
    - Adult ALL
        - Patients with minimum residual disease after up front treatment
        - Patients who have no other curative options
    - RR diffuse large B-cell lymphoma (DLBCL)
    - RR chronic lymphocytic Leukemia (CLL)
    - RR small lymphocytic lymphoma (SLL)
    - Other RR non-Hodgkin's lymphoma (NHL)

We projected that Novartis would secure supplementary approval for these indications at some point over the next 10 years.

2. **Indication-Specific Approval Time and Treated Population Estimates**

We made the following indication-specific assumptions based in part on data from the National Cancer Institute's Surveillance, Epidemiology, and End Results program and ClinicalTrials.gov.

Pediatric and Young Adult RR ALL

Experts have estimated that 600 children and young adults have RR ALL. An additional 3,100 children and young adults develop ALL annually, of whom only 15% (n=465) will not be long-term, event-free survivors on non-CAR-T therapies. Based on these statistics and the number of centers currently equipped to administer Kymriah, we estimated that 300 children and young adults would receive treatment in 2018. We assumed that this number would rise to 600 in 2019 and—anticipating some spillover from patients not fully benefiting from another treatment but not having exhausted other options—800 in 2020. We projected 2% annual growth thereafter.

Adult ALL

Number: We estimated that 346 (30%) of the 1,152 adults who die from ALL annually would receive treatment. We additionally estimated that 240 (10%) of the 2,400 adults newly diagnosed with ALL annually would receive treatment as patients who were MRD+ after upfront treatment. We projected that both numbers would grow 2% annually.

Timing: The Phase II trial in adult ALL patients with no other curative options had a target completion date of July 2019. We projected a US launch 12 months later in July 2020. The Phase II trial in adult ALL patients with minimum residual disease following upfront treatment had a target completion date of April 2018. We projected a US launch 15 months later in July 2019.

DLBCL

Number: We estimated that 11,400 (60%) of the 19,000 DLBCL patients on third-line treatment annually would receive CAR-T treatment, which would be split evenly between Kymriah (n=5,700) and Kite's Yescarta (n=5,700).

Timing: Novartis filed for supplementary approval of this indication in October 2017 and received a "breakthrough therapy" designation. We anticipated a US launch in July 2018.

CLL

Number: We estimated that 1,398 (30%) of the 4,660 patients who die each year from CLL would receive treatment and that this number would increase 2% annually.

Timing: The Phase II trial in adults with RR CLL or SLL had a target completion date of October 2019. We projected a US launch 15 months later in January 2021.

SLL

Number: We estimated that 132 (33%) of the 400 newly diagnosed SLL patients annually would relapse, and that 40 (30%) of these relapsed patients would receive treatment.

Timing: The Phase II trial in adults with RR CLL or SLL had a target completion date of October 2019. We projected a US launch 15 months later in January 2021.

Other NHL

Each year, about 5,000 people die from NHL (excluding DLBCL, CLL, and SLL). We estimated that 1,500 (30%) of these people would receive CAR-T treatment, which would be split evenly between Kymriah (n=750) and Yescarta (n=750).

Timing: The Phase II trial in adults with NHL had a target completion date of January 2018. We projected a US launch 12 months later in January 2019.

3. International sales

We estimated that unit sales would be comparable in the EU and the US, and two-thirds less in other regions of the world combined. We assumed Novartis would market Kymriah for specific indications outside the US the year after doing so in the US.

ASSUMPTIONS FOR NVS CTL019 FINANCIAL MODELS

R&D ($000)	Unit cost $000	Total cost $000	Information source
Clinical studies - est. 456 patients dosed to date in clinical trials at $1.0 million each	$ 1,000	$ 456,000	Infused patient count estimated from enrollment targets from NIH database. $1.0 million clinical cost per patient is (generous) estimate.
Process development		$ 100,000	Estimate - please note that basic process development was done at U Penn. NVS did scale-up to commercial size plus process validation. We doubt this would add up to $100 million.
Basic cell biology research		$ 100,000	Please note that basic cell biology research was done through NIH (in-house and through grants) plus work done at U Penn. NVS most likely will have replicated some research to validate the concept. We doubt this would add up to $100 million.
Total clinicals subject to ODA tax credit		$ 456,000	Total R&D expenses that can be included subject to Orphan Drug Act tax credit
ODA tax credit = 50 %		(228,000)	
Amortizable R&D amount		$ 428,000	The after tax R&D amount can be amortized once the product is launched

Manpower cost 2014 - 2017	Average cost per person $000	Total cost $000	Comments
Staffing 2014 - 50 people	$ 200	$ 10,000	Gradual growth of the people complement during the development timeline. Average costs per person reflects staffing cost for different skill levels. Average compensation growth of 5% per year. The number of 200 associated staffers in 2017 was provided by NVS' Mr. Henshaw.
Staffing 2015 - 100 people (+ 5 % raise)	$ 210	$ 21,000	
Staffing 2016 - 150 people (+ 5 % raise)	$ 221	$ 33,075	
Staffing 2017 - 200 people (+ 5 % raise)	$ 232	$ 46,305	
Total manpower cost 2014-2017		**$ 110,380**	Future headcount ex US to equal US headcount with one year lag.

Facilities and equipment		$000	Comments
Purchase price of "old plant" - NJ		$ 20,000	The total investment into the Morris Plains facility of $43 million was provided by Mr. Henshaw. Some assumption was made to split that investment into "facility" (bricks and mortar) and equipment directly related to the production of CTL019 (lab equipment, cell expansion, etc.).
Upgrades of old plant - NJ		$ 10,000	
Equipment - NJ		$ 13,000	
European facility		$ 25,000	Same equipment cost as Morris Plains. Facility cost reflects a $5 million building cost efficiency of a newly designed building dedicated to CTL019
European facility - equipment		$ 13,000	
Singapore facility		$ 25,000	Same equipment cost as Morris Plains. Facility cost reflects a $5 million building cost efficiency of a newly designed building dedicated to CTL019
Singapore facility - equipment		$ 13,000	
Total facilities and equipment		$ 119,000	

U Penn investment		$000	Notes
Licensing fees		$ 20,000	We assume that a licensing fee was paid to U Penn but cannot find reference. Estimate $20 million.
"Construction of U Penn facilities"		$ 20,000	Public information
Total U Penn investment		**$ 40,000**	

Oxford BioMedica		$000	Notes
Exclusive licensing fee		$ 20,000	Estimate $20 million
Total Oxford Biotech		**$ 20,000**	

Other cash outlays		$000	Notes
Development of S&M, medical programs		25,000	Common between US and ex US markets
Compilation of regulatory dossiers/experts		25,000	US dossier to be core of the ex US filings
Development of worldwide patient registry		15,000	
Total		**65,000**	

Total NVS spend prior to launch		$000	Notes
R&D (pre-tax)		$ 656,000	Gross, not including ODA tax credit, to come close to Jimenez $1 billion
Manpower pre-launch		$ 98,804	
Facilities and equipment		$ 119,000	
U Penn		$ 40,000	
Oxford Biomedica		$ 20,000	
Worldwide patient registry		$ 15,000	
S&M programs		$ 25,000	
Regulatory submissions		$ 25,000	
Grand total of NVS cash spend - pre tax		**$ 998,804**	Reflects the '$1 billion development cost' made by Mr. Jimenez to Forbes
plus ODA tax credit		$ (228,000)	From US taxpayer
Grand total of NVS cash spend - after tax		**$ 770,804**	US piece, net of ODA tax credit

Amortizable amounts		$000	Notes
After tax R&D		$ 35,667	Amortizable R&D
Facilities and upgrades		$ 3,200	Weighted average for building and systems such as HVAC, water, etc.
Equipment		$ 5,571	Weighted average for all "manufacturing equipment"
Patient registry		$ 1,250	
Licensing fees		$ 3,333	
U Penn facility		$ 2,000	
Total amortizable amounts/year		**$ 51,021**	
Total amortizable amounts/year considering cost of capital		**$ 67,910**	Assuming a 10% cost of capital and that all the investment has occurred at the beginning of 2015

Cost of goods in 2017 per dose		$000	Notes
Direct costs		$ 12	Please note - "people costs" are already included in manpower costs
Indirect costs		$ 12	Assume mfg overheads = mfg direct costs (high assumption in pharmaceuticals)
Lentivrus from Oxford BioMedica		$ 5	Estimate based on analyst revenue projections for Oxford Biomedica
QA		$ 8	
Cold chain handling		$ 3	
Grand total COGS		**$ 40**	Base number for 2017 per infusion

Patient Base Calculations - Based on Assumptions of Accompanying Word File

Patient subgroup US	Base/growth rate in %	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Pediatric RR B-cell ALL	600											
	2%											
		50	300	600	800	816	832	849	866	883	901	919
Adult ALL - patients with MRD+ during upfront teatment	240											
	2%											
		0	0	120	240	245	250	255	260	265	270	276
Adult ALL - last resort treatment	640											
	2%											
		0	0	0	172	346	353	360	367	375	382	390
CLL	932											
	2%											
		0	0	0	0	1,398	1,426	1,454	1,484	1,513	1,544	1,574
DBCL	5700											
	2%											
		0	2,135	5,700	5,814	5,930	6,049	6,170	6,293	6,419	6,548	6,678
SLL	20											
	2%											
		0	0	0	0	20	40	41	42	42	43	44
All other NHL	750											
	2%											
	0	0	0	750	765	780	796	812	828	845	862	879

Worldwide market estimates		**2017**	**2018**	**2019**	**2020**	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**
US		50	2,435	7,170	7,791	9,535	9,746	9,941	10,139	10,342	10,549	10,760
EU		0	50	2,435	7,170	7,791	9,535	9,746	9,941	10,139	10,342	10,549
Rest of the world (ROW)		0	17	812	2,390	2,597	3,178	3,249	3,314	3,380	3,447	3,516
Grand total Kymriah patients		**50**	**2,502**	**10,417**	**17,351**	**19,923**	**22,460**	**22,935**	**23,394**	**23,861**	**24,339**	**24,825**

KYMRIAH - FINANCIAL ANALYSIS - PROJECTED ACTUAL $000'S

P&L Item	Base/prior cumul spend	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Number of patients												
US		50	2,435	7,170	7,791	9,535	9,746	9,941	10,139	10,342	10,549	10,760
EU		-	50	2,435	7,170	7,791	9,535	9,746	9,941	10,139	10,342	10,549
ROW		-	17	812	2,390	2,597	3,178	3,249	3,314	3,380	3,447	3,516
Total patient pool		**50**	**2,502**	**10,417**	**17,351**	**19,923**	**22,460**	**22,935**	**23,394**	**23,861**	**24,339**	**24,825**
Price per infusion ($000) - gross	$ 475											
Net price per infusion - with 16% discount ($000)	$ 399											
Price escalation - US (percent)		0	0	0	0	0	0	0	0	0	0	0
Price escalation - ex US (percent)		0	0	0	0	0	0	0	0	0	0	0
Revenue per infusion - US ($000)		$ 399	$ 399	$ 399	$ 399	$ 399	$ 399	$ 399	$ 399	$ 399	$ 399	$ 399
Revenue per infusion - ex US ($000)		$ 399	$ 399	$ 399	$ 399	$ 399	$ 399	$ 399	$ 399	$ 399	$ 399	$ 399
Total revenues US ($000)		$ 19,950	$ 971,565	$ 2,860,830	$ 3,108,609	$ 3,804,617	$ 3,888,529	$ 3,966,300	$ 4,045,626	$ 4,126,538	$ 4,209,069	$ 4,293,251
Total revenues ex US ($000)		$ -	$ 26,600	$ 1,295,420	$ 3,814,440	$ 4,144,812	$ 5,072,822	$ 5,184,706	$ 5,288,400	$ 5,394,168	$ 5,502,051	$ 5,612,092
Total worldwide revenues ($000's)		**$ 19,950**	**$ 998,165**	**$ 4,156,250**	**$ 6,923,049**	**$ 7,949,429**	**$ 8,961,352**	**$ 9,151,006**	**$ 9,334,026**	**$ 9,520,706**	**$ 9,711,121**	**$ 9,905,343**
Cost of goods per infusion ($000)	$ 40											
Cost inflation per year (percent)		0	-5%	-5%	-5%	-5%	-5%	-5%	0%	0%	0%	0%
Adjusted COGS per infusion ($000)		$ 40	$ 38	$ 36	$ 34	$ 33	$ 31	$ 29	$ 29	$ 29	$ 29	$ 29
Total COGS ($000)		**$ 2,000**	**$ 95,063**	**$ 376,042**	**$ 595,053**	**$ 649,109**	**$ 695,150**	**$ 674,369**	**$ 687,856**	**$ 701,613**	**$ 715,646**	**$ 729,959**
Manpower cost												
Number of people in US		40	160	170	180	190	200	210	220	220	230	240
Number of people ex US		10	40	160	170	180	190	200	210	220	220	230
Total number of people		50	200	330	350	370	390	410	430	440	450	470
Average compensation per person per year ($000) - 2017 base	$ 232											
Average compensation increase per year		0.0%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
Average comp per person ($000)		$ 231.5	$ 240	$ 248	$ 257	$ 266	$ 275	$ 285	$ 295	$ 305	$ 316	$ 327
Total worldwide manpower cost ($000)		**$ 11,576**	**$ 47,926**	**$ 81,845**	**$ 89,844**	**$ 98,302**	**$ 107,242**	**$ 116,687**	**$ 126,663**	**$ 134,145**	**$ 141,995**	**$ 153,497**
Royalties												
U Penn (% of sales) - ($000)	2.0%	$ 399	$ 19,963	$ 83,125	$ 138,461	$ 158,989	$ 179,227	$ 183,020	$ 186,681	$ 190,414	$ 194,222	$ 198,107
Oxford BioMedica (% of sales) - ($000)	1.0%	$ 200	$ 9,982	$ 41,563	$ 69,230	$ 79,494	$ 89,614	$ 91,510	$ 93,340	$ 95,207	$ 97,111	$ 99,053
Total royalties		**$ 599**	**$ 29,945**	**$ 124,688**	**$ 207,691**	**$ 238,483**	**$ 268,841**	**$ 274,530**	**$ 280,021**	**$ 285,621**	**$ 291,334**	**$ 297,160**
Travel grants												
Grant per eligible patient ($000)	$ 6.0											
Inflation per year		0.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Inflation adjusted travel grant per eligible patient ($000)		$ 6.0	$ 6.2	$ 6.4	$ 6.6	$ 6.8	$ 7.0	$ 7.2	$ 7.4	$ 7.6	$ 7.8	$ 8.1
Travel grants for 50% of total patient pool		**$ 150**	**$ 7,730**	**$ 33,153**	**$ 56,880**	**$ 67,272**	**$ 78,110**	**$ 82,156**	**$ 86,313**	**$ 90,681**	**$ 95,269**	**$ 100,090**
Patient monitoring cost - $2,000 per patient in 2017. Cost efficiencies of 5% per patient per year thereafter.		$ 2.00	$ 1.90	$ 1.81	$ 1.71	$ 1.63	$ 1.55	$ 1.47	$ 1.40	$ 1.33	$ 1.26	$ 1.20
Cost for patient monitoring program per year for the cumulative number of patients on worldwide basis from launch		$ 100	$ 4,848	$ 23,408	$ 51,990	$ 81,846	$ 112,511	$ 140,604	$ 166,247	$ 189,595	$ 210,794	$ 229,982
Amortization (please see assumptions): accounted for 10% cost of capital- 2017 reflects sales of 1 quarter		$ 16,977	$ 74,700	$ 82,171	$ 90,388	$ 99,426	$ 109,369	$ 120,306	$ 132,336	$ 145,570	$ 160,127	$ 176,140

Summary Pre-tax Operating Income ($000)		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Revenues		$ 19,950	$ 998,165	$ 4,156,250	$ 6,923,049	$ 7,949,429	$ 8,961,352	$ 9,151,006	$ 9,334,026	$ 9,520,706	$ 9,711,121	$ 9,905,343
COGS		$ (2,000)	$ (95,063)	$ (376,042)	$ (595,053)	$ (649,109)	$ (695,150)	$ (674,369)	$ (687,856)	$ (701,613)	$ (715,646)	$ (729,959)
Manpower cost		$ (11,576)	$ (47,926)	$ (81,845)	$ (89,844)	$ (98,302)	$ (107,242)	$ (116,687)	$ (126,663)	$ (134,145)	$ (141,995)	$ (153,497)
Royalties		$ (599)	$ (29,945)	$ (124,688)	$ (207,691)	$ (238,483)	$ (268,841)	$ (274,530)	$ (280,021)	$ (285,621)	$ (291,334)	$ (297,160)
Travel grants		$ (150)	$ (7,730)	$ (33,153)	$ (56,880)	$ (67,272)	$ (78,110)	$ (82,156)	$ (86,313)	$ (90,681)	$ (95,269)	$ (100,090)
Patient monitoring program		$ (100)	$ (4,848)	$ (23,408)	$ (51,990)	$ (81,846)	$ (112,511)	$ (140,604)	$ (166,247)	$ (189,595)	$ (210,794)	$ (229,982)
Amortization		$ (16,977)	$ (74,700)	$ (82,171)	$ (90,388)	$ (99,426)	$ (109,369)	$ (120,306)	$ (132,336)	$ (145,570)	$ (160,127)	$ (176,140)
Operating income		**$ (11,452)**	**$ 737,952**	**$ 3,434,944**	**$ 5,831,204**	**$ 6,714,991**	**$ 7,590,129**	**$ 7,742,353**	**$ 7,854,589**	**$ 7,973,481**	**$ 8,095,956**	**$ 8,218,515**
Internal cost of capital	6%											
Discount factor		1.00	1.06	1.12	1.18	1.24	1.30	1.36	0	0	0	0
Allocation of voucher value per year (base year)	**36,750**											
Voucher value - NPV of $192 mil at ICC of 6%	**$ 192,742**	**$ 9,188**	**$ 34,670**	**$ 32,813**	**$ 31,144**	**$ 29,637**	**$ 28,269**	**$ 27,022**	$ -	$ -	$ -	$ -
Operating income adjusted for PPRV value		**$ (2,265)**	**$ 772,622**	**$ 3,467,757**	**$ 5,862,348**	**$ 6,744,628**	**$ 7,618,398**	**$ 7,769,375**	**$ 7,854,589**	**$ 7,973,481**	**$ 8,095,956**	**$ 8,218,515**
Adjusted operating income as percent of revenues		-11%	77%	83%	85%	85%	85%	85%	84%	84%	83%	83%
Percent "excess" operating income (= total percent operating income less 27% historical operating margin less 19% for ongoing R&D)		-57%	31%	37%	39%	39%	39%	39%	38%	38%	37%	37%
Weighted average "excess" profits	38.01%	-0.01%	0.41%	2.03%	3.49%	4.03%	4.56%	4.65%	4.65%	4.69%	4.74%	4.78%
Median "excess" profits	37%											

Valuation of PPRV Vouchers in the Open Market Based on Disclosed Transactions

Seller	Buyer	$ millions	Date	Years to Oct 2017	Value in Oct 2017 $
Biomarin	Sanofi Regeneron	$ 67.5	Jul-14	3.25	$ 72.0
Knight Therapeutics	Gilead	$ 125.0	Aug-14	3.16	$ 133.1
United Therapeutics	AbbVie	$ 350.0	Aug-15	2.16	$ 365.3
Asklepion	Sanofi	$ 245.0	May-15	2.32	$ 256.5
ParVax Bermuda	Gilead	$ 200.0	Dec-16	0.83	$ 203.3
Sarepta Therapeutics	Gilead	$ 125.0	Feb-17	0.66	$ 126.6
Average in 10/2017 dollars					$ 192.8

KYMRIAH - FINANCIAL ANALYSIS - PROJECTED ACTUAL $000'S - SELLING PRICE NEEDED TO ASSURE NOVARTIS' HISTORICAL MARGIN AND R&D SET-ASIDE

P&L Item	Base/prior cumul spend	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Number of patients												
US		50	2,435	7,170	7,791	9,535	9,746	9,941	10,139	10,342	10,549	10,760
EU		-	50	2,435	7,170	7,791	9,535	9,746	9,941	10,139	10,342	10,549
ROW		-	17	812	2,390	2,597	3,178	3,249	3,314	3,380	3,447	3,516
Total patient pool		**50**	**2,502**	**10,417**	**17,351**	**19,923**	**22,460**	**22,935**	**23,394**	**23,861**	**24,339**	**24,825**
Price per infusion ($000) - gross	$ 156											
Net price per infusion - with 16% discount ($000)	$ 131											
Price escalation - US (percent)		0%	0%	-23%	0%	0%	0%	0%	0%	0%	0%	0%
Price escalation - ex US (percent)		0%	0%	-23%	0%	0%	0%	0%	0%	0%	0%	0%
Revenue per infusion - US ($000)		$ 131	$ 131	$ 101	$ 101	$ 101	$ 101	$ 101	$ 101	$ 101	$ 101	$ 101
Revenue per infusion - ex US ($000)		$ 131	$ 131	$ 101	$ 101	$ 101	$ 101	$ 101	$ 101	$ 101	$ 101	$ 101
Total revenues US ($000)		$ 6,552	$ 319,082	$ 723,459	$ 786,118	$ 962,127	$ 983,348	$ 1,003,015	$ 1,023,075	$ 1,043,536	$ 1,064,407	$ 1,085,695
Total revenues ex US ($000)		$ -	$ 8,736	$ 327,591	$ 964,612	$ 1,048,158	$ 1,282,837	$ 1,311,130	$ 1,337,353	$ 1,364,100	$ 1,391,382	$ 1,419,210
Total worldwide revenues ($000's)		**$ 6,552**	**$ 327,818**	**$ 1,051,050**	**$ 1,750,730**	**$ 2,010,285**	**$ 2,266,184**	**$ 2,314,145**	**$ 2,360,428**	**$ 2,407,636**	**$ 2,455,789**	**$ 2,504,905**
Cost of goods per infusion ($000)	$ 40											
Cost inflation per year (percent)		0	-5%	-5%	-5%	-5%	-5%	-5%	0%	0%	0%	0%
Adjusted COGS per infusion ($000)		$ 40	$ 38	$ 36	$ 34	$ 33	$ 31	$ 29	$ 29	$ 29	$ 29	$ 29
Total COGS ($000)		**$ 2,000**	**$ 95,063**	**$ 376,042**	**$ 595,053**	**$ 649,109**	**$ 695,150**	**$ 674,369**	**$ 687,856**	**$ 701,613**	**$ 715,646**	**$ 729,959**
Manpower cost												
Number of people in US		40	160	170	180	190	200	210	220	220	230	240
Number of people ex US		10	40	160	170	180	190	200	210	220	220	230
Total number of people		50	200	330	350	370	390	410	430	440	450	470
Average compensation per person per year ($000) - 2017 base	$ 232											
Average compensation increase per year		0.0%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%	3.5%
Average comp per person ($000)		$ 231.5	$ 240	$ 248	$ 257	$ 266	$ 275	$ 285	$ 295	$ 305	$ 316	$ 327
Total worldwide manpower cost ($000)		**$ 11,576**	**$ 47,926**	**$ 81,845**	**$ 89,844**	**$ 98,302**	**$ 107,242**	**$ 116,687**	**$ 126,663**	**$ 134,145**	**$ 141,995**	**$ 153,497**
Royalties												
U Penn (% of sales) - ($000)	2.0%	$ 131	$ 6,556	$ 21,021	$ 35,015	$ 40,206	$ 45,324	$ 46,283	$ 47,209	$ 48,153	$ 49,116	$ 50,098
Oxford BioMedica (% of sales) - ($000)	1.0%	$ 66	$ 3,278	$ 10,511	$ 17,507	$ 20,103	$ 22,662	$ 23,141	$ 23,604	$ 24,076	$ 24,558	$ 25,049
Total royalties		**$ 197**	**$ 9,835**	**$ 31,532**	**$ 52,522**	**$ 60,309**	**$ 67,986**	**$ 69,424**	**$ 70,813**	**$ 72,229**	**$ 73,674**	**$ 75,147**
Travel grants												
Grant per eligible patient ($000)	$ 6.0											
Inflation per year		0.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%	3.0%
Inflation adjusted travel grant per eligible patient ($000)		$ 6.0	$ 6.2	$ 6.4	$ 6.6	$ 6.8	$ 7.0	$ 7.2	$ 7.4	$ 7.6	$ 7.8	$ 8.1
Travel grants for 50% of total patient pool		**$ 150**	**$ 7,730**	**$ 33,153**	**$ 56,880**	**$ 67,272**	**$ 78,110**	**$ 82,156**	**$ 86,313**	**$ 90,681**	**$ 95,269**	**$ 100,090**
Patient monitoring cost - $2,000 per patient in 2017. Cost efficiencies of 5% per patient per year thereafter.		$ 2.00	$ 1.90	$ 1.81	$ 1.71	$ 1.63	$ 1.55	$ 1.47	$ 1.40	$ 1.33	$ 1.26	$ 1.20
Cost for patient monitoring program per year for the cumulative number of patients on worldwide basis from launch		$ 100	$ 4,848	$ 23,408	$ 51,990	$ 81,846	$ 112,511	$ 140,604	$ 166,177	$ 186,209	$ 194,448	$ 193,676
Amortization (please see assumptions): accounted for 10% cost of capital- 2017 reflects sales of 1 quarter		$ 16,977	$ 74,700	$ 82,171	$ 90,388	$ 99,426	$ 109,369	$ 120,306	$ 132,336	$ 145,570	$ 160,127	$ 176,140

Summary Pre-tax Operating Income ($000)		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Revenues		$ 6,552	$ 327,818	$ 1,051,050	$ 1,750,730	$ 2,010,285	$ 2,266,184	$ 2,314,145	$ 2,360,428	$ 2,407,636	$ 2,455,789	$ 2,504,905
COGS		$ (2,000)	$ (95,063)	$ (376,042)	$ (595,053)	$ (649,109)	$ (695,150)	$ (674,369)	$ (687,856)	$ (701,613)	$ (715,646)	$ (729,959)
Manpower cost		$ (11,576)	$ (47,926)	$ (81,845)	$ (89,844)	$ (98,302)	$ (107,242)	$ (116,687)	$ (126,663)	$ (134,145)	$ (141,995)	$ (153,497)
Royalties		$ (197)	$ (9,835)	$ (31,532)	$ (52,522)	$ (60,309)	$ (67,986)	$ (69,424)	$ (70,813)	$ (72,229)	$ (73,674)	$ (75,147)
Travel grants		$ (150)	$ (7,730)	$ (33,153)	$ (56,880)	$ (67,272)	$ (78,110)	$ (82,156)	$ (86,313)	$ (90,681)	$ (95,269)	$ (100,090)
Patient monitoring program		$ (100)	$ (4,848)	$ (23,408)	$ (51,990)	$ (81,846)	$ (112,511)	$ (140,604)	$ (166,177)	$ (186,209)	$ (194,448)	$ (193,676)
Amortization		$ (16,977)	$ (74,700)	$ (82,171)	$ (90,388)	$ (99,426)	$ (109,369)	$ (120,306)	$ (132,336)	$ (145,570)	$ (160,127)	$ (176,140)
Operating income		**$ (24,448)**	**$ 87,716**	**$ 422,900**	**$ 814,054**	**$ 954,022**	**$ 1,095,816**	**$ 1,110,598**	**$ 1,090,269**	**$ 1,077,189**	**$ 1,074,631**	**$ 1,076,397**
Internal cost of capital	6%											
Discount factor		**1.00**	**1.06**	**1.12**	**1.18**	**1.24**	**1.30**	**1.36**	0	0	0	0
Allocation of voucher value per year (base year)	**36,750**											
Voucher value - NPV of $192 mil at ICC of 6%	**$ 192,742**	**$ 9,188**	**$ 34,670**	**$ 32,813**	**$ 31,144**	**$ 29,637**	**$ 28,269**	**$ 27,022**	$ -	$ -	$ -	$ -
Operating income adjusted for PPRV value		**$ (15,261)**	**$ 122,386**	**$ 455,713**	**$ 845,198**	**$ 983,659**	**$ 1,124,086**	**$ 1,137,620**	**$ 1,090,269**	**$ 1,077,189**	**$ 1,074,631**	**$ 1,076,397**
Adjusted operating income as percent of revenues		-233%	37%	43%	48%	49%	50%	49%	46%	45%	44%	43%
Percent "excess" operating income (= total percent operating income less 27% historical operating margin less 19% for ongoing R&D)		-279%	-9%	-3%	2%	3%	4%	3%	0%	-1%	-2%	-3%
Weighted average "excess" profits	0.11%	-0.09%	-0.15%	-0.14%	0.20%	0.30%	0.42%	0.38%	0.02%	-0.16%	-0.28%	-0.39%
Median "excess" profits												