U.S. FOOD & DRUG ADMINISTRATION

CENTER FOR DRUG EVALUATION AND RESEARCH

DRUG TRIALS SNAPSHOTS

SUMMARY REPORT 2021

April 2022
www.fda.gov

Introduction

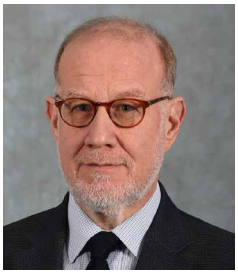
Welcome to the FDA's Center for Drug Evaluation and Research's (CDER's) Drug Trials Snapshots Summary Report

Since January 2015, CDER has shared information on the diversity of participants in clinical trials through the transparency initiative called Drug Trials Snapshots.

This year's annual report summarizes the 2021 Drug Trials Snapshot program, complementing CDER's annual report, Advancing Health Through Innovation: New Drug Therapy Approvals 2021, published on January 6, 2022, by providing information on the diversity of participants in the clinical trials relied upon for approval of novel therapies. The approved therapies span a wide range of medical conditions including ones that largely affect pediatric patients, diseases affecting only males or only females, common diseases that affect a large proportion of the population in the United States, and rare (or orphan) diseases with a smaller number of patients in the United States and around the world. Given the varied diseases being targeted, including in men's and women's health issues, looking at patient populations by individual drug or therapeutic area gives the clearest insight into patient diversity rather than summary statistics.

We welcome your feedback on the Drug Trial Snapshot program and ideas you may have regarding how FDA can enhance the information provided in each Snapshot. You can share your thoughts by sending an email to Snapshots@fda.hhs.gov.

Patrizia Cavazzoni, MD
Director, CDER



Peter Stein, MD,
Director, Office of New Drugs (OND), CDER

Mary Thanh Hai, MD,
Deputy Director, Office of New Drugs (OND), CDER

2021 Summary Statistics

January 1, 2021 - December 31, 2021

In 2021, CDER approved 50 novel drugs, either as new molecular entities (NMEs) under new drug applications (NDAs) or as new therapeutic biologics under biologics license applications (BLA). The 2021 annual report highlights demographic data from some novel therapeutics approved in the following categories:

- **Heart, Blood, Kidney, and Endocrine Diseases**
- **Autoimmune, Inflammatory, and Lung Diseases**
- **Infectious Diseases**
- **Neurological and Psychiatric Disorders**
- **Cancers**
- **Other Advances in Drug Therapies**

We hope information from this annual report will help promote further dialogue on how drug development can be enhanced to improve knowledge about the safety and effectiveness of therapies across the diverse patient community in the United States.

Heart, Blood, Kidney and Endocrine Diseases

In 2021, ten novel therapies were approved for medical conditions affecting the heart, blood, kidney, or endocrine system (Table 1).

Table 1. Summary of Demographic Data for Novel Therapies Approved to Treat Heart, Blood, Kidney, and Endocrine Diseases (numbers represent percentage of patients studied)

Trade name	Active ingredient	Indication	Female[1]	White[2]	Black[2]	Asian[2]	Hispanic[3]	≥ 65 yrs[4]
Besremi	Ropeginterferon alpha-2b-njft	To treat polycythemia vera*	39	98	0	0.6	NA	33
Cosela	Trilacicilib	To mitigate chemotherapy-induced myelosuppression in small cell lung cancer	33	95	NA	NA	NA	47
Empaveli	Pegcetacoplan	To treat paroxysmal nocturnal hemoglobinuria*	61	61	3	15	NA	21
Evkeeza	Evinacumab-dgnb	To treat homozygous familial hypercholesterolemia*	54	74	3	15	3	12
Kerendia	Finerenone	To reduce the risk of kidney and heart complications in chronic kidney disease associated with type 2 diabetes	30	63	5	25	15	58
Leqvio	Inclisiran	To treat heterozygous familial hypercholesterolemia or clinical ASCVD	32	92	6	1	6	53
Skytrofa	Lonapegsomatropin-tcgd	To treat short stature due to inadequate secretion of endogenous growth hormone*	18	94	2	1	4	0
Verquvo	Vericiguat	To mitigate the risk of cardiovascular death and hospitalization for chronic heart failure	24	64	5	22	16	63
Voxzogo	Vosoritide	To improve growth in children achondroplasia*	47	71	4	19	6	0
Zegalogue	Dasiglucagon	To treat severe hypoglycemia – adults	40	92	2	3	8	4
Zegalogue	Dasiglucagon	To treat severe hypoglycemia – pediatrics	52	94	NA	NA	17	0

NA – data not available | *Orphan disease | Further explanation of footnotes click here

Two approvals, one in adults with diabetes and kidney disease (Kerendia) and one in adults with severe congestive heart failure (Verquvo), evaluated the effect of these treatments on clinical outcomes (e.g., having a heart attack, worsening kidney disease, or death from worsening heart failure). These were very large trials (> 5000 patients) at multiple sites located in over 45 countries studying treatment out to 3 to 4 years in duration. Overall, about 25% of patients enrolled were female; approximately 64% were White, 22-25% were Asian, 5% were Black; 15% of patients were of Hispanic/Latino ethnicity. These conditions can affect an older population and over 50% enrolled were 65 years of age or older. Approximately 8 to 17% of patients in these programs were from the United States.

Two therapies to treat high cholesterol levels were approved. Leqvio is approved for adults who have very elevated cholesterol levels and established cardiovascular disease on maximally tolerated statin therapy but require additional cholesterol lowering. Evkeeza is indicated to treat a rare inherited disease known as homozygous familial hypercholesterolemia (HoFH), where patients present in childhood with severely elevated cholesterol levels and are at risk for cardiovascular disease such as heart attacks, strokes and death in early adulthood. In these two programs, 32-54% of patients enrolled were females, 74-92% were White, and 3-6% were Black. Asians comprised 15% of enrolled patients in the Evkeeza program compared to 1% in the Leqvio program. Patients of Hispanic/Latino ethnicity comprised 3-6% of the two programs.

Other treatments approved for rare diseases included Besremi, Empaveli, Skytrofa, and Voxzogo whose programs enrolled between 51 and 161 patients in the pivotal trials. Voxzogo is the first approved treatment for achondroplasia, the most common form of dwarfism. Skytrofa is approved for pediatric growth hormone deficiency which can lead to short stature and similar to Voxzogo, only studied pediatric patients. Across these rare disease programs, the range of patients studied in the different race categories was 61-98% White, 0-4% Black, and 1-23% Asian. For programs with available ethnicity data, 3-6% of patients were of Hispanic/Latino ethnicity.

Autoimmune, Inflammatory, and Lung Diseases

In 2021, eight novel therapies were approved for autoimmune, inflammatory, or lung diseases (Table 2).

Table 2. Summary of Demographic Data for Novel Therapies Approved to Autoimmune, Inflammatory, and Lung Diseases (numbers represent percentage of patients studied)

Trade Name	Active Ingredient	Indication	Female[1]	White[2]	Black[2]	Asian[2]	Hispanic[3]	≥ 65 yrs[4]
Adbry	Tralokinum-ab-ldrm	To treat moderate-to-severe atopic dermatitis	48	69	7	21	5	5
Bylvay	Odevixibat	To treat pruritus in progressive familial intrahepatic cholestasis*	50	84	3	3	2	0
Korsuva	Difelikefalin	To treat moderate-to-severe pruritus in chronic kidney disease	40	61	29	5	32	33
Livmarli	Maralixibat	To treat cholestatic pruritus in Alagille syndrome*	34	NA	NA	NA	NA	0
Lupkynis	Voclosporin	To treat lupus nephritis	86	38	10	37	26	1
Saphnelo	Anifrolumab-fnia	To treat moderate-to-severe systemic lupus erythematosus along with standard therapy	93	60	13	9	28	3
Tavneos	Avacopan	To treat severe active anti-neutrophil cytoplasmic autoantibody-associated vasculitis*	44	84	2	10	4	49
Tezspire	Tezepelumab-ekko	To treat severe asthma as an add-on therapy	64	68	5	23	12	16

NA – data not available | *Orphan disease | Further explanation of footnotes click here

Many of the medical conditions targeted by these treatments are caused by an individual's immune cells attacking the body's own tissues or cells (autoimmune). For example, Saphnelo was approved for the treatment of systemic lupus erythematosus (SLE), an autoimmune disease that can affect many parts of the body including the skin, joints, kidneys, blood vessels, and brain. The disease primarily affects women in early adulthood with a high prevalence in racial/ethnic minority groups. The Saphnelo program enrolled over 1100 patients in approximately 20 countries worldwide; 37% of the patients were in the U.S. Over 93% of patients were female, 60% were White followed by 13% Black and 9% Women. Approximately 2% of the study population were American Indian or Alaska Native and 28% were of Hispanic/Latino ethnicity. Lupkynis was approved for the treatment of patients with kidney disease due to lupus (lupus nephritis). This program also enrolled a diverse patient population reflecting the demographics of this disease with 86% being female, 38% White, 37% Asian, 10% Black, and 26% of Hispanic/Latino ethnicity.

There were three new treatments approved for pruritus (itching) due to three different medical conditions. Korsuva was approved for the treatment of pruritus associated with chronic kidney disease, a common condition in the United States. The Korsuva program enrolled 851 patients, of which 77% were from the United States, 40% were female, 61% White, 29% Black, 5% Asian, and 32% were of Hispanic/Latino ethnicity. Bylvay and Livmarli were approved for pruritus in two very rare liver diseases impacting the pediatric population resulting in a more limited patient database. Livmarli, which is approved for pruritus due to Alagille syndrome, studied 29 pediatric patients, all outside of the United States. Race/ethnicity information was not available for this program because three out of the nine study sites were in France where regulation prohibits collection of race/ethnicity data. Bylvay, which is approved for pruritus due to progressive familial intrahepatic cholestasis, studied 62 patients, 13% from the United States. Other sites were in Australia, Canada, Europe, Middle East and North America. Although race/ethnicity data were collected in this program, the trial populations from Middle Eastern countries were captured as White by the company.

Infectious Diseases

Four new treatments were approved to treat a variety of infectious diseases in 2021 (See Table 3).

Table 3. Summary of Demographic Data for the Novel Therapies Approved to Treat Infectious Diseases (numbers represent percentage of patients studied)

Trade Name	Active Ingredient	Indication	Female[1]	White[2]	Black[2]	Asian[2]	Hispanic[3]	≥ 65 yrs[4]
Brexafemme	Ibrexafungerp	To treat vulvovaginal candidiasis	100	67	30	2	18	1
Cabenuva	Cabotegravir and rilpivirine	To treat human immunodeficiencyvirus-1 (HIV-1)	28	71	21	5	12	19 (≥50 yrs)
	Fexinidazole	To treat human African trypanosomiasis*	44	NA	NA	NA	NA	31
Livtencity	Maribavir	To treat cytomegalovirus infection*	39	76	13	5	6	20

NA – data not available | *Orphan disease | Further explanation of footnotes click here

Cabenuva was approved for the treatment of adults with HIV-1 infection. It is the first extended-release injectable drug available as a co-packaging of two extended-release injectable suspensions (cabotegravir, a novel ingredient, and rilpirivine, currently approved as an oral tablet) that provides a complete regimen for monthly administration. Approximately 1200 patients were studied with 20% from the United States, 28% were female, 71% were White, followed by 21% Black and 5% Asian. Approximately 19% were 65 years of age or older and 12% of Hispanic/Latino ethnicity.

Two novel therapies were approved to treat rare diseases. Fexinidazole was approved to treat trypanosoma brucei gambiense infection also called African trypanosomiasis or sleeping sickness. The trials were conducted in the Democratic Republic of Congo and the Central African Republic and information on race/ethnicity was not collected. Approximately 44% of the study population were female. Livtencity is the first antiviral drug approved to treat adults and adolescents with post-transplant cytomegalovirus (CMV) infection or disease that does not respond to other antiviral drugs. Three hundred fifty-two transplant patients who had CMV infection or disease, not responding to a variety of antiviral drugs were enrolled across 14 countries; 54% of the patients were in the United States. Approximately 39% were female, 76% White, 13% Black, 5% Asian and 6% were of Hispanic/Latino ethnicity.

Neurological and Psychiatric Disorders

In 2021, there were eight novel therapies approved to treat neurological and psychiatric disorders (See Table 4).

Table 4. Summary of Demographic Data for the Novel Therapies Approved to Treat Neurological and Psychiatric Disorders (numbers represent percentage of patients studied)

Trade Name	Active Ingredient	Indication	Female[1]	White[2]	Black[2]	Asian[2]	Hispanic[3]	≥ 65 yrs[4]
Aduhelm	Aducanumab-avwa	To treat Alzheimer's disease	52	78	1	9	3	79
Amondys 45	Casimersen	To treat Duchenne muscular dystrophy*	0	89	0	6	6	0
Azstarys	Serdexmethylphenidate and dexmethylphenidate	To treat attention-deficit hyperactivity disorder	39	51	37	5	27	0
Lybalvi	Olanzapine and samidorphan	To treat schizophrenia and aspects of bipolar I disorder	32	44	52	NA	8	1
Ponvory	Ponesimod	To treat relapsing forms of multiple sclerosis	65	97	0.4	NA	4	35 (≥40 yrs)
Qelbree	Viloxazine	To treat attention-deficit hyperactivity disorder	36	53	42	0.3	NA	0
Qulipta	Atogepant	To prevent episodic migraines	88	80	17	1	13	3
Vyvgart	Efgartigimod alpha-fcab	To treat generalized myasthenia gravis*	71	84	4	10	5	15

NA – data not available | *Orphan disease | Further explanation of footnotes click here

Aduhelm was approved under the accelerated approval pathway for the treatment of Alzheimer's disease in patients with mild cognitive impairment or with mild dementia stage of disease. Approximately 3300 patients were enrolled in two large clinical trials across 19 countries; 46% of patients were from the United States. Fifty-two percent of trial participants were female; the majority (78%) were White, followed by Asian (9%) and Black (1%); 12% did not report their race. Three percent were of Hispanic/Latino ethnicity.

Two novel therapies were approved for rare diseases. Amondys 45 was approved for the treatment of Duchenne muscular dystrophy, affecting young males, predominantly Whites. Vyvgart was approved for the treatment of myasthenia gravis, an autoimmune disease where cells of the immune system destroy the body's communication system between the nerve and muscle with a higher prevalence in women in young adulthood. The demographics of both these programs reflect what is observed in the general population for these diseases. Similar to myasthenia gravis, multiple sclerosis (MS) is an autoimmune disease where cells of the immune system attack the protective sheath covering nerve fibers, disrupting communication between the brain and the rest of the body. MS is more common in women and among people of European ancestry. Ponvory was approved for multiple sclerosis and the demographics of this program also reflects what is observed in the general population for this disease.

Two novel therapies (Azstarys and Qelbree) were approved for the treatment of attention-deficit hyperactivity disorder, which is primarily diagnosed in childhood and young adulthood. Both these programs enrolled approximately one-third females, 51-53% White followed by 37-42% Black and <5% Asian. Hispanic/Latino ethnicity information was only available for Azstarys and comprised 27% of the study population.

Cancers

In 2021, CDER approved 15 novel therapies to treat a variety of cancers (See Table 5).

Table 5. Summary of Demographic Data for the Novel Therapies Approved to Treat Cancers (numbers represent percentage of patients studied)

Trade Name	Active Ingredient	Indication	Female[1]	White[2]	Black[2]	Asian[2]	Hispanic[3]	≥ 65 yrs[4]
Exkivity	Mobocertinib	To treat types of locally advanced or metastatic non-small cell lung cancer*	66	37	3	60	1	37
Fotivda	Tivozanib	To treat renal cell carcinoma	27	95	1	1	6	45
Jemperli	Dostarlimab-gxly	To treat endometrial cancer	100	82	1	3	NA	49
Lumakras	Sotorasib	To treat types of non-small cell lung cancer*	55	80	3	15	2	56
Pepaxto	Melphalan flufenamide	To treat relapsed or refractory multiple myeloma*	43	86	7	NA	3	50
Rezurock	Belumosudil	To treat chronic graft vs host disease*	35	83	9	NA	NA	26
Rybrevant	Amivantamab-vmjw	To treat types of non-small cell lung cancer	61	35	2	55	3	41
Rylaze	Asparaginase erwinia chrysanthemi (recombinant)-rywn	To treat acute lymphoblastic leukemia (ALL) and lymphoplastic lymphoma in patients who allergic to E. coli-derived asparaginase products*	43	72	12	5	34	0
Scemblix	Ascinimib	To treat Philadelphia chromosome-positive chronic myeloid leukemia*	48	75	5	14	10	18
Tepmetko	Tepotinib	To treat types of non-small cell lung cancer*	52	67	1	28	1	79
Tivdak	Tezepelumab-ekko	To treat recurrent or metastatic cervical cancer	100	95	1	2	6	13
Truseltiq	Infigratinib	To treat cholangiosarcoma*	38	78	4	10	3	24

Trade Name	Active Ingredient	Indication	Female[1]	White[2]	Black[2]	Asian[2]	Hispanic[3]	≥ 65 yrs[4]
Ukoniq	Umbralisib	To treat follicular lymphoma and marginal zone lymphoma*	43	89	6	3	5	56
Welireg	Belzutifan	To treat von Hippel Landau disease*	48	90	3	2	10	3
Zynlonta	Loncastuximab tersine-lpyl	To treat types of relapsed or refractory large B-cell lymphoma*	41	90	3	2	9	55

NA – data not available | *Orphan disease | Further explanation of footnotes click here

Four new therapies were approved for the treatment of non-small cell lung cancer (Exkivity, Lumakras, Rybrevant, Tepmetko), each targeting a specific genetic mutation in patients with locally advanced disease or disease that has spread to other parts of the body (metastases). Across these four programs, more than half of these patients were women (52-66%), Asians made up more than half of the population studied in Exkivity (60%) and Rybrevant (55%), and Blacks made up 1-3% and Hispanics/Latinos 1-3% of the study population.

Two of the approvals were for gender-specific indications (Jemperli and Tivdak), with 100% of the study population being female. Excluding Jemperli and Tivdak, clinical trials in oncology enrolled between 27-48% females. Across all 15 novel approvals, the majority of patients were White (72-95%) with exception for two programs, Exkiviity enrolling 37% and Rybrevant enrolling 35% White patients. Blacks and Hispanic enrollment across the programs ranged from 1-10% with exception for Rylaze, which enrolled 34% Hispanic/Latinos.

Other Advances in Drug Therapies

In other areas (Table 6), CDER approved 2 novel therapies for cancer detection (Cytalux and Pylarify), one novel oral contraceptive (Nextstellis), and two drugs to treat rare diseases (Nexviazyme and Nulibry).

Table 6. Summary of Demographic Data for the Novel Therapies Approved to Treat Other Areas (numbers represent percentage of patients studied)

Trade Name	Active Ingredient	Indication	Female[1]	White[2]	Black[2]	Asian[2]	Hispanic[3]	≥ 65 yrs[4]
Cytalux	Pafolacianine	To use for ovarian cancer imaging*	100	85	5	5	12	26 (≥70 yrs)
Nextstellis	Drospirenone and estetrol	To prevent pregnancy	100	70	20	5	26	0
Nexviazyme	Avalglucosidase alfa-ngpt	To treat late-onset Pompe disease*	48	87	4	8	12	12
Nulibry	fosdenopterin	To reduce risk of mortality in molybdenum cofactor deficiency Type A*	35	68	NA	22	10	0
Pylarify	Piflufolastat F 18	To identify prostate-specific membrane antigen-positive lesions in prostate cancer	0	89	7	2	4	60

NA – data not available | *Orphan disease | Further explanation of footnotes click here

Cytalux, Nextstellis and Pylarify were approved for gender-specific indications. Nexviazyme and Nulibry were approved for rare diseases requiring enrollment of small numbers of patients who were geographically dispersed. Nexviazyme is an enzyme replacement therapy approved for late-onset Pompe disease, a rare lysosomal storage disease that results in the buildup of glycogen in muscles, including the heart. Patients develop muscle weakness, respiratory failure and heart failure. A total of 146 patients with Pompe disease from 22 countries were studied in this program; 100 patients with late-onset Pompe disease contributed to the clinical trial establishing efficacy and safety of Nexviazyme compared to another approved enzyme replacement therapy. Nulibry is indicated to reduce death in patients with molybdenum cofactor deficiency (MoCD) Type A disease, a rare disease with an estimated 45 to 54 patients in the United States, all under 10 years of age. Patients experience seizures, difficulty feeding, poor growth and metabolic acidosis, and early death from buildup of a toxic metabolite in the brain. Data from 31 patients with MoCD were evaluated in this program. Of these 31 patients, 13 received treatment in 3 clinical investigations across multiple study sites located in 15 countries. Data on survival in this group of 13 patients were compared to data from 18 patients in a natural history study who never received Nulibry but were matched to the treatment group to allow for comparison.

Conclusions

CDER approved 50 novel therapies for a broad range of diseases in 2021. Over 38,000 patients contributed to the advance of science and medicine through their participation in the pivotal studies supporting these approvals. This annual report summarizes the demographic information across a range of populations studied. Although many programs were able to enroll patients within the race categories of Black and Asian and of Hispanic/Latino ethnicity, there were many programs where representation from certain racial and ethnic groups was low. Continuing efforts to expand our experience in diverse populations remain highly important. FDA is committed to working with sponsors to better achieve our objective towards improving patient diversity in clinical trials.

Acknowledgements

We acknowledge and appreciate the diligence of FDA review staff in providing additional analyses to support our transparency goals related to diversity and inclusion in clinical trials to support novel new drugs.

We also acknowledge the following contributors to this report:

Robert Abugov, PhD, Senior Mathematical Statistician, Division of Biometrics II, Office of Biostatistics, Office of Translational Sciences, CDER

Lawrence Allan, Senior Regulatory Project Manager, Business Process Operations Staff, Office of Program Operations (OPO), OND

Kevin Bugin, PhD, Deputy Director for Operations, Office of New Drugs (OND)

Cathryn Lee, CRNP, MSN, Staff Director, Program Development, Implementation and Management Staff, Office of Program Operations, OND

Jinzhong Liu, PhD, Acting Director, Clinical Data Science Staff, Immediate Office, OND

Mark Rothman, PhD, Director, Division of Biometrics II, Office of Biostatistics, Office of Translational Sciences, CDER

Jizu Zhi, PhD, MS, Lead Data Scientist, Clinical Data Science Staff, Immediate office, OND

Footnote explanation

[1] Some conditions occur only in women or men

[2] The percentages of all other races combined (American Indian, Native Hawaiian or other Pacific Islander, Other, Unknown/Unreported) adds up to 100% of race category

[3] The percentage of Non-Hispanic and Unknown/Unreported ethnicity adds up to 100% of ethnicity category

[4] Therapies for the pediatric population or conditions affecting younger adults would not have any patients in the ≥65 yr group. For programs that analyzed age by a different threshold, the age cutoff is provided.

U.S. Food and Drug Administration
10903 New Hampshire Ave.
Silver Spring, MD 20993
www.fda.gov