

Supplementary Online Content

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This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1: A Comprehensive List of Telehealth-Eligible Services and Associated Codes^a

Type of Service	CPT and HCPCS Codes associated with Type of Service
E & M – office	99201, 99202, 99203, 99204, 99205, 99211, 99212, 99213, 99214, 99215, 99354, 99355, 99421 ^C , 99422 ^C , 99423 ^C , 99441 ^C , 99442 ^C , 99443 ^C , G2012, G2061 ^C , G2062 ^C , G2063 ^C
E & M – emergency department^b	99281, 99282, 99283, 99284, 99285
E & M – hospital^b	99217, 99218, 99219, 99220, 99221, 99222, 99223, 99224, 99225, 99226, 99231, 99232, 99233, 99234, 99235, 99236, 99238, 99239, 99291, 99292, 99356, 99357, 99468, 99469, 99471, 99472, 99475, 99476, 99477, 99478, 99479, 99480, G0508 ^C , G0509 ^C
Behavioral health	0362T, 0373T, 90785, 90791, 90792, 90832, 90833, 90834, 90836, 90837, 90838, 90839, 90840, 90845, 90846, 90847, 90853, 90875, 97151, 97152, 97153, 97154, 97155, 97156, 97157, 97158, G0396, G0397, G0410, G0443, G2086, G2087, G2088
Rehabilitation	97110, 97112, 97116, 97150, 97161, 97162, 97163, 97164, 97165, 97166, 97167, 97168, 97530, 97535, 97542, 97750, 97755, 97760, 97761, S9152
Other	77427, 90951, 90952, 90953, 90954, 90955, 90956, 90957, 90958, 90959, 90960, 90961, 90962, 90963, 90964, 90965, 90966, 90967, 90968, 90969, 90970, 92002, 92004, 92012, 92014, 92507, 92508, 92521, 92522, 92523, 92524, 92601, 92602, 92603, 92604, 94002, 94003, 94004, 94005, 94664, 96110, 96112, 96113, 96116, 96121, 96127, 96130, 96131, 96132, 96133, 96136, 96137, 96138, 96139, 96156, 96158, 96159, 96160, 96161, 96164, 96165, 96167, 96168, 96170, 96171, 97802, 97803, 97804, 98966 ^C , 98967 ^C , 98968 ^C , 98970 ^C , 98971 ^C , 98972 ^C , 99091 ^C , 99304, 99305, 99306, 99307, 99308, 99309, 99310, 99315, 99316, 99324, 99325, 99326, 99327, 99328, 99334, 99335, 99336, 99337, 99341, 99342, 99343, 99344, 99345, 99347, 99348, 99349, 99350, 99406, 99407, 99446 ^C , 99447 ^C , 99448 ^C , 99449 ^C , 99451 ^C , 99452 ^C , 99453 ^C , 99454 ^C , 99457 ^C , 99458 ^C , 99473, 99474 ^C , 99483, 99495, 99496, 99497, 99498, G0108, G0109, G0270, G0296, G0406 ^C , G0407 ^C , G0408 ^C , G0420, G0421, G0425 ^C , G0426 ^C , G0427 ^C , G0436, G0437, G0438, G0439, G0442, G0444, G0445, G0446, G0447, G0459 ^C , G0506, G0513, G0514, G2010 ^C , G9685, Q3014 ^C , T1014 ^C

^A A list of CPT® and HCPCS codes for telehealth-eligible services by type of service (source: CMS List of telehealth services. <https://www.cms.gov/Medicare/Medicare-General-Information/Telehealth/Telehealth-Codes>)

^b Type of service was excluded from our study.

^c Code does not require a modifier or place of service code if provided via telehealth.

CPT: Current Procedural Terminology, E & M: means evaluation and management, HCPCS: HealthcareCommon Procedure Coding System

eTable 2. CMS Designated Codes for Place of Service

Place of Service Category	CMS Place of Service Code	CMS Place of Service Name
Inpatient	13	Assisted Living Facility
	14	Group Home
	21	Inpatient Hospital
	31	Skilled Nursing Facility
	32	Nursing Facility
	33	Custodial Care Facility
	51	Inpatient Psychiatric Facility
	54	Intermediate Care Facility
	55	Residential Substance Abuse Treatment Facility
	56	Psychiatric Residential Treatment Center
	61	Comprehensive Inpatient Rehabilitation Facility
Emergency Department	23	Emergency Room – Hospital
Outpatient Facility	05	Indian Health Service Free-standing Facility
	06	Indian Health Service Provider-based Facility
	07	Tribal 638 Free-standing Facility
	08	Tribal 638 Provider-based Facility
	19	Off Campus-Outpatient Hospital
	22	On Campus-Outpatient Hospital
	24	Ambulatory Surgical Center
	25	Birthing Center
	26	Military Treatment Facility
	52	Psychiatric Facility-Partial Hospitalization
	57	Non-residential Substance Abuse Treatment Facility
	58	Non-residential Opioid Treatment Facility
	62	Comprehensive Outpatient Rehabilitation Facility
	65	End-Stage Renal Disease Treatment Facility
Office / Clinic	11	Office
	17	Walk-in Retail Health Clinic
	18	Place of Employment-Worksite
	20	Urgent Care Facility
	49	Independent Clinic
	50	Federally Qualified Health Center
	53	Community Mental Health Center
	60	Mass Immunization Center
	71	Public Health Clinic
	72	Rural Health Clinic
Telehealth	02	Telehealth
Other Ambulatory	01	Pharmacy
	03	School
	04	Homeless Shelter
	09	Prison/ Correctional Facility
	12	Home
	15	Mobile Unit
	16	Temporary Lodging
	34	Hospice

	41	Ambulance - Land
	42	Ambulance – Air or Water
	81	Independent Laboratory
	99	Other Place of Service
	UN	Unknown Place of Service
CMS: Centers for Medicare and Medicaid Services		

eTable 3. Approach to Designating Telehealth Services (from Among Telehealth Eligible Services) and Type of Modality

(See text for further explanation of methodology)

A: Service Modifier and Place of Service Codes Used to Designate Telehealth Service and Modality

Code Type	Code	Definition	Modality Classification
Modifier	GT	“Via interactive audio and video telecommunications systems.”	Video-Supported telehealth
	95	“Synchronous telemedicine service rendered via a real-time interactive audioand video telecommunications system.”	Video Supported-Telehealth
Place of Service	02	The location where health services and health-related services are provided or received, through a telecommunication system.	Telehealth - not specified

Telehealth was defined as one of the telehealth-eligible codes with a GT or 95 modifiers or place of service code '02.

B: Assignment of Telehealth Eligible Service Codes to Specific Type of Virtual Encounter Modality

Remote monitoring
99457, 99458
Video supported telehealth
G0425, G0426, G0427, G0508, G0509
Telephone
98966, 98967, 98968, 99441, 99442, 99443
An encounter with any of the listed codes was considered as telehealth, regardless of modifier status and place of service.

eTable 4. Study Designated Specialty Using CMS Provider Specialty Codes

Study Designated Specialty	CMS Provider Specialty Code	Specialty Description
Primary Care	1	GENERAL PRACTICE
	8	FAMILY PRACTICE
	11	INTERNAL MEDICINE
	16	OBSTETRICS GYNECOLOGY
	37	PEDIATRIC MEDICINE
	38	GERIATRIC MEDICINE
Medical Specialist	3	ALLERGY / IMMUNOLOGY
	6	CARDIOLOGY
	7	DERMATOLOGY
	10	GASTROENTEROLOGY
	13	NEUROLOGY
	21	CARDIAC ELECTROPHYSIOLOGY
	29	PULMONARY DISEASE
	39	NEPHROLOGY
	44	INFECTIOUS DISEASES
	46	ENDOCRINOLOGY
	66	RHEUMATOLOGY
	81	CRITICAL CARE (INTENSIVISTS)
	82	HEMATOLOGY
	83	HEMATOLOGY / ONCOLOGY
	84	PREVENTIVE MEDICINE
	90	MEDICAL ONCOLOGY
	C0	SLEEP MEDICINE
Surgical Specialist	2	GENERAL SURGERY
	4	OTOLARYNGOLOGY
	14	NEUROSURGERY
	18	OPHTHALMOLOGY
	19	ORAL SURGERY (DENTISTS ONLY)
	20	ORTHOPEDIC SURGERY
	23	SPORTS MEDICINE
	24	PLASTIC AND RECONSTRUCTIVE SURGERY
	28	COLORECTAL SURGERY (FORMERLY PROCTOLOGY)
	33	THORACIC SURGERY
	34	UROLOGY
	40	HAND SURGERY
	76	PERIPHERAL VASCULAR DISEASE
	77	VASCULAR SURGERY
	78	CARDIAC SURGERY
	85	MAXILLOFACIAL SURGERY
	91	SURGICAL ONCOLOGY
98	GYNECOLOGICAL / ONCOLOGY	
Behavioral Health	26	PSYCHIATRY
	27	GERIATRIC PSYCHIATRY
	62	INDEPENDENT BILLING PSYCHOLOGIST

	68	CLINICAL PSYCHOLOGIST
	79	ADDICTION MEDICINE
	86	NEUROPSYCHIATRY
Rehabilitation	12	OSTEOPATHIC MANIPULATIVE THERAPY
	15	SPEECH LANGUAGE PATH. IN PRIV. PRACTICE
	25	PHYSICAL MEDICINE AND REHABILITATION
	35	CHIROPRACTIC
	65	INDEPENDENTLY PRACTICING PHYSICAL THERAPIST
	67	INDEPEND. PRACTICING OCCUPATIONAL THERAPIST
Physician Assistant / Nurse Practitioner	50	NURSE PRACTITIONER
	89	CERTIFIED CLINICAL NURSE SPECIALIST
	97	PHYSICIAN ASSISTANT
Other Physician / Practitioner	5	ANESTHESIOLOGY
	9	INTERVENTIONAL PAIN MANAGEMENT
	22	PATHOLOGY
	30	DIAGNOSTIC RADIOLOGY
	32	ANESTHESIOLOGIST ASSISTANTS
	36	NUCLEAR MEDICINE
	41	OPTOMETRY
	42	CERTIFIED NURSE MIDWIFE
	43	CERTIFIED RN ANESTHETIST, ANESTHESIA ASSISTANT
	48	PODIATRY
	55	INDIVIDUAL CERTIFIED ORTHOTIST
	56	INDIVIDUAL CERTIFIED PROSTHETIST
	57	INDIVIDUAL CERTIFIED PROSTHETIST-ORTHOTIST
	64	INDEPENDENTLY BILLING AUDIOLOGIST
	70	MULTI SPECIALTY CLINIC OR GROUP PRACTICE
	71	REGISTERED DIETICIAN/NUTRITION PROFESSIONAL
	72	PAIN MANAGEMENT
	80	LICENSED CLINICAL SOCIAL WORKER
	92	RADIATION ONCOLOGY
	93	EMERGENCY MEDICINE
	94	INTERVENTIONAL RADIOLOGY
	96	OPTICIAN
	99	UNKNOWN PHYSICIAN SPECIALTY
	B2	PEDORTHIC PERSONNEL
	B5	OCULARIST
Other	51	MEDICAL SUPPLY COMP.WITH CERTIFIED ORTHOTIST
	52	MEDICAL SUPPLY COMP. W/CERTIFIED PROSTHETIST
	53	MED SUPPLY CO. W/CERT. PROSTHETIST ORTHOTIST
	54	MEDICAL SUPPLY COMPANY NOT 51, 52, OR 53
	58	MEDICAL SUPPLY COMP. W/REGIST. PHARMACIST
	59	AMBULANCE SERVICE SUPPLIER

	60	PUBLIC HEALTH OR WELFARE AGENCIES
	61	VOLUNTARY HEALTH OR CHARITABLE AGENCIES
	63	PORTABLE X-RAY SUPPLIER
	69	INDEPENDENTLY BILLING CLINICAL LABORATORY
	73	MASS IMMUNIZATION ROSTER BILLER
	75	SLIDE PREPARATION FACILITIES
	87	ALL OTHER SUPPLIERS
	88	UNKNOWN SUPPLIER
	A4	HOME HEALTH AGENCY
	A5	PHARMACY
	A6	MEDICAL SUPPLY COMP. W/RESPIRATORY THERAPIST
	A7	DEPARTMENT STORE
	A8	GROCERY STORE
	B3	MEDICAL SUPPLY CO W/ PEDORTHIC PERSONNEL
	B4	REHABILITATION AGENCY
	C1	CENTRALIZED FLU
	IN	INVALID
Facility	17	HOSPICE AND PALLIATIVE CARE
	31	INTENSIVE CARDIAC REHABILITATION (ICR)
	45	MAMMOGRAPHY SCREENING CENTER
	47	INDEPENDENT DIAGNOSTIC TESTING FACILITY
	49	AMBULATORY SURGICAL CENTER
	74	RADIATION THERAPY CENTER
	A0	HOSPITAL
	A1	SKILLED NURSING FACILITY
	A2	INTERMEDIATE CARE NURSING FACILITY
	A3	NURSING FACILITY, OTHER

eTable 5. Approach to Selecting Acute and Chronic Ambulatory Care Sensitive Conditions for Assessment of Utilization Patterns. (See text for further explanation of methodology)

Clinical Condition	Description	No. Members	No. Ambulatory Encounters	% of Total Ambulatory Encounters via Telehealth
I10	Essential (Primary) Hypertension	1,996,347	2,729,223	321,812 (11.79%)
E11	Type 2 Diabetes Mellitus	1,152,835	1,906,344	243,223 (12.76%)
J02	Acute Pharyngitis	638,249	704,672	91,253 (12.95%)
J06	Acute Upper Resp Infections of Multiple and Unspecified Sites	522,687	566,762	100,677 (17.76%)
J45	Asthma	395,684	512,657	95,551 (18.64%)
E10	Type 1 Diabetes Mellitus	138,302	251,836	44,893 (17.83%)
D50	Iron Deficiency Anemia	89,378	127,502	18,578 (14.57%)
G40	Epilepsy and Recurrent Seizures	85,857	125,378	36,819 (29.37%)
J20	Acute Bronchitis	84,734	92,908	18,158 (19.54%)
K52	Other and Unspecified Noninfective Gastroenteritis and Colitis	69,451	81,153	17,951 (22.12%)
J44	Other Chronic Obstructive Pulmonary Disease	69,421	98,745	14,694 (14.88%)
J03	Acute Tonsillitis	53,588	59,352	6,323 (10.65%)
I50	Heart Failure	41,671	68,215	8,172 (11.98%)
I11	Hypertensive Heart Disease	41,517	55,274	6,627 (11.99%)
J18	Pneumonia, Unspecified Organism	34,355	45,025	5,809 (12.9%)
K13	Other Diseases of Lip and Oral Mucosa	28,598	32,629	3,466 (10.62%)
R56	Convulsions, not Elsewhere Classified	27,744	38,413	8,211 (21.38%)
K04	Diseases of Pulp and Periapical Tissues	18,435	19,573	3,657 (18.68%)
K08	Other Disorders of Teeth and Supporting Structures	10,340	10,839	2,112 (19.49%)
E16	Other Disorders of Pancreatic Internal Secretion	9,129	11,497	2,204 (19.17%)
N12	Tubulo-interstitial Nephritis, Not Specified as Acute or Chronic	6,418	7,822	834 (10.66%)
N10	Acute Pyelonephritis	6,411	7,800	842 (10.79%)
<p>We assessed the ambulatory encounters for each set of 3-digit ICD-10 codes for ACS conditions. From the cohort of members that had 1+ encounter during the study period, we counted the number of members that had an encounter for an avoidable ACS condition. As an initial screening process to eliminate rare conditions, we limited the list to conditions that were diagnosed in at least 5000 members. To ensure adequate use of telehealth among the conditions, we also required at least 10% of the members diagnosed with an ACS condition to have at least 1 telehealth claim associated with the condition. After screening for candidate conditions, additional inclusion criteria required members to have no pre-existing care related to the condition (no encounters for the condition 90 days before the initial encounter in the study period).</p>				

eTable 6. Severity Levels Assigned to ACS Chronic Condition ICD-10 Codes within 3-Digit Code Categories

3-digit ICD-10	3-digit ICD-10 description	ICD-10	ICD-10 Description	Severity
D50	Iron deficiency anemia	D500	Iron deficiency anemia secondary to blood loss (chronic)	1
		D501	Sideropenic dysphagia	1
		D508	Other iron deficiency anemias	1
		D509	Iron deficiency anemia, unspecified	1
E10	Type 1 diabetes mellitus	E1010	Type 1 diabetes mellitus with ketoacidosis without coma	3
		E1011	Type 1 diabetes mellitus with ketoacidosis with coma	3
		E10610	Type 1 diabetes mellitus w diabetic neuropathic arthropathy	2
		E10618	Type 1 diabetes mellitus with other diabetic arthropathy	2
		E10620	Type 1 diabetes mellitus with diabetic dermatitis	2
		E10621	Type 1 diabetes mellitus with foot ulcer	2
		E10622	Type 1 diabetes mellitus with other skin ulcer	2
		E10628	Type 1 diabetes mellitus with other skin complications	2
		E10630	Type 1 diabetes mellitus with periodontal disease	2
		E10638	Type 1 diabetes mellitus with other oral complications	2
		E10641	Type 1 diabetes mellitus with hypoglycemia with coma	3
		E10649	Type 1 diabetes mellitus with hypoglycemia without coma	2
		E1065	Type 1 diabetes mellitus with hyperglycemia	2
		E1069	Type 1 diabetes mellitus with other specified complication	2
E108	Type 1 diabetes mellitus with unspecified complications	2		
E109	Type 1 diabetes mellitus without complications	1		
E11	Type 2 diabetes mellitus	E1100	Type 2 diab w hyposm w/o nonket hyprgly-hypros coma (NKHHC)	3
		E1101	Type 2 diabetes mellitus with hyperosmolarity with coma	3
		E11610	Type 2 diabetes mellitus w diabetic neuropathic arthropathy	2
		E11618	Type 2 diabetes mellitus with other diabetic arthropathy	2
		E11620	Type 2 diabetes mellitus with diabetic dermatitis	2
		E11621	Type 2 diabetes mellitus with foot ulcer	2
		E11622	Type 2 diabetes mellitus with other skin ulcer	2

3-digit ICD-10	3-digit ICD-10 description	ICD-10	ICD-10 Description	Severity
		E11628	Type 2 diabetes mellitus with other skin complications	2
		E11630	Type 2 diabetes mellitus with periodontal disease	2
		E11638	Type 2 diabetes mellitus with other oral complications	2
		E11641	Type 2 diabetes mellitus with hypoglycemia with coma	3
		E11649	Type 2 diabetes mellitus with hypoglycemia without coma	2
		E1165	Type 2 diabetes mellitus with hyperglycemia	2
		E1169	Type 2 diabetes mellitus with other specified complication	2
		E118	Type 2 diabetes mellitus with unspecified complications	2
		E119	Type 2 diabetes mellitus without complications	1
G40	Epilepsy and recurrent seizures	G40001	Local-rel idio epi w seiz of loc onst, not ntrct, w stat epi	3
		G40009	Local-rel idio epi w seiz of loc onst,not ntrct,w/o stat epi	2
		G40011	Local-rel idio epi w seiz of loc onset, ntrct, w stat epi	3
		G40019	Local-rel idio epi w seiz of loc onset, ntrct, w/o stat epi	2
		G40101	Local-rel symptc epi w simp part seiz, not ntrct, w stat epi	3
		G40109	Local-rel symptc epi w simp prt seiz,not ntrct, w/o stat epi	2
		G40111	Local-rel symptc epi w simple part seiz, ntrct, w stat epi	3
		G40119	Local-rel symptc epi w simple part seiz, ntrct, w/o stat epi	2
		G40201	Local-rel symptc epi w cmplx prt seiz, not ntrct, w stat epi	3
		G40209	Local-rel symptc epi w cmplx prt seiz,not ntrct,w/o stat epi	2
		G40211	Local-rel symptc epi w cmplx partial seiz, ntrct, w stat epi	3
		G40219	Local-rel symptc epi w cmplx part seiz, ntrct, w/o stat epi	2
		G40301	Gen idiopathic epilepsy, not intractable, w stat epi	3
		G40309	Gen idiopathic epilepsy, not intractable, w/o stat epi	1
		G40311	Generalized idiopathic epilepsy, intractable, w stat epi	3
		G40319	Generalized idiopathic epilepsy, intractable, w/o stat epi	2
		G40401	Oth generalized epilepsy, not intractable, w stat epi	3
		G40409	Oth generalized epilepsy, not intractable, w/o stat epi	1
G40411	Oth generalized epilepsy, intractable, w status epilepticus	3		

3-digit ICD-10	3-digit ICD-10 description	ICD-10	ICD-10 Description	Severity
		G40419	Oth generalized epilepsy, intractable, w/o stat epi	2
		G4042	Cyclin-Dependent Kinase-Like 5 Deficiency Disorder	1
		G40501	Epileptic seiz rel to extrn causes, not ntrct, w stat epi	3
		G40509	Epileptic seiz rel to extrn causes, not ntrct, w/o stat epi	2
		G40801	Other epilepsy, not intractable, with status epilepticus	3
		G40802	Other epilepsy, not intractable, without status epilepticus	2
		G40803	Other epilepsy, intractable, with status epilepticus	3
		G40804	Other epilepsy, intractable, without status epilepticus	2
		G40811	Lennox-Gastaut syndrome, not intractable, w stat epi	3
		G40812	Lennox-Gastaut syndrome, not intractable, w/o stat epi	2
		G40813	Lennox-Gastaut syndrome, intractable, w status epilepticus	3
		G40814	Lennox-Gastaut syndrome, intractable, w/o status epilepticus	2
		G40821	Epileptic spasms, not intractable, with status epilepticus	3
		G40822	Epileptic spasms, not intractable, w/o status epilepticus	2
		G40823	Epileptic spasms, intractable, with status epilepticus	3
		G40824	Epileptic spasms, intractable, without status epilepticus	2
		G40833	Dravet syndrome, intractable, with status epilepticus	3
		G40834	Dravet syndrome, intractable, without status epilepticus	2
		G4089	Other seizures	2
		G40901	Epilepsy, unsp, not intractable, with status epilepticus	3
		G40909	Epilepsy, unsp, not intractable, without status epilepticus	1
		G40911	Epilepsy, unspecified, intractable, with status epilepticus	3
		G40919	Epilepsy, unsp, intractable, without status epilepticus	2
		G40A01	Absence epileptic syndrome, not intractable, w stat epi	3
		G40A09	Absence epileptic syndrome, not intractable, w/o stat epi	1
		G40A11	Absence epileptic syndrome, intractable, w stat epi	3
		G40A19	Absence epileptic syndrome, intractable, w/o stat epi	2
		G40B01	Juvenile myoclonic epilepsy, not intractable, w stat epi	3
		G40B09	Juvenile myoclonic epilepsy, not intractable, w/o stat epi	2

3-digit ICD-10	3-digit ICD-10 description	ICD-10	ICD-10 Description	Severity
		G40B11	Juvenile myoclonic epilepsy, intractable, w stat epi	3
		G40B19	Juvenile myoclonic epilepsy, intractable, w/o stat epi	2
I10	Essential (primary) hypertension	I10	Essential (primary) hypertension	1
I11	Hypertensive heart disease	I110	Hypertensive heart disease with heart failure	2
		I119	Hypertensive heart disease without heart failure	1
I50	Heart failure	I501	Left ventricular failure, unspecified	2
		I5020	Unspecified systolic (congestive) heart failure	2
		I5021	Acute systolic (congestive) heart failure	3
		I5022	Chronic systolic (congestive) heart failure	2
		I5023	Acute on chronic systolic (congestive) heart failure	3
		I5030	Unspecified diastolic (congestive) heart failure	2
		I5031	Acute diastolic (congestive) heart failure	3
		I5032	Chronic diastolic (congestive) heart failure	2
		I5033	Acute on chronic diastolic (congestive) heart failure	3
		I5040	Unsp combined systolic and diastolic (congestive) hrt fail	2
		I5041	Acute combined systolic and diastolic (congestive) hrt fail	3
		I5042	Chronic combined systolic and diastolic hrt fail	2
		I5043	Acute on chronic combined systolic and diastolic hrt fail	3
		I50810	Right heart failure, unspecified	1
		I50811	Acute right heart failure	2
		I50812	Chronic right heart failure	1
		I50813	Acute on chronic right heart failure	2
		I50814	Right heart failure due to left heart failure	1
		I5082	Biventricular heart failure	1
		I5083	High output heart failure	1
I5084	End stage heart failure	2		
I5089	Other heart failure	1		
I509	Heart failure, unspecified	1		
J44	Other chronic obstructive pulmonary disease	J440	Chr obstructive pulmon disease with (acute) lower resp infct	3
		J441	Chronic obstructive pulmonary disease w (acute) exacerbation	2

3-digit ICD-10	3-digit ICD-10 description	ICD-10	ICD-10 Description	Severity
		J449	Chronic obstructive pulmonary disease, unspecified	1
J45	Asthma	J4520	Mild intermittent asthma, uncomplicated	1
		J4521	Mild intermittent asthma with (acute) exacerbation	2
		J4522	Mild intermittent asthma with status asthmaticus	3
		J4530	Mild persistent asthma, uncomplicated	1
		J4531	Mild persistent asthma with (acute) exacerbation	2
		J4532	Mild persistent asthma with status asthmaticus	3
		J4540	Moderate persistent asthma, uncomplicated	2
		J4541	Moderate persistent asthma with (acute) exacerbation	2
		J4542	Moderate persistent asthma with status asthmaticus	3
		J4550	Severe persistent asthma, uncomplicated	2
		J4551	Severe persistent asthma with (acute) exacerbation	3
		J4552	Severe persistent asthma with status asthmaticus	3
		J45901	Unspecified asthma with (acute) exacerbation	2
		J45902	Unspecified asthma with status asthmaticus	3
		J45909	Unspecified asthma, uncomplicated	1
		J45990	Exercise induced bronchospasm	1
		J45991	Cough variant asthma	1
		J45998	Other asthma	1
K52	Other and unsp noninfective gastroenteritis and colitis	K520	Gastroenteritis and colitis due to radiation	2
		K521	Toxic gastroenteritis and colitis	2
		K5221	Food protein-induced enterocolitis syndrome	2
		K5222	Food protein-induced enteropathy	2
		K5229	Other allergic and dietetic gastroenteritis and colitis	2
		K523	Indeterminate colitis	2
		K5281	Eosinophilic gastritis or gastroenteritis	2
		K5282	Eosinophilic colitis	2
		K52831	Collagenous colitis	2
		K52832	Lymphocytic colitis	2
		K52838	Other microscopic colitis	2
		K52839	Microscopic colitis, unspecified	2
		K5289	Other specified noninfective gastroenteritis and colitis	2
		K529	Noninfective gastroenteritis and colitis, unspecified	1

eTable 7. Ambulatory Encounters and Percentage Telehealth During July-December 2019 and 2020: Unadjusted Results Comparing Full Population with Those Included in the Regression Analysis		
Patient Level Characteristics	Full Population Patient No. (%)	Regression Analysis Cohort Patient No. (%)
Total No. Members	40,739,915	1,086,720
Age in 2019		
0 to 17	9,102,907 (22.34%)	211,124 (19.43%)
18 to 34	9,755,452 (23.95%)	229,851 (21.15%)
35 to 49	10,069,444 (24.72%)	273,973 (25.21%)
50+	11,812,112 (28.99%)	371,772 (34.21%)
Elixhauser Comorbidity Index		
0	38,294,865 (94%)	969,962 (89.26%)
1	2,354,975 (5.78%)	112,819 (10.38%)
2	69,213 (0.17%)	2,905 (0.27%)
3+	20,862 (0.05%)	1,034 (0.1%)
US Census Region of Residence		
Midwest	10,056,251 (24.68%)	265,029 (24.39%)
Northeast	7,036,675 (17.27%)	168,888 (15.54%)
South	16,771,293 (41.17%)	496,176 (45.66%)
West	6,875,696 (16.88%)	156,627 (14.41%)
Urban / Rural Status of Residence		
Rural	6,308,636 (15.49%)	211,503 (19.46%)
Urban	34,431,279 (84.51%)	875,217 (80.54%)
COVID-19 Hot-Spot of Residence		
Hotspot - No	18,676,928 (45.84%)	442,704 (40.74%)
Hotspot - Yes	22,062,987 (54.16%)	644,016 (59.26%)
Area Deprivation Index (by Quartile)		
Quartile 1 (<i>Low Deprivation</i>)	16,869,885 (41.41%)	385,242 (35.45%)
Quartile 2	9,163,847 (22.49%)	256,311 (23.59%)
Quartile 3	8,582,511 (21.07%)	257,559 (23.7%)
Quartile 4 (<i>High Deprivation</i>)	6,123,672 (15.03%)	187,608 (17.26%)
Internet Connectivity (# of households with internet access per 1000 at zip code level)		
0-499	164,834 (0.4%)	5,276 (0.49%)
500-1000	40,575,081 (99.6%)	1,081,444 (99.51%)
Type of Insurance Plan in 2019		

High Deductible	10,623,412 (26.08%)	299,539 (27.56%)
HMO	2,435,534 (5.98%)	51,724 (4.76%)
Standard PPO	27,680,969 (67.95%)	735,457 (67.68%)

eTable 8. In-Person and Telehealth Ambulatory Encounters for 40.7 million Continuously Enrolled Insured Persons During Post Implementation Phase (July-December); Comparing Pre COVID-19 (2019) and Post COVID-19 (2020) Periods

<u>Type of Service</u>	<u>Summer Plateau</u> (July-September)		<u>Fall Surge</u> (October-December)	
	<u>2019-Pre COVID-19</u>	<u>2020-Post COVID-19</u>	<u>2019-Pre COVID-19</u>	<u>2020-Post COVID-19</u>
Total Ambulatory Encounters Per Enrollee	1.20	1.20	1.26	1.25
In Person Ambulatory Encounters Per Enrollee	1.20	1.00	1.25	1.04
% of Total Encounters Via Telehealth (<i>Distribution of telehealth modality below</i>)	147,860 (0.36%)	8,170,597 (20.06%)	217,512 (0.53%)	8,583,684 (21.07%)
• Video Supported	54,631 (36.95%)	6,547,014 (80.13%)	71,685 (32.96%)	6,803,596 (79.26%)
• Telephone	85,080 (57.54%)	543,849 (6.66%)	134,751 (61.95%)	559,614 (6.52%)
• Other or Unspecified	8,149 (5.51%)	1,079,734 (13.21%)	11,076 (5.09%)	1,220,474 (14.22%)
% Enrollees with 1+ Ambulatory Encounter of Any Kind	18,072,540 (44.36%)	17,448,169 (42.83%)	18,675,255 (45.84%)	17,894,218 (43.92%)
% Enrollees with 1+ Telehealth Encounters	105,734 (0.26%)	3,611,386 (8.86%)	159,370 (0.39%)	3,777,007 (9.27%)

eTable 9. Ambulatory Encounters and Percentage Telehealth During 2019 and 2020: Unadjusted Results Broken Down by Characteristics of Persons and Their Residence Location

		Encounters per person, No. (% that were telehealth)					
Patient-Level Characteristics	Patient, No (%)	Summer Plateau (July-September)			Fall Surge (October-December)		
		2019-Pre COVID-19	2020-Post COVID-19		2019-Pre COVID-19	2020-Post COVID-19	
		All Persons ^a	All Persons ^a	Persons with 1+ encounter	All Persons ^a	All Persons ^a	Persons with 1+ encounter
Column Mean		1.20	1.20	2.81 (16.7%)	1.26	1.25	2.84 (16.9%)
Age in 2019							
0 to 17	9,102,907 (22.34%)	1.05	0.93	2.65 (18.93%)	1.18	0.96	2.75 (19.51%)
18 to 34	9,755,452 (23.95%)	0.96	1.04	2.78 (25.01%)	0.96	1.09	2.77 (25.52%)
35 to 49	10,069,444 (24.72%)	1.19	1.23	2.82 (19.02%)	1.23	1.28	2.82 (19.07%)
50+	11,812,112 (28.99%)	1.53	1.52	2.89 (12.66%)	1.58	1.56	2.93 (12.49%)
Elixhauser Comorbidity Index							
0	38,294,865 (94%)	1.10	1.13	2.75 (18.15%)	1.15	1.17	2.78 (18.39%)
1	2,354,975 (5.78%)	2.72	2.33	3.28 (16.03%)	2.85	2.34	3.28 (15.64%)
2	69,213 (0.17%)	5.00	3.62	4.61 (19.76%)	5.43	3.46	4.44 (19.4%)
3+	20,862 (0.05%)	6.24	4.49	5.38 (19.08%)	6.81	4.22	5.1 (18.27%)
US Census Region of Residence							
Midwest	10,056,251 (24.68%)	1.20	1.23	2.97 (15.64%)	1.28	1.27	3.01 (16.94%)
Northeast	7,036,675 (17.27%)	1.28	1.28	2.87 (25.11%)	1.32	1.33	2.91 (25.77%)
South	16,771,293 (41.17%)	1.18	1.21	2.64 (14.68%)	1.24	1.25	2.67 (13.33%)
West	6,875,696 (16.88%)	1.16	1.07	2.97 (21.86%)	1.20	1.10	2.98 (23.79%)
Urban / Rural Status of Residence							
Rural	6,308,636 (15.49%)	1.03	1.05	2.47 (10.23%)	1.09	1.07	2.49 (10.99%)
Urban	34,431,279 (84.51%)	1.23	1.23	2.87 (19.13%)	1.29	1.28	2.9 (19.19%)
COVID-19 Hot-Spot of Residence							
Hotspot - No	24,304,495 (59.66%)	1.25	1.25	2.93 (19.92%)	1.30	1.31	2.93 (19.73%)
Hotspot - Yes	16,435,420 (40.34%)	1.13	1.13	2.58 (12.16%)	1.14	1.07	2.63 (14.97%)
Area Deprivation Index (by Quartile)							
Quartile 1 (Low)	16,869,885 (41.41%)	1.34	1.32	3.04 (21.74%)	1.40	1.38	3.08 (21.96%)
Quartile 2	9,163,847 (22.49%)	1.15	1.14	2.71 (15.76%)	1.20	1.18	2.73 (16.04%)

Quartile 3	8,582,511 (21.07%)	1.11	1.12	2.62 (14.01%)	1.16	1.15	2.64 (14.21%)
Quartile 4 (<i>High</i>)	6,123,672 (15.03%)	1.04	1.08	2.56 (14.18%)	1.08	1.10	2.57 (13.73%)
Internet Connectivity (# of households with internet access per 1000 at zip code level)							
0-499	164,834 (0.4%)	0.97	1.03	2.41 (2.23%, 8.63%)	1.02	1.03	2.4 (2%, 7.63%)
500-1000	40,575,081 (99.6%)	1.20	1.20	2.81 (1.11%, 13.36%)	1.26	1.25	2.84 (1.1%, 13.39%)
Type of Insurance Plan in 2019							
High Deductible	10,623,412 (26.08%)	1.04	1.05	2.56 (15.14%)	1.09	1.10	2.59 (15.04%)
HMO	2,435,534 (5.98%)	1.21	1.06	2.93 (29.42%)	1.22	1.09	2.96 (28.41%)
Standard PPO	27,680,969 (67.95%)	1.26	1.27	2.89 (17.97%)	1.32	1.32	2.92 (18.33%)
^a The entire sample (of users and nonusers) continuously enrolled in commercial insurance plans from July 1, 2019, through December 31, 2020. These unadjusted rates are reported as the number of telehealth eligible ambulatory encounters per enrollee and the percentage of these encounters that took place via telehealth during each 3-month study period (July-September and October-December). All rows are calculated at the person level. ^b Telephone% and video encounters%.							

eTable 10. Ambulatory Encounters and Percentage Telehealth During 2019 and 2020: Unadjusted Encounter Level Results Broken Down by Characteristics of the Encounter

Encounter Level Characteristics	Encounters per person, No. (% that were telehealth)					
	<u>Summer Plateau</u> (July-September)			<u>Fall Surge</u> (October-December)		
	<u>2019-Pre COVID-19</u>	<u>2020-Post COVID-19</u>		<u>2019- Pre COVID</u>	<u>2020-Post COVID-19</u>	
	All Persons ^a	All Persons ^a	Persons with 1+ encounter	All Persons ^a	All Persons ^a	Persons with 1+ encounter
Column Mean for Entire Subgroup	1.20	1.20	2.81 (16.7%)	1.26	1.25	2.84 (16.9%)
Type of Ambulatory Encounter						
Evaluation and Management Office Encounter	0.77	0.76	1.78 (14.64%)	0.83	0.80	1.82 (14.59%)
Behavioral Health	0.16	0.18	0.41 (52.15%)	0.16	0.18	0.41 (54.66%)
Rehabilitation	0.07	0.08	0.18 (10.02%)	0.07	0.07	0.17 (10.81%)
Other	0.19	0.18	0.43 (1.87%)	0.20	0.19	0.44 (1.46%)
Provider Specialty						
Primary Care MD/DO	0.33	0.31	0.72 (15.03%)	0.36	0.32	0.72 (15.42%)
Medical Specialist MD/DO	0.11	0.11	0.27 (13.97%)	0.11	0.11	0.26 (13.19%)
Surgical Specialist MD/DO	0.10	0.10	0.23 (3.77%)	0.10	0.10	0.22 (3.51%)
Behavioral Health MD/DO/Non-MD	0.08	0.09	0.21 (56.38%)	0.08	0.09	0.21 (59.73%)
Rehabilitation MD/DO/Non-MD	0.16	0.16	0.36 (2.95%)	0.17	0.16	0.36 (2.53%)
Other Physician	0.25	0.27	0.64 (25.11%)	0.27	0.29	0.66 (24.6%)
Physician Assistant /Nurse Practitioner	0.09	0.10	0.23 (13.33%)	0.10	0.11	0.25 (13.94%)
Other non-Physician	0.06	0.06	0.14 (18.61%)	0.06	0.07	0.15 (18.56%)
Primary Diagnosis						
Diabetes	0.03	0.03	0.06 (14.32%)	0.03	0.03	0.06 (13.38%)
Hypertension	0.03	0.03	0.08 (12.99%)	0.03	0.03	0.08 (11.56%)
Behavioral Health	0.23	0.25	0.58 (50.31%)	0.23	0.25	0.57 (52.56%)
Cancer	0.02	0.03	0.06 (8.2%)	0.02	0.03	0.06 (7.93%)
Well Child Care	0.01	0.01	0.03 (0.3%)	0.01	0.01	0.02 (0.29%)
COVID-19 Diagnosis	NA	0.01	0.01 (30.25%)	NA	0.02	0.04 (26.17%)
Other Chronic Diagnosis	0.22	0.21	0.5 (12.81%)	0.22	0.21	0.48 (12.49%)
Other Acute Diagnosis	0.66	0.64	1.49 (7.97%)	0.71	0.68	1.54 (7.9%)

Continuity of Patient Encounter/ Problem						
Existing Patient Encounters	0.93	0.89	2.08 (17.99%)	0.97	0.92	2.09 (18.15%)
New Patient Encounters	0.27	0.31	0.72 (17.73%)	0.29	0.33	0.75 (17.95%)
Existing Problem Encounters	0.78	0.74	1.73 (18.7%)	0.80	0.75	1.72 (18.81%)
New Problem Encounters	0.42	0.46	1.08 (16.67%)	0.46	0.49	1.12 (17.01%)
^a The full study sample included persons continuously enrolled from July 1, 2019, through December 31, 2020. These unadjusted rates are reported as the number of telehealth eligible ambulatory encounters per enrollee that took place during each 3-month study period (July-September and October-December). Percentages represent the proportion of encounters that took place via telehealth. Note that all rows were calculated at encounter level and that the "all persons" columns include all enrollees whether or not they used any services.						

eTable 11. Summary of Acute and Chronic Ambulatory Care Sensitive Conditions and Subsequent Utilization Patterns in 2020

Condition	Total Members	Members with Any Follow-up Encounter	Members with ED Follow-up	Members with Hospitalization Follow-up
ACUTE - Ambulatory Care Sensitive Conditions				
Acute bronchitis				
First Encounter: Telehealth	9,245	6,981 (75.51%)	384 (4.15%)	306 (3.31%)
First Encounter: In-Person	30,381	20,948 (68.95%)	1,038 (3.42%)	903 (2.97%)
Acute pharyngitis				
First Encounter: Telehealth	36,399	24,933 (68.5%)	690 (1.9%)	503 (1.38%)
First Encounter: In-Person	189,567	105,755 (55.79%)	2,952 (1.56%)	2,218 (1.17%)
Acute pyelonephritis				
First Encounter: Telehealth	389	318 (81.75%)	28 (7.2%)	20 (5.14%)
First Encounter: In-Person	1,655	1,341 (81.03%)	114 (6.89%)	85 (5.14%)
Acute tonsillitis				
First Encounter: Telehealth	3,758	2,427 (64.58%)	93 (2.47%)	40 (1.06%)
First Encounter: In-Person	23,424	14,177 (60.52%)	659 (2.81%)	252 (1.08%)
Acute upper respiratory infections of multiple and unspecified sites				
First Encounter: Telehealth	49,336	34,966 (70.87%)	1,348 (2.73%)	945 (1.92%)
First Encounter: In-Person	180,034	101,290 (56.26%)	3,872 (2.15%)	2,661 (1.48%)
Pneumonia, unspecified organism				
First Encounter: Telehealth	1,402	1,286 (91.73%)	82 (5.85%)	69 (4.92%)
First Encounter: In-Person	7,420	6,290 (84.77%)	373 (5.03%)	421 (5.67%)
Convulsions, not elsewhere classified				
First Encounter: Telehealth	1,022	675 (66.05%)	32 (3.13%)	44 (4.31%)
First Encounter: In-Person	3,099	2,246 (72.48%)	121 (3.9%)	119 (3.84%)
Diseases of pulp and periapical tissues				
First Encounter: Telehealth	2,480	1,348 (54.35%)	89 (3.59%)	47 (1.9%)
First Encounter: In-Person	10,570	5,519 (52.21%)	362 (3.42%)	209 (1.98%)
Other diseases of lip and oral mucosa				
First Encounter: Telehealth	2,271	1,543 (67.94%)	50 (2.2%)	35 (1.54%)
First Encounter: In-Person	14,573	10,077 (69.15%)	336 (2.31%)	253 (1.74%)
Stomatitis and related lesions				
First Encounter: Telehealth	2,187	1,446 (66.12%)	79 (3.61%)	40 (1.83%)
First Encounter: In-Person	12,284	7,928 (64.54%)	350 (2.85%)	246 (2%)

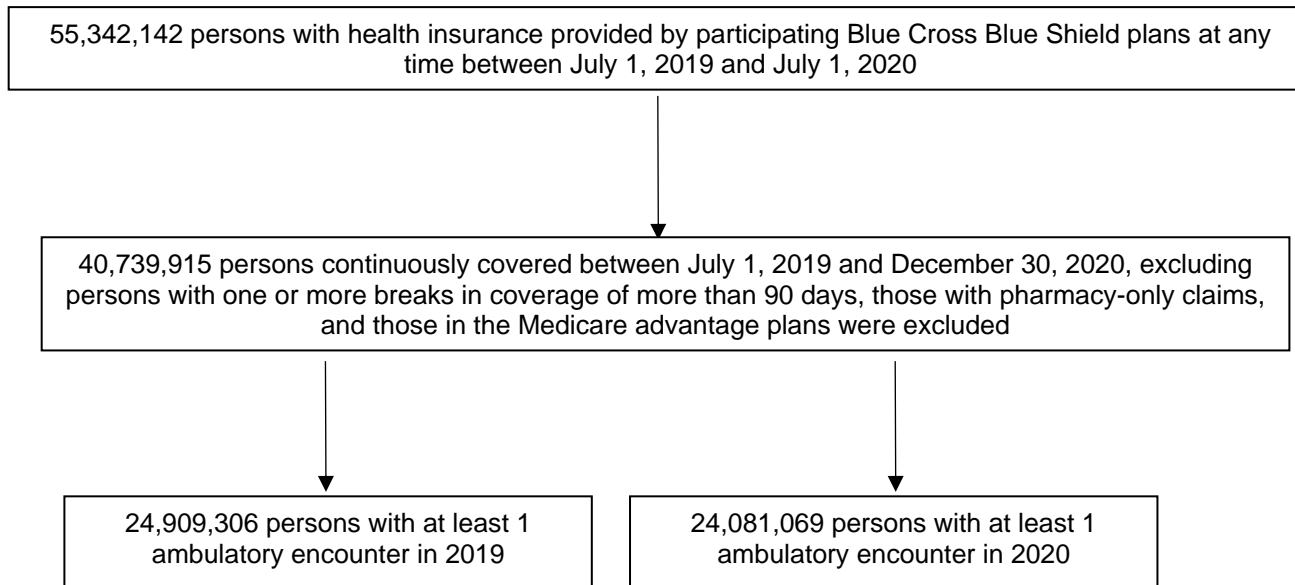
CHRONIC - Ambulatory Care Sensitive Condition				
Asthma				
First Encounter: Telehealth	23,878	15,231 (63.79%)	533 (2.23%)	398 (1.67%)
First Encounter: In-Person	72,918	45,301 (62.13%)	1,617 (2.22%)	1,241 (1.7%)
Epilepsy and recurrent seizures				
First Encounter: Telehealth	3,013	1,692 (56.16%)	66 (2.19%)	68 (2.26%)
First Encounter: In-Person	7,645	4,632 (60.59%)	187 (2.45%)	195 (2.55%)
Essential (primary) hypertension				
First Encounter: Telehealth	42,450	27,753 (65.38%)	628 (1.48%)	867 (2.04%)
First Encounter: In-Person	215,227	144,220 (67.01%)	3,262 (1.52%)	4,395 (2.04%)
Heart failure				
First Encounter: Telehealth	556	456 (82.01%)	21 (3.78%)	51 (9.17%)
First Encounter: In-Person	3,908	3,418 (87.46%)	173 (4.43%)	343 (8.78%)
Hypertensive heart disease				
First Encounter: Telehealth	1,259	948 (75.3%)	35 (2.78%)	68 (5.4%)
First Encounter: In-Person	7,551	5,976 (79.14%)	229 (3.03%)	354 (4.69%)
Iron deficiency anemia				
First Encounter: Telehealth	2,812	2,440 (86.77%)	100 (3.56%)	130 (4.62%)
First Encounter: In-Person	9,174	7,652 (83.41%)	330 (3.6%)	464 (5.06%)
Other and unspecified noninfective gastroenteritis and colitis				
First Encounter: Telehealth	7,586	5,698 (75.11%)	333 (4.39%)	212 (2.79%)
First Encounter: In-Person	21,929	14,995 (68.38%)	888 (4.05%)	622 (2.84%)
Other chronic obstructive pulmonary disease				
First Encounter: Telehealth	1,961	1,471 (75.01%)	74 (3.77%)	94 (4.79%)
First Encounter: In-Person	9,165	6,906 (75.35%)	323 (3.52%)	445 (4.86%)
Type 1 diabetes mellitus				
First Encounter: Telehealth	689	491 (71.26%)	24 (3.48%)	20 (2.9%)
First Encounter: In-Person	4,365	3,395 (77.78%)	139 (3.18%)	180 (4.12%)
Type 2 diabetes mellitus				
First Encounter: Telehealth	8,798	6,839 (77.73%)	115 (1.31%)	227 (2.58%)
First Encounter: In-Person	52,817	39,747 (75.25%)	931 (1.76%)	1,524 (2.89%)
Unspecified Disorders				
First Encounter: Telehealth	1,479	865 (58.49%)	50 (3.38%)	39 (2.64%)
First Encounter: In-Person	6,044	3,443 (56.97%)	226 (3.74%)	135 (2.23%)

All ambulatory care sensitive conditions (grouped by 3-digit ICD-10 categories) were selected based on sufficient prevalence within our study population and if there was evidence of telehealth utilization for the conditions. Enrollees that had encounters related to the condition in the 90-day period before the first encounter within the study period were removed from the cohort. Follow-up encounters were counted if there were any subsequent encounters to a provider within 14 days after the initial encounter.
ED: Emergency Department

eTable 12. Counts and Percentage of Initial Ambulatory Encounters for Chronic Ambulatory Care Sensitive Conditions by Severity Level and Encounter Type

Severity Level	In-Person	Telehealth	All Encounters
1	378961 (92.26%)	84583 (89.52%)	463544 (91.75%)
2	30452 (7.41%)	9580 (10.14%)	40032 (7.92%)
3	1330 (0.32%)	318 (0.34%)	1648 (0.33%)
All Levels	410743 (100%)	94481 (100%)	505224 (100)

eFigure1: Sample Selection and Subgroup Identification Diagram

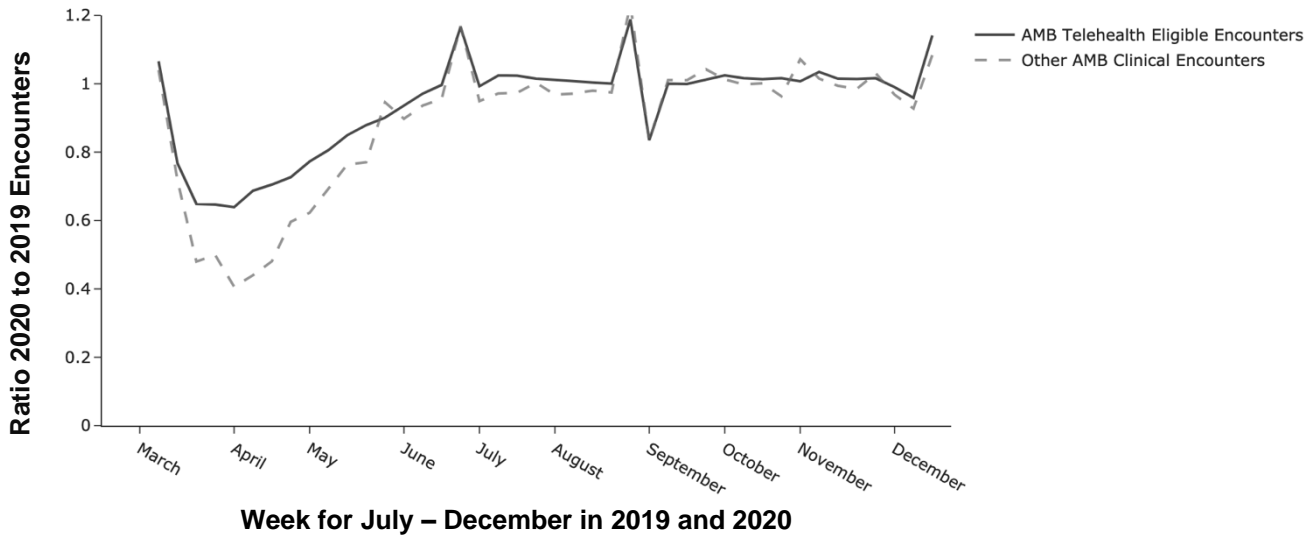


Ambulatory encounters are encounters for a set of CPT® and HCPCS codes that in 2020 are eligible for payment on a remote, telehealth basis. See Table 1 for a listing of codes. Inpatient and hospital emergency department places of service are excluded from the definition, as are service codes that are explicitly defined as inpatient or emergency services. An encounter or encounter is defined as a unique combination of the member, rendering physician, date of service, and place of service.

Only 1.4% of the cohort had any gap in coverage and of these, the majority of those with a gap (66%) had a gap of one month or less.

CPT: Current Procedural Terminology, HCPC: Healthcare Common Procedure Coding.

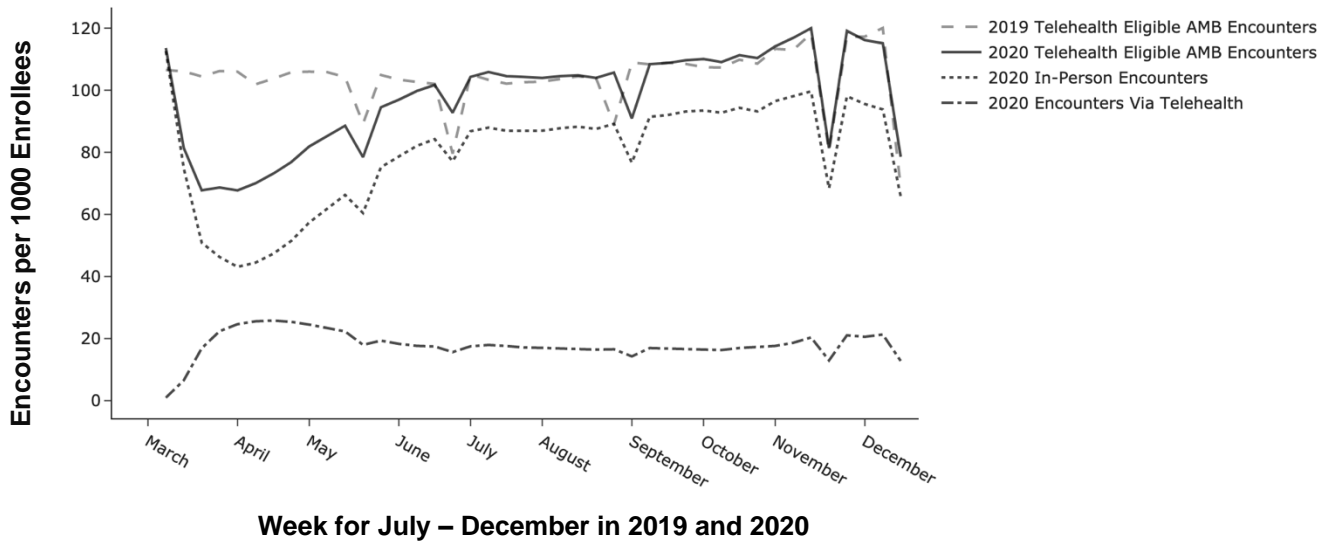
eFigure 2. The ratio of 2020 to 2019 Ambulatory (AMB) Clinical Encounters by Week, July through December



The graph distinguishes between *telehealth-eligible services* (our list of 264 codes) and all other services provided on an ambulatory basis, except for lab tests and ED encounters. Together these two categories correspond to almost all ambulatory care that requires a clinical encounter.

By the second week of April 2020, Other ambulatory (AMB) encounters had decreased to 40.1% of 2019 levels. In contrast, telehealth eligible services were less severely impacted and decreased to just 64% of 2019 Levels. By the end of June, both categories have steadily climbed back almost to 2019 levels and remained consistent throughout the rest of 2020.

eFigure 3. Telehealth-eligible Ambulatory (AMB) Encounters per 1000 Enrollees by Week, March-June 2019 and 2020



The graphs are based on encounters per 1000 enrollees and explain a disparity in impact. This graph focuses exclusively on *telehealth-eligible services* and distinguishes between those provided on an *in-person* basis and those provided via *telehealth*.

In-person encounters in 2020 were severely impacted and dropped to a low of 43.1 encounters per 1000, but this drop was partially offset by a sharp increase in telehealth - from less than 1 encounter per 1000 at the beginning of March, to a peak of 25.8 telehealth encounters per 1000 at the end of April. By the end of June, telehealth encounters decreased to a rate of 17.5 per 1000, and remained fairly consistent in this range throughout the rest of 2020. Telehealth played a critical role in ensuring continuity and availability of care at the peak of the crisis in 2020, and remained prevalent even after the peak of the crisis.