



LAST UPDATED: Feb 2025

Claims and Registry Data Analysis Plan: For the Vision & Eye Health Surveillance System

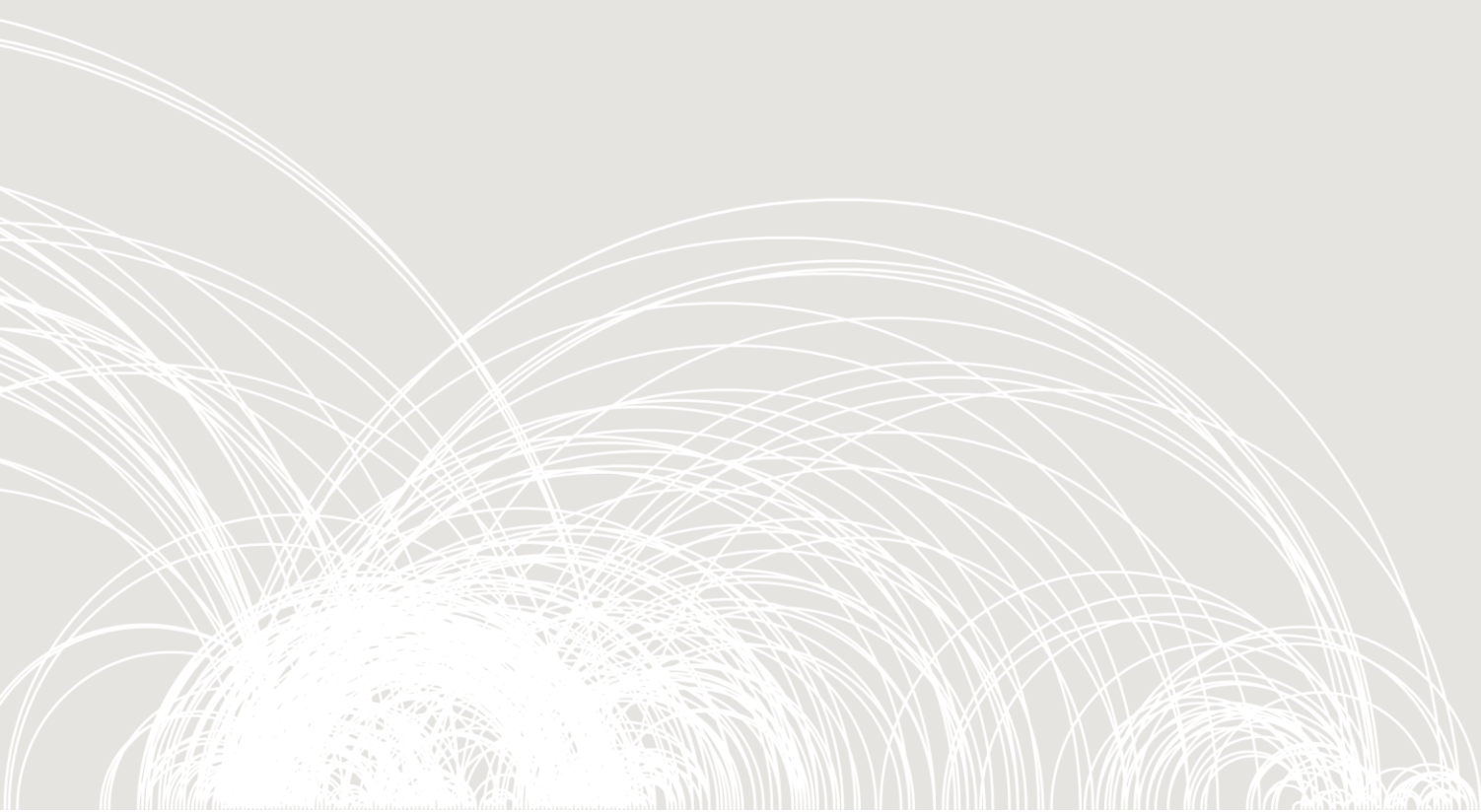


Table of Contents

Introduction	1
The Vision and Eye Health Surveillance System (VEHSS)	1
Document Purpose	1
Code Lists	1
Data Indicator Overview	2
Diagnosis categories and subgroups	2
Service Utilization Categories and Subgroups	7
Visual Acuity Categories and Subgroups	8
Analysis Approach.....	11
Diagnosed Prevalence	11
Service Utilization.....	12
Visual Acuity	13
Patient denominator	14
High Level Validation.....	15
Internal Validation	15
External Validation	15
Dataset Preparation	17
Summary Table Public Use Files (PUF) and Research De-identified Files	
Calculating Rates and Confidence Intervals	17
Data Suppression.....	17
Stratification Combinations.....	18
Data Dissemination	20
Appendix A. VEHSS Uniform Data Template, Version 3-3	21
Appendix B. VEHSS Uniform Data Dictionary, Version 3-3	24

List of Tables

Table 1.	Diagnosis Categories and Subgroups.....	2
Table 2.	Diagnosis Summary Subgroups	6
Table 3.	Procedure Categories and Subgroups.....	7
Table 4.	Subgroups of ‘CVISAC Measured Visual Acuity’ Category	9
Table A1.	VEHSS Minimum Dataset Fields	21
Table A2.	VEHSS Open Data Fields.....	22
Table B1.	Topics.....	24
Table B2.	Categories	24
Table B3.	Question (for website display).....	25
Table B4.	Subgroups (denoted as Responses for website data).....	29
Table B5.	PUF major age groups.....	34
Table B6.	RDF Modified WHO Age Groups	34
Table B7.	Other Age Groups	35
Table B8.	Sex	36
Table B9.	Race/Ethnicity	36
Table B10.	Risk Factors	36
Table B11.	Risk Factor Response	37
Table B12.	National and States	38
Table B13.	Data Value Types	40

DISCLAIMER: The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of NORC at the University of Chicago or the Centers for Disease Control and Prevention.

Introduction

The Vision and Eye Health Surveillance System (VEHSS)

The VEHSS initiative aims to combine and analyze multiple existing data sources to address knowledge gaps in vision and eye health surveillance. To achieve this, the project team identifies and prioritizes available sources of secondary information, defines common outcome indicators, analyzes and reports outcomes from individual data sources, and resolves methods to harmonize or integrate multiple data sources to produce integrated national and state prevalence and service utilization estimates.

Document Purpose

This document serves as a data analysis guide for claims and registry data used by analysts and data providers developing summary data tables on the prevalence of diagnosed eye disorders, prevalence of receipt of eyecare services, and prevalence of visual acuity categories for inclusion in VEHSS. This report may be updated throughout the course of the project.

Code Lists

Code lists used for the VEHSS analyses, including the diagnosis code and procedure code crosswalks are available online at <https://github.com/VEHSS>

Diagnosis code crosswalk:

https://github.com/VEHSS/VEHSS_DiagnosisCodes

Procedure code crosswalk:

https://github.com/VEHSS/VEHSS_procedures

Data Indicator Overview

The VEHSS tracks three separate topic areas from administrative data:

- Medical diagnoses
- Service utilization
- Visual function

Diagnosis categories and subgroups

Diagnosis codes are used to identify vision and eye disorders in administrative data sources. Diagnosis codes are categorized based on the ICD system. We reviewed ICD-9 and ICD-10 codes to identify codes that are related to vision, the eye, and ocular adnexa. This included codes for eye-related systems such as the orbit and the lacrimal system, including conjunctivitis.

We organized the individual diagnosis codes into a 2-level categorization schema consisting of categories and clinical subgroups. Every Vision, eye, and ocular adnexa code is assigned to a clinical subgroup, and a category may contain multiple subgroup.¹ Each category includes an “All subgroup representing the category subtotal for all subgroups within the category. For example, The Category “CDXC9 Strabismus and Amblyopia” includes clinical subgroups “R9_1 - Strabismus” and “R9_2 - Amblyopia”. These subgroups are not mutually exclusive, meaning a patient can be assigned to both subgroups. The category “R9_ALL - All Strabismus and amblyopia, contains all persons with a diagnosis of “R9_1 - Strabismus”, “R9_2 - Amblyopia” or a diagnosis of both of “R9_1 - Strabismus” and “R9_2 - Amblyopia”.

The Diagnosis Code Categories and Subgroups are listed in Table 1.

Table 1. Diagnosis Categories and Subgroups

CategoryID	Category	SubgroupID	Subgroup
CDXC1	Retinal Detachment and Defects	R1_ALL	All Retinal detachment and defects
		R1_1	Retinal detachment and defects
CDXC2	Diabetic Eye Diseases	R2_ALL	All Diabetic eye diseases
		R2_3	Proliferative
		R2_4	Diabetic macular edema
		R2_5	Other diabetes related eye disorders

¹ A small number of ICD10 codes are assigned to multiple subgroups if the ICD code definition includes multiple conditions. For example, E083519 defines both proliferative diabetic retinopathy and macular edema, and is therefore assigned to both subgroups R2_3-Proliferative DR and R2_4-Diabetic macular edema.

CategoryID	Category	SubgroupID	Subgroup
		R2_6	Non-proliferative
		R2_7	Severe non-proliferative
		R2_VT	Vision threatening DR
		R2_NVT	Non-vision threatening DR
CDXC3	Age Related Macular Degeneration	R3_ALL	All Age related macular degeneration
		R3_1	Unspecified
		R3_2	Early
		R3_3	Dry-form
		R3_3GA	Geographic atrophy
		R3_4	Wet-form
		R3_4CNV	Choroidal neovascularization
		R3_5	Advanced GA or Inactive CNV
		R3_VT	Vision threatening AMD
		R3_NVT	Non-vision threatening AMD
CDXC4	Other Retinal Disorders	R4_ALL	All Other retinal disorders
		R4_1	Retina vascular disease, Occlusive
		R4_2	Central retinal vein occlusion
		R4_3	Branch retinal vein occlusion
		R4_AnyRVO	Retinal vascular occlusion
		R4_4	Central retinal arterial occlusion
		R4_5	Branch retinal artery occlusion
		R4_AnyRAO	Retinal arterial occlusion
		R4_6	Non-Occlusive
		R4_8	Hereditary chorioretinal dystrophy
		R4_9	Myopic degeneration
		R4_10	Other/unspecified other retinal disorders
		R4_11	Retinopathy of prematurity
R4_12	Macular edema (Cystoid or non-diabetic)		
CDXC5	Glaucoma	R5_ALL	All Glaucoma
		R5_1	Open angle
		R5_4	Glaucoma suspect
		R5_5	Angle-closure
		R5_9	Other/unspecified glaucoma
		R5_10	Secondary glaucoma

CategoryID	Category	SubgroupID	Subgroup
		R5_VA	Vision affecting glaucoma
		R5_NVA	Non-vision affecting glaucoma
		R5_NOS	Glaucoma, non-suspect
		R5_SUS	Glaucoma, suspect
CDXC6	Cataracts	R6_ALL	All Cataracts
		R6_3	Congenital Cataract
		R6_4	Posterior capsular opacity
		R6_5	Pseudophakia
		R6_6	Aphakia and disorders of lens
		R6_7	Age-related cataract
		R6_8	Other or unspecified cataract
		R6_NTX	Diagnosed untreated cataract
		R6_TX	Diagnosed treated cataract
CDXC7	Disorders of Refraction and Accommodation	R7_ALL	All Refraction and accommodation
		R7_1	Myopia
		R7_2	Hypermetropia
		R7_3	Astigmatism
		R7_4	Presbyopia
		R7_5	Other
CDXC8	Blindness and Low Vision	R8_ALL	All Blindness and low vision
		R8_1	Unqualified, both eyes
		R8_2	Unqualified in one eye, or unspecified
		R8_7	Low vision or blindness, one eye
		R8_8	Blindness one eye, low vision other eye
		R8_9	Low vision, both eyes
		R8_10	Blindness, both eyes, including legal blindness
CDXC9	Strabismus and Amblyopia	R9_ALL	All Strabismus and amblyopia
		R9_1	Strabismus
		R9_2	Amblyopia
CDXC10	Injury, Burns and Surgical Complications of the Eye	R10_ALL	All Injury, burns and surgical complications of the eye
		R10_1	Ocular injury
		R10_2	Burn
		R10_3	Surgical complication
CDXC11		R11_ALL	All Disorders of optic nerve and visual pathways

CategoryID	Category	SubgroupID	Subgroup
	Disorders of Optic Nerve and Visual Pathways	R11_1	Optic nerve disorders
		R11_3	Disorders of the visual pathway and visual cortex
CDXC12	Other Visual Disturbances	R12_ALL	All Other visual disturbances
		R12_1	Visual field defect
		R12_2	Color blindness
		R12_3	Night blindness
		R12_4	Other/unspecified visual disturbances
CDXC13	Infectious and Inflammatory Diseases	R13_ALL	All Infectious and inflammatory diseases
		R13_1	Infectious diseases
		R13_2	Keratitis
		R13_3	Conjunctivitis
		R13_4	Eyelid infection and inflammation
		R13_5	Other/unspecified infectious and inflammatory diseases
		R13_6	Lacrimal and orbit inflammation
		R13_7	Endophthalmitis
CDXC14	Orbital and External Disease	R14_ALL	All Orbital and external disease
		R14_1	Congenital anomalies
		R14_2	Other/unspecified orbital and external disease
		R14_3	Lacrimal diseases
		R14_4	Eyelid disorders
		R14_5	Dry eye syndrome
		R14_6	Disorders of the globe
CDXC15	Cancer and Neoplasms of the Eye	R15_ALL	All Cancer and neoplasms of the eye diseases
		R15_1	Malignant neoplasm
		R15_2	Benign neoplasm
CDXC16	Cornea Disorders	R16_ALL	All Cornea disorders
		R16_1	Keratoconus
		R16_2	Endothelial dystrophy (Fuchs)
		R16_3	Other corneal disorders
		R16_4	Cornea disorder related to contact lens
		R16_5	Corneal transplant
CDXC17	Other Eye Disorders	R17_ALL	All Other eye disorders
		R17_1	Other eye disorders

The full list of ICD9 and ICD10 diagnosis codes assigned to each subgroup are available at: https://github.com/VEHSS/VEHSS_procedures

Diagnosis Summary subgroups

In addition to the diagnosis subgroups listed above, the VEHSS analysis includes summary subgroups intended to provide public health-oriented outcome measures to indicate whether a disease is of a vision threatening stage or not. Unlike the subgroups listed above, summary subgroups are mutually exclusive. For example, any patient with diagnosed DR including clinical subgroups severe non-proliferative DR (R2_7), proliferative DR (R2_3), or diabetic macular edema (R2_4) will be categorized to the summary subgroup Vision Threatening DR (R2_VT). Any patient with DR but is not assigned to R2_VT will be assigned to non-vision threatening DR (R2_NVT). Diagnosis summary subgroups are listed in Table 2.

Table 2. Diagnosis Summary Subgroups

CategoryID	Category	SubgroupID	Subgroup	Definition
CDXCS	Any eye condition	RS_ANY	Any diagnosed eye disorder	Any diagnosed eye disorder
CDXC2	Diabetic Eye Diseases	R2_VT	Vision threatening DR	R2_3 (Proliferative), R2_4 (DME), OR R2_7 (severe non-proliferative)
CDXC2	Diabetic Eye Diseases	R2_NVT	Non-vision threatening DR	R2_ALL but NOT in R2_VT
CDXC3	Age Related Macular Degeneration	R3_VT	Vision threatening AMD	R3_3GA, R3_4, R3_4CNV, OR R3_5
CDXC3	Age Related Macular Degeneration	R3_NVT	Non-vision threatening AMD	R3_ALL but NOT in R3_VT
CDXC5	Glaucoma	R5_VA	Vision affecting glaucoma	ICD10 code indicating moderate of severe stage glaucoma
CDXC5	Glaucoma	R5_NVA	Non-vision affecting glaucoma	R5_ALL but NOT R5_VA
CDXC5	Glaucoma	R5_NOS	Glaucoma, non-suspect	R5_1, R5_5, R5_9, R5_10, R5_XS
CDXC5	Glaucoma	R5_SUS	Glaucoma, suspect	R5_4, but NOT in R5_1, R5_5, R5_9, R5_10, R5_XS
CDXC6	Cataracts	R6_TX	Treated cataract	R6_4, R6_5 OR RCATSUR (from utilization)
CDXC6	Cataracts	R6_NTX	Untreated cataract	R6_ALL but NOT R6_TX

Service Utilization Categories and Subgroups

VEHSS estimates the proportion of persons receiving specified eye care services per calendar year. Note that this is not the same as frequency of service because the unit of measure is based on a person, not the quantity of services each person received.

Services are identified based on the presence of procedure codes, including Current Procedural Terminology (CPT) Codes or Healthcare Common Procedure Coding System (HCPCS) Codes, ICD diagnosis codes, and in some cases, additional codes such as National Drug Codes (NDC) or provider specialty codes.

Eye care services are assigned to patients with at least one instance of a designated procedure during a calendar year.

Table 3. Procedure Categories and Subgroups

CategoryID	Category text	SubgroupID	Subgroup text
CSCRN	Screening	RSCNGLA	Glaucoma screening
		RSCNVIS	Vision screening
		RSCNDR	Diabetic Retinopathy Telemedicine Screening
		RSCNTM	Telemedicine Screening
		RSCNANY	Any eye or vision screening
CTEST	Imaging or diagnostic test	RGONIO	Gonioscopy
		RVISFLD	Visual field testing
		RTONO	Tonometry test
		ROCT	Optical coherence tomography
		RFUN	Stereo fundus exam
		RANGIO	Angiography
		RCORTOP	Corneal topography
		RELECRET	Electroretinography
		QTESTANY	Any diagnostic eye test
CAMDTX	AMD Treatment	RVEGF	Anti-VEGF injections
		RLASER	Laser surgery
		RPHOTO	Photodynamic therapy
		RAMDANY	Any AMD procedure
CCATS	Cataract Surgery	RCATSUR	Cataract surgery
CGLAU	Glaucoma Treatment	RGLADRN	Drain
		RGSUR	Glaucoma surgery

CategoryID	Category text	SubgroupID	Subgroup text
		RLASER	Laser surgery
		RGRX	Glaucoma prescription drugs
		RGLAANY	Any glaucoma treatment
CDRTX	Treatment for diabetic retinopathy	RLASPH	Laser/photocoagulation
		RDRRET	Retinal detachment repair
		RDRVIC	Vitrectomy
		RVEGF	Anti-VEGF injections
		RDRANY	Any DR treatment
CVC	Vision Correction	RCONTAC	Contact lens or fitting
		RGLASS	Eyeglasses
		RVAID	Low Vision Aids
		RVCANY	Any vision correction
CUTLEX	Eye Exams	REXANY	By any provider type
		REXPHS	By an ophthalmologist or other physician
		REXOPH	By an ophthalmologist
		REXOPT	By an optometrist or optician
CRVOTX	Treatment for RVO	RVEGF	Anti-VEGF injections
		RDRVIC	Vitrectomy
		RLASER	Laser surgery
		RSTEROID	Steroid
		RRVOANY	Any RVO treatment
CREFRACT	Refraction	RREFRACT	Refraction only

The full code list and algorithms for the procedure code analysis are available at:

https://github.com/VEHSS/VEHSS_DiagnosisCodes

Visual Acuity Categories and Subgroups

Visual acuity information may be available in some electronic health records data, including the IRIS® Registry. Visual function is measured based on best-corrected visual acuity in the better-seeing eye. The VEHSS system also tracks monocular impairment based on the best-corrected acuity in the worse-seeing eye. Presenting acuity and uncorrected refractive error (URE) is defined in VEHSS, but to our knowledge is not currently captured in any available secondary data sources.

Visual acuity categories are listed in **Table 4**.

Table 4. Subgroups of ‘CVISAC Measured Visual Acuity’ Category

SubgroupID	Subgroup	BCVA				Presenting/habitual acuity			
		Better-seeing eye		Worse-seeing eye		Better-seeing eye		Worse-seeing eye	
		Snellen	LogMar	Snellen	LogMar	Snellen	LogMar	Snellen	LogMar
RVNORM	Normal vision	20/12 – <20/32	-0.2 – <0.2						
RVANY	Any vision loss	<=20/32	>=0.2						
RVIMP	Visual impairment	20/32 – <20/200	0.2 – <1.0						
RVIMIL	Mild visual impairment	20/32 – <20/80	0.2 – <0.6						
RVIMOD	Moderate visual impairment	20/80 - <20/200	0.6 - <1.0						
RVUSB	US-defined blindness	<=20/200	>=1.0						
RVWB	WHO-defined blindness	<=20/400	>=1.3						
RVMON	Monocular vision loss	20/12 – <20/32	-0.2 – <0.2	<=20/32	>=0.2				
RVMISS	Missing acuity	missing	missing						
RVPNOR	Presenting with normal vision					20/12 – 20/25	-0.2 – 0.1		
RVPANY	Presenting with any vision loss					<=20/32	>=0.2		
RVPIMP	Presenting with visual impairment					20/32 – 20/160	0.2 – 0.9		
RVPMIL	Presenting with mild visual impairment					20/32 – 20/63	0.2 – 0.5		
RVPMOD	Presenting with moderate visual impairment					20/80-20/160	0.6-0.9		
RVPUSB	Presenting with US-defined blindness					<=20/200	>=1.0		
RVPWB	Presenting with WHO-defined blindness					<=20/400	>=1.3		
RVPMON	Presenting with monocular vision loss					20/12 – 20/25	-0.2 – 0.1	<=20/32	>=0.2

SubgroupID	Subgroup	BCVA				Presenting/habitual acuity			
		Better-seeing eye		Worse-seeing eye		Better-seeing eye		Worse-seeing eye	
		Snellen	LogMar	Snellen	LogMar	Snellen	LogMar	Snellen	LogMar
RVPMISS	Missing presenting acuity					missing	missing		
RVURE	Uncorrected refractive error (URE)	>20/40	<0.3			<=20/50	>=0.4		

Analysis Approach

Below we summarize the analysis approach for each outcome measure.

Diagnosed Prevalence

VEHSS calculates the annual prevalence of categorized diagnosis codes within each dataset. Patients must be enrolled in the program during the year of observation. The definition of enrollment is defined in the data summary report for each data set, which are located on the VEHSS website. For example, in the VEHSS analysis of Medicare FFS data, patients must be enrolled in Part B for all 12 months of the calendar year. However, for Medicaid T-MSIS data, patients must be enrolled for one full month during a calendar year.

Individual patients are assigned to diagnosis categories and subgroups based on the presence of an included ICD9 or ICD10 code on any patient claim, diagnosis, or procedure during the year of observation. Diagnosis codes may be primary or secondary codes. Only one instance of a code is required to assign the patient to a diagnosis category and subgroup.

In summary, we use the following algorithm to assign diagnosis category and subgroup:

1. Any observation of an indicated diagnosis code in any claim for a patient.
2. The diagnosis code can be primary or secondary.
3. Only one instance of the diagnosis code is necessary to trigger a diagnosis.
4. Patients may be assigned to multiple categories and subgroups.
5. Data is analyzed on an annual basis.

Example

For example, assume a patient had 2 claims during a calendar year which contained a total of 3 ICD10 codes included in the VEHSS diagnosis code crosswalk:

- H.4940 Progressive external ophthalmoplegia, unspecified eye
- H.50021 Monocular esotropia with A pattern, right eye
- H.53003 Unspecified amblyopia, bilateral

The VEHS diagnosis code crosswalk maps each ICD10 code to a VEHS category and subgroup:

ICD10	ICD10 Description	CategoryID	Category	SubgroupID	Subgroup
...
H4940	Progressive external ophthalmoplegia, unspecified eye	CDXC9	Strabismus and Amblyopia	R9_1	Strabismus
H50021	Monocular esotropia with A pattern, right eye	CDXC9	Strabismus and Amblyopia	R9_1	Strabismus
H53003	Unspecified amblyopia, bilateral	CDXC9	Strabismus and Amblyopia	R9_2	Amblyopia
...

H4940 and H50021 are both assigned to subgroup ‘9.1 Strabismus’. The patient is assigned to subgroup 9.1.

H53003 is assigned to subgroup ‘9.2 Amblyopia’.

The patient is counted as one prevalent case for subgroup 9_1, one case for subgroup 9_2, and one case for ‘Category 9 Strabismus and Amblyopia’. Thus, individual patients can appear in multiple subgroups and categories, but cannot be double counted within a specific category or subgroup.

Service Utilization

The VEHS calculates the prevalence of receipt of services of categorized eye care services using procedure, diagnosis, drug, and provider type codes. These analyses should be conducted after the diagnosed prevalence analysis because disease categories are used to assign certain services.

Patients are assigned to categories and subgroups based on the same approach as diagnostic categories. However, the assignment of some service groups may require multiple conditions and as a result the VEHS eye care services crosswalk has additional fields, including secondary code lists and patient-level diagnosis categories.

In summary, we use the following algorithm to assign eye care services categories and subgroups:

- Patient is assigned to VEHS eye care services category and subgroup if they have any claim or patient record with an included indicated CPT/HCPCS procedure code during a calendar year
- If ‘Required secondary codes’ are listed in the VEHS procedure code categories crosswalk, the indicated diagnosis or procedure code must be present on the same claim as the procedure code.
- If ‘Required diagnosis’ is listed in the VEHS procedure code categories crosswalk, the patient must be assigned to this diagnosis category based on the results of the VEHS diagnosed prevalence analysis.

- Results should be calculated for the entire patient sample, as well as subset for each Risk Factor group indicated on the VEHSS procedure code categories crosswalk. RFDR, RFCAT, RFAMD, and RFGLC indicate patients assigned to the VEHSS diagnosis categories of Diabetic Eye Disease, Cataract, AMD, and glaucoma, respectively.
- Only one instance of the procedure code is necessary.
- Patients may be assigned to multiple categories and subgroups.
- Data is analyzed on an annual basis.

Example:

Assume a patient has two claims in a calendar year related to eye care. The first claim includes CPT code 99201 (office/outpatient visit new) with a provider type of 'Optometry', and a diagnosis code of H353211. The second claim includes 92014 (eye exam tx estab pt 1/>vt), J3490 (Drugs unclassified injection), and 67028 (intravitreal injection of a pharmacologic agent) but is missing a provider type and diagnosis code.

Due to having a ICD10 code mapped to "CDXC3-Age Related Macular Degeneration, R3_4CNV-Choroidal neovascularization", this patient would have previously been assigned to the AMD Category based on the VEHSS diagnosed prevalence analysis.

For the Service Utilization analysis, the first claim's CPT 99201 is included in the VEHSS procedure code categories crosswalk under the category 'CUTLEX-Eye Exams'. However, this is an E&M code which is not specific to eye care. Under 'Required secondary codes-same encounter or date' it specifies that this code also requires an eye care provider specialty code on the same claim. In this case, the provider specialty type on the claim was 'Optometry'. So, this patient is assigned to two subgroups with the Eye Exam category "REXANY-By any provider type" and "REXOPT-By an optometrist or optician".

Based on the second claim, this patient would also be assigned to "CAMDTX-AMD Treatment, RVEGF-Anti-VEGF injections" because they meet the following three conditions, 1) a CPT code mapped to the RVEGF subgroup, 2) a CPT code 67028 on the same claim, and 3) the patient is assigned to the CDXC3- Age Related Macular Degeneration diagnosis category. This patient would then also be assigned to subgroup "CAMDTX-AMD Treatment, RAMDANY-Any AMD procedure" which is the category total for having any AMD treatment included in the VEHSS case definitions.

Visual Acuity

Patient counts:

Patients are assigned to visual function categories based on their best-corrected visual acuity in the better-seeing eye. Patients with multiple measures are assigned to a category based on their last recorded acuity during the period of observation. Scored acuity values take precedence over any

measures that are unknown, incomplete, or indeterminate acuity. Patients who cannot be assigned to a visual acuity category are reported as Missing acuity.

Patients are assigned to one or more of the visual acuity categories listed in **Table 4**. Normal vision, Any Vision Loss, and Missing Acuity are mutually exclusive, and incorporate all patients. Normal, Mild impairment, Moderate impairment, US blind, and Missing Acuity are also mutually exclusive and contain all patients. WHO Blind and Monocular Impairment are not mutually exclusive with any other visual acuity category.

Patient denominator

Patient counts:

The patient denominator is the total count of patients enrolled in the payer system or EHR registry during the year of observation. The definition of “enrolled” patients is not uniform across data systems and is defined in the data summary report for each data set. For example, Medicare patients are considered enrolled if they are enrolled for all 12 months of the calendar year. However, other claims systems (i.e. VSP) do not have monthly enrollment data: Most employers provide enrollee data annually. Likewise, Medicaid has complex enrollment criteria that differs by state. Further details are included in the respective data set summary reports.

High Level Validation

To ensure scientific accuracy and integrity, we conduct internal and external validation of the outcomes of this analysis.

Internal Validation

Upon completion or delivery of each dataset, we conduct initial quality testing and internal validation steps to mitigate the chance of errors. We assess file structure, and extent and patterns of missing data. We use the following checklist on all data sources:

- All of the indicators are present, unless noted.
- Measures and variables are not missing.
- Correct identifiers are used.
- Stratification by identifiers reconcile with “All” identifiers.
- Sample Size values are the same across different indicators for the same population group.
- Variable values are within a plausible range
- Subgroups should usually sum to be greater than their constituent category since subcategories are not mutually exclusive. Subgroups cannot sum to be less than the category total.
- Visual acuity: Normal, vision loss and missing reconcile with denominator

External Validation

To externally validate the data we receive, we compare estimates across different years and different data sources, particularly those developed using common data, measures, or methods. We do not expect results to align across datasets. Differences in estimates are analyzed, summarized, and documented. The differences between datasets are evaluated based on what is considered reasonable and how these differences meet the expectations of the project team and the expert panel.

Primary measures from each dataset are compared to others. For example, we compared the national level treated prevalence of each category and subgroup of diagnosed disorders from each claims system and IRIS Registry.

We also compare estimates to those in published studies. We conducted a review of published studies to identify existing measures of prevalence of vision loss for major eye disorders. We included studies that reported prevalence estimates based on primary data and identified 78 articles from 1991 to 2016 using combinations the search term, ‘prevalence,’ with specific eye and vision condition terms, including:

- “age-related macular degeneration”, “age-related maculopathy”, “macular degeneration”, “AMD”
- “diabetic retinopathy”
- “glaucoma”
- “cataract”
- “vision impairment”, “visual impairment”, “acuity”
- “blindness”
- “uncorrected refractive error”

The VEHSS team compares estimates from the VEHSS system to the age, race, and sex-specific prevalence estimates identified in this literature review. We consider the differences in case definitions, data, and methodology when making these comparisons; differences across these factors are likely to lead to different results. This external validation step allows the VEHSS team to assess the general comparability of VEHSS prevalence results to existing published estimates.

Dataset Preparation

Summary Table Public Use Files (PUF) and Research De-identified Files (RDF)

The VEHSS system prepares and releases summary table public use files (PUFs) on the VEHSS system website and through the CDC Open Data platform. PUFs are de-identified summary tables aggregated by demographic characteristics and geography. PUFs do not contain person-level records. To ensure compliance with the Health Insurance Portability and Accountability Act (HIPAA), it is necessary to suppress some PUF results to mitigate the potential of patient re-identification, which could pose a risk to the privacy of individual patients. We assessed various options for data suppression. While protecting patient privacy is of paramount importance, it is also important to ensure that data is not unnecessarily suppressed to retain research utility.

In addition to the PUF, VEHSS prepares research de-identified files (RDF) for use in the data integration model (Step 5). These are also fully de-identified summary data files but do not undergo the stringent suppression of the PUFs and may include more detailed age groups as noted in **Appendix C Tables A6 and A7**.

Calculating Rates and Confidence Intervals

Rates are calculated as crude prevalence rates per 100 persons. The denominator is defined for each dataset based on its unique characteristics. All rates are expressed as annual rates.

Unless otherwise noted on the VEHSS, confidence intervals are calculated using the Clopper-Pearson (Exact) method based on a binomial distribution, which is the standard approach for calculating uncertainty in small proportion estimates by the National Center for Health Statistics.²

Data Suppression

CMS VRDC DUA Suppression requirement

RDF files do not include patient level data and contain rows representing summary results for different population bins. RDFs may or may not include suppression, depending on the requirements of the DUA. For example, to analyze and report data from the CMS Virtual Research Data Center (VRDC),

² Parker JD, Talih M, Malec DJ, et al. National Center for Health Statistics Data Presentation Standards for Proportions. National Center for Health Statistics. Vital Health Stat 2(175). 2017

including Medicare 100% claims and Medicaid T-MSIS data, the VRDC requires suppression of denominators less than 11 before removal from the VRDC. As specified in our Data Use Agreement:

“...no cell (e.g. admittances, discharges, patients, services) 10 or less may be displayed. Also, no use of percentages or other mathematical formulas may be used if they result in the display of a cell 10 or less.”

Additional Suppression for PUFs

To ensure patient privacy and protections, the VEHSS project adopted more stringent data suppression on PUFs. NORC worked with its internal data governance board, external experts, and data providers to design a suppression algorithm to balance high level patient protection while maintaining the research utility of PUF data. Currently, VEHSS employs the following data suppression algorithm:

1. Suppress rates and denominator when denominator < 11
2. Suppress rate if numerator <3 and denominator <30
3. Report rates to 4 digits, formatting as percentage and two decimal points. For example,
 - a. 0.001223 reported as 0.12%,
 - b. 0.0724896 reported as 7.25%,
 - c. 0.500000 reported as 50.00%
4. Optional: Rounding the denominator. For example, to the nearest 100
 - a. 27 rounded to <100
 - b. 79 rounded to 100
 - c. 249,501 rounded to 249,500

Indicating Suppression in PUFs

PUF files indicate suppressed results by reporting a blank value in the suppressed 'Data_Value' field, and then indicating the suppression in the 'Data_Value_Footnote_Symbol' field and reason for suppression in the 'Data_Value_Footnote' field, as noted in **Appendix B**.

Stratification Combinations

The CDC data visualization application displays a line from the PUF file based on queries matching the demographic and risk factor stratification variables selected by users. The application does not perform any calculations. Therefore, every single combination of factors that are intended to be shown are presented as a row in the PUF file. Up to 15 stratification combinations are possible for each geographic level:

One –way

1. Age group
2. Race
3. Sex
4. RiskFactor

2-way

5. Age group*Race
6. Age group*Sex
7. Age group*RiskFactor
8. Race*Sex
9. Race*RiskFactor
10. Sex*RiskFactor

3-way

11. Age group*Race*Sex
12. Age group*Race*RiskFactor
13. Age group*Sex*RiskFactor
14. Race*Sex*RiskFactor

4-way

15. Age group*Race*Sex*RiskFactor

Data Dissemination

The VEHSS data visualization application allows analysis and visualization of each dataset. The visualization pages have the following features:

- Users may select one source of data.
- Users may select one topic, such as medical diagnoses, service utilization, or visual function.
- Users may select a condition category, which will populate the subgroup options. Users may then select one subgroup. Users may select age group, race, and sex. In the first year of development, only one year of claims data may be displayed at a time.
- Users may display results in different graph or map formats. When map formats are selected, users may select individual states.
- Users may save figures and export summary tables.
- Suppressed data does not appear as an option among the stratification categories in queries. For example, if data is suppressed for a particular state, that state will appear as gray in the resulting map, and blank in tables and figures.

Through the CDC Open Data platform the public can also directly access VEHSS summary table PUFs for all data. The IRIS Registry data are, however, not available.

Appendix A. VEHSS Uniform Data Template, Version 3-3

Table A1. VEHSS Minimum Dataset Fields

Variable	Description	Data Type
YearStart	Starting Year for year range	number
YearEnd	Ending Year if data pooled over multiple years	number
StateAbbr	State Abbreviation	plain text
LocationAbbr	If GeographicLevel ="National" then "US" ="State" then StateAbbr ="County" then <county name without the word county, parish, municipality etc>	plain text
GeographicLevel	National, State, County	plain text
DataSource	Abbreviation of Data Source	plain text
Data_Value_Unit	The unit, such as "%" for percentage	plain text
Data_Value_Type	The data value type, such as age-adjusted prevalence or crude prevalence	plain text
Data_Value	Data Value, such as 14.7 or no value if footnote symbol is present	number
Data_Value_Footnote_Symbol	Footnote symbol	plain text
Data_Value_Footnote	Footnote text	plain text
Numerator	Numerator of the data value (weighted for survey data)	number
Sample_Size	Sample size used to calculate the data value	number
LocationID	FIPS code, 2-digit for state/national, 5 digit for county	plain text
TopicID	Lookup identifier value for Topic	plain text
CategoryID	Identifier for category	plain text
QuestionID	Lookup identifier value for Question	plain text
ResponseID	Response identifier for Question	Plain text
DataValueTypeID	ID field for Data_Value_Type	plain text
AgeID	Identifier for the stratification1 (Age)	plain text
SexID	Identifier for the stratification2 (Sex)	plain text
RaceEthnicityID	Identifier for the stratification3 (Race/Ethnicity)	plain text
RiskFactorID	Identifier for the stratification4 (Major Risk Factor)	plain text
RiskFactorResponseID	Response identifier for Major Risk Factor Response	Plain text

Table A2. VEHSS Open Data Fields

Variable	Description	Data Type	Length
YearStart	Starting Year for year range	number	4.
YearEnd	Ending Year if data pooled over multiple years	number	4.
StateAbbr	State Abbreviation		\$2.
LocationAbbr	If GeographicLevel ="National" then "US" ="State" then StateAbbr ="County" then <county name without the word county, parish, municipality etc>	plain text	\$40.
LocationDesc	State Name	plain text	\$50.
GeographicLevel	National, State, County		\$10.
DataSource	Abbreviation of Data Source	plain text	\$28.
Topic	Topic Description	plain text	\$50.
Category	Category description	plain text	\$120.
Question	Question Description (i.e., Percentage of adults with diabetic retinopathy)	plain text	\$215.
Response	Optional column to hold the response value	plain text	\$120.
Age	Stratification value for age group e.g. 18-39yrs	plain text	\$22.
Sex	Stratification value for sex e.g. Male, Female	plain text	\$22.
RaceEthnicity	Stratification value for race e.g. White, non-hispanic	plain text	\$22.
RiskFactor	Stratification value for major risk factor e.g. diabetes	plain text	\$100.
RiskFactorResponse	Optional column to hold response for the risk factor that was evaluated.	plain text	\$50.
Data_Value_Unit	The unit, such as "%" for percentage	plain text	\$1.
Data_Value_Type	The data value type, such as age-adjusted prevalence or crude prevalence	plain text	\$24.
Data_Value	Data Value, such as 14.7 or no value if footnote symbol is present	number	6.2
Data_Value_Footnote_Symbol	Footnote symbol	plain text	\$8.
Data_Value_Footnote	Footnote text	plain text	\$90.
Low_Confidence_limit	95% confidence interval lower bound	number	6.2
High_Confidence_Limit	95% confidence interval higher bound	number	6.2
Numerator	Numerator of the data value (weighted for survey data)		8.
Sample_Size	Sample size used to calculate the data value	number	8.
LocationID	FIPS code, 2-digit for state/national, 5 digit for county	plain text	\$5.
Latitude	Latitude	plain text	\$15.
Longitude	Longitude	plain text	\$15.

Variable	Description	Data Type	Length
GeoLocation	GeoLocation or Geocode in the format (latitude, longitude)	Location	\$70.
TopicID	Lookup identifier value for Topic	plain text	\$8.
CategoryID	Identifier for category	plain text	\$12.
QuestionID	Lookup identifier value for Question	plain text	\$10.
ResponseID	Response identifier for Question	Plain text	\$10.
DataValueTypeID	ID field for Data_Value_Type		\$10.
AgeID	Identifier for the stratification1 (Age)	plain text	\$12.
SexID	Identifier for the stratification2 (Sex)	plain text	\$12.
RaceEthnicityID	Identifier for the stratification3 (Race/Ethnicity)	plain text	\$8.
RiskFactorID	Identifier for the stratification4 (Major Risk Factor)	plain text	\$8.
RiskFactorResponseID	Response identifier for Major Risk Factor Response	Plain text	\$12.

Appendix B. VEHSS Uniform Data Dictionary

Table B1. Topics

TopicID	Topic
TVFUNC	Visual Function
TCOND	Eye Health Conditions
TUTL	Service Utilization

Table B2. Categories

TopicID	CategoryID	Category
TCOND	CDXC1	Retinal Detachment and Defects
TCOND	CDXC10	Injury, Burns and Surgical Complications of the Eye
TCOND	CDXC11	Disorders of Optic Nerve and Visual Pathways
TCOND	CDXC12	Other Visual Disturbances
TCOND	CDXC13	Infectious and Inflammatory Diseases
TCOND	CDXC14	Orbital and External Disease
TCOND	CDXC15	Cancer and Neoplasms of the Eye
TCOND	CDXC16	Cornea Disorders
TCOND	CDXC17	Other Eye Disorders
TCOND	CDXC2	Diabetic Eye Diseases
TCOND	CDXC3	Age Related Macular Degeneration
TCOND	CDXC4	Other Retinal Disorders
TCOND	CDXC5	Glaucoma
TCOND	CDXC6	Cataracts
TCOND	CDXC7	Disorders of Refraction and Accommodation
TCOND	CDXC8	Diagnosed Blindness and Low Vision
TCOND	CDXC9	Strabismus and Amblyopia
TCOND	CDXCB	Big four eye conditions
TCOND	CDXCS	Any eye condition
TUTL	CAMDTX	Treatment for age related macular degeneration
TUTL	CCATS	Cataract Surgery
TUTL	CDEVIC	Adaptive devices
TUTL	CDRTX	Treatment for diabetic retinopathy

TopicID	CategoryID	Category
TUTL	CGLAUTX	Treatment for glaucoma
TUTL	CINJ	Intravitreal injection
TUTL	CREHAB	Vision rehabilitation
TUTL	CSCRN	Screening
TUTL	CREFRACT	Refraction
TUTL	CRVOTX	Treatment for RVO
TUTL	CTEST	Imaging or diagnostic test
TUTL	CUTLEX	Eye Exams
TUTL	CVC	Vision Correction
TVFUNC	CVI	Vision Impairment
TVFUNC	CVISAC	Measured Visual Acuity

Table B3. Question (for website display)

TopicID	CategoryID	QuestionID	Question
TCOND	CDXC1	QDXC1	Annual prevalence of treated retinal detachment and defects
TCOND	CDXC1	QDXDC1	Annual prevalence of diagnosed retinal detachment and defects
TCOND	CDXC10	QDXC10	Annual prevalence of treated injury, burns and surgical complications of the eye
TCOND	CDXC10	QDXDC10	Annual prevalence of diagnosed injury, burns and surgical complications of the eye
TCOND	CDXC11	QDXC11	Annual prevalence of treated disorders of optic nerve and visual pathways
TCOND	CDXC11	QDXDC11	Annual prevalence of diagnosed disorders of optic nerve and visual pathways
TCOND	CDXC12	QDXC12	Annual prevalence of treated other visual disturbances
TCOND	CDXC12	QDXDC12	Annual prevalence of diagnosed other visual disturbances
TCOND	CDXC13	QDXC13	Annual prevalence of treated infectious and inflammatory diseases
TCOND	CDXC13	QDXDC13	Annual prevalence of diagnosed infectious and inflammatory diseases
TCOND	CDXC14	QDXC14	Annual prevalence of treated orbital and external disease
TCOND	CDXC14	QDXDC14	Annual prevalence of diagnosed orbital and external disease
TCOND	CDXC15	QDXC15	Annual prevalence of treated cancer and neoplasms of the eye
TCOND	CDXC15	QDXDC15	Annual prevalence of diagnosed cancer and neoplasms of the eye
TCOND	CDXC16	QDXC16	Annual prevalence of treated cornea disorders
TCOND	CDXC16	QDXDC16	Annual prevalence of diagnosed cornea disorders
TCOND	CDXC17	QDXC17	Annual prevalence of treated other eye disorders

TopicID	CategoryID	QuestionID	Question
TCOND	CDXC17	QDXDC17	Annual prevalence of diagnosed other eye disorders
TCOND	CDXC2	QDXC2	Annual prevalence of treated diabetic eye diseases
TCOND	CDXC2	QDXDC2	Annual prevalence of diagnosed diabetic eye diseases
TCOND	CDXC2	QDXVT02	Annual prevalence of diagnosed diabetic retinopathy, vision threatening stages
TCOND	CDXC3	QDXC3	Annual prevalence of treated age related macular degeneration
TCOND	CDXC3	QDXDC3	Annual prevalence of diagnosed age related macular degeneration
TCOND	CDXC3	QDXVT03	Annual prevalence of diagnosed AMD, vision threatening stages
TCOND	CDXC4	QDXC4	Annual prevalence of treated other retinal disorders
TCOND	CDXC4	QDXDC4	Annual prevalence of diagnosed other retinal disorders
TCOND	CDXC5	QDXC5	Annual prevalence of treated glaucoma
TCOND	CDXC5	QDXDC5	Annual prevalence of diagnosed glaucoma
TCOND	CDXC5	QDXVT05	Annual prevalence of diagnosed glaucoma, specified/non-suspect types
TCOND	CDXC6	QDXC6	Annual prevalence of treated cataracts
TCOND	CDXC6	QDXDC6	Annual prevalence of diagnosed cataracts
TCOND	CDXC6	QDXVT06	Annual prevalence of diagnosed cataract, presumed untreated
TCOND	CDXC7	QDXC7	Annual prevalence of treated disorders of refraction and accommodation
TCOND	CDXC7	QDXDC7	Annual prevalence of diagnosed disorders of refraction and accommodation
TCOND	CDXC8	QDXC8	Annual prevalence of treated blindness and low vision
TCOND	CDXC8	QDXDC8	Annual prevalence of diagnosed blindness and low vision
TCOND	CDXC9	QDXC9	Annual prevalence of treated strabismus and amblyopia
TCOND	CDXC9	QDXDC9	Annual prevalence of diagnosed strabismus and amblyopia
TCOND	CDXCB	QDXDCB	Annual prevalence of diagnosed AMD, cataract, diabetic retinopathy OR glaucoma
TCOND	CDXCS	QDXDCS	Annual prevalence of any diagnosed eye disorder
TUTL	CAMD	QAMLAS	Proportion of diagnosed AMD patients who had laser surgery in selected year
TUTL	CAMDTX	QAMD	Percentage of people with diagnosed AMD who had a treatment claim
TUTL	CAMDTX	QAMDANY	Proportion of diagnosed AMD patients who had any AMD treatments in selected year
TUTL	CAMDTX	QAMPHO	Proportion of diagnosed AMD patients who had photodynamic therapy in selected year

TopicID	CategoryID	QuestionID	Question
TUTL	CAMDTX	QAMVEGF	Proportion of diagnosed AMD patients who had anti-VEGF injections in selected year
TUTL	CCATS	ISOCAT	Percentage of adults who ever had cataract surgery (NHIS Adult Module)
TUTL	CCATS	MCOCAT	Percentage of people who have ever had an operation for cataracts
TUTL	CCATS	NHOCAT	Percentage of people who had a cataract operation
TUTL	CCATS	NHOCTE	Percentage of people who had cataract operation in right, left, or both eyes
TUTL	CCATS	QCATS	Percentage of people with diagnosed cataract who had a treatment claim
TUTL	CCATS	QCATSUR	Proportion of diagnosed cataract patients who had cataract surgery in selected year
TUTL	CDEVIC	IDEVIC	Proportion of persons who have trouble seeing that use adaptive devices
TUTL	CDRTX	QDRLAS	Proportion of diagnosed diabetic retinopathy patients who had laser/photodynamic procedure in selected year
TUTL	CDRTX	QDRRET	Proportion of diagnosed diabetic retinopathy patients who had retinal detachment repair procedure in selected year
TUTL	CDRTX	QDRTX	Percentage of people with diagnosed DR who had a treatment claim
TUTL	CDRTX	QDRVEGF	Proportion of diagnosed diabetic retinopathy patients who had anti-VEGF injections in selected year
TUTL	CDRTX	QDRVIC	Proportion of diagnosed diabetic retinopathy patients who had vitrectomy procedure in selected year
TUTL	CGLAUTX	QGLADRN	Proportion of diagnosed glaucoma patients who had glaucoma drain in selected year
TUTL	CGLAUTX	QGLALAS	Proportion of diagnosed glaucoma patients who had glaucoma laser procedure in selected year
TUTL	CGLAUTX	QGLASUR	Proportion of diagnosed glaucoma patients who had glaucoma surgery in selected year
TUTL	CGLAUTX	QGLAU	Percentage of people with diagnosed glaucoma who had treatment claim
TUTL	CINJ	QINJ	Proportion of patients who had any intravitreal injections in the selected year
TUTL	CREHAB	IREHAB	Proportion of persons who have trouble seeing that use vision rehabilitation services
TUTL	CSCRN	CHSCRN	Percentage of children who have ever had their vision tested with pictures, shapes, or letters
TUTL	CSCRN	QSCNGLA	Proportion of persons who were screened for glaucoma
TUTL	CSCRN	QSCNVIS	Proportion of persons who had a vision screening

TopicID	CategoryID	QuestionID	Question
TUTL	CSCRN	QSCRN	Percentage of people who had a vision or eye disease screening claim
TUTL	CTEST	QANGIO	Proportion of persons who had flourescein angiography
TUTL	CTEST	QFUN	Proportion of persons who had stereo biomicroscopic exam of the fundus
TUTL	CTEST	QGONIO	Proportion of persons who had gonioscopy test
TUTL	CTEST	QOCT	Proportion of persons who had optical coherence tomography test
TUTL	CTEST	QTEST	Percentage of people who had an eye or vision diagnostic test claim
TUTL	CTEST	QTONO	Proportion of persons who had tonometry test
TUTL	CTEST	QVISFLD	Proportion of persons who had visual field test
TUTL	CUTLEX	ISEDCA	Percentage of adults that talked to an optometrist, ophthalmologist, or eye doctor about their health in the past 12 months (NHIS adult module)
TUTL	CUTLEX	ISEDOC	Percentage of families that talked to an optometrist, ophthalmologist, or eye doctor about child's health in the past 12 months
TUTL	CUTLEX	ISEXCH	Percentage of children less than 6 who are not blind who have ever had their vision tested by a doctor or other health professional (NHIS Child Module)
TUTL	CUTLEX	ISEXD	Percentage of adults that had an eye exam in which the pupils were dilated less than 1 month, 1 year, 2 year, or 2+ years ago (NHIS Adult Module)
TUTL	CUTLEX	ISTSCH	Percentage of children who ever had their vision tested (NHIS Child Module)
TUTL	CUTLEX	QUTLEX	Proportion of patients who had an eye exam in selected year
TUTL	CVC	ISGL	Percentage of people who wear glasses (NHIS Functioning and Disability Module)
TUTL	CVC	ISGLA	Percentage of adults who currently wear eyeglasses or contact lenses (NHIS Adult Module)
TUTL	CVC	ISGLCH	Percentage of children who wear eyeglasses or contact lenses (NHIS Child Module)
TUTL	CVC	QCONTAC	Proportion of persons who had contact lens fitting in selected year
TUTL	CVC	QGLASS	Proportion of persons who received eyeglasses in selected year
TUTL	CVC	QVC	Percentage of people who had a vision correction visit or supplies claim
TVFUNC	CVISAC	QPVISA	Presenting visual acuity
TVFUNC	CVISAC	QUVISA	Uncorrected Refractive Error (URE)
TVFUNC	CVISAC	QVISA	Best-corrected visual acuity

Table B4. Subgroups (denoted as Responses for website data)

ResponseID (subgroupID)	Response (Subgroup)
R3_ALL	All Age-related macular degeneration (AMD)
R8_ALL	All Blindness and low vision
R15_ALL	All Cancer and neoplasms of the eye diseases
R6_ALL	All Cataracts
R16_ALL	All Cornea disorders
R2_ALL	All Diabetic eye diseases
R11_ALL	All Disorders of optic nerve and visual pathways
R5_ALL	All Glaucoma
R13_ALL	All Infectious and inflammatory diseases
R10_ALL	All Injury, burns and surgical complications of the eye
R14_ALL	All Orbital and external disease
R17_ALL	All Other eye disorders
R4_ALL	All Other retinal disorders
R12_ALL	All Other visual disturbances
R7_ALL	All Refraction and accommodation disorders
R1_ALL	All Retinal detachment and defects
R9_ALL	All Strabismus and amblyopia
R2_2	Moderate/Severe non-proliferative diabetic retinopathy
R2_3	Proliferative diabetic retinopathy
R2_4	Diabetic macular edema
R2_5	Other diabetes related eye disorders
R2_6	Non-proliferative
R2_7	Severe non-proliferative
R3_4CNV	Choroidal neovascularization
R3_3	Dry-form age-related macular degeneration
R3_2	Early stage age-related macular degeneration
R3_3GA	Geographic atrophy
R3_4	Wet-form age-related macular degeneration
R3_1	Unspecified-age related macular degeneration
R4_5	Branch retinal artery occlusion
R4_3	Branch retinal vein occlusion

ResponseID (subgroupID)	Response (Subgroup)
R4_4	Central retinal arterial occlusion
R4_2	Central retinal vein occlusion
R4_8	Hereditary chorioretinal dystrophy
R4_7	Macular edema (not diabetic)
R4_12	Macular edema (Cystoid or non-diabetic)
R4_9	Myopic degeneration
R4_6	Non-Occlusive retinal vascular disease
R4_1	Occlusive retinal vascular disease
R4_11	Retinopathy of prematurity
R4_10	Other/unspecified other retinal disorders
R5_7	Congenital glaucoma
R5_4	Glaucoma suspect
R5_3	Low-tension glaucoma
R5_6	Narrow-angle glaucoma
R5_8	Neovascular glaucoma
R5_1	Open-angle glaucoma
R5_5	Primary angle-closure glaucoma
R5_2	Primary open-angle glaucoma
R5_XS	Severe stage
R5_9	Other/unspecified glaucoma
R5_10	Secondary glaucoma
R6_7	Age-related cataract
R6_6	Aphakia and disorders of lens
R6_3	Congenital Cataract
R6_2	Non-congenital cataract
R6_8	Other or unspecified cataract
R6_4	Posterior capsular opacity
R6_5	Pseudophakia
R6_1	Senile cataract
R7_3	Astigmatism
R7_2	Hypermetropia
R7_1	Myopia
R7_4	Presbyopia
R7_5	Other refraction and accommodation disorders
R8_8	Blindness one eye, low vision other eye

ResponseID (subgroupID)	Response (Subgroup)
R8_10	Blindness, both eyes, including legal blindness
R8_7	Low vision or blindness, one eye
R8_9	Low vision, both eyes
R8_5	Moderate bilateral impairment
R8_4	Moderate imp. better eye, profound imp. lesser eye
R8_6	Profound bilateral imp., legal blindness
R8_2	Unqualified impairment in one eye, or unspecified
R8_1	Unqualified impairment, both eyes
R8_3	Vision impairment one eye
R9_2	Amblyopia
R9_1	Strabismus
R10_2	Ocular burns
R10_1	Ocular injury
R10_3	Surgical complication of the eye
R11_3	Disorders of the visual pathway and visual cortex
R11_1	Optic nerve disorders
R11_2	Visual pathway disorders
R12_2	Color blindness
R12_3	Night blindness
R12_1	Visual field defect
R12_4	Other/unspecified visual disturbances
R13_3	Conjunctivitis
R13_7	Endophthalmitis
R13_4	Eyelid infection and inflammation
R13_1	Infectious diseases
R13_2	Keratitis
R13_6	Lacrimal and orbit inflammation
R13_5	Other/unspecified infectious and inflammatory diseases
R14_1	Congenital anomalies
R14_6	Disorders of the globe
R14_5	Dry eye syndrome
R14_4	Eyelid disorders
R14_3	Lacrimal diseases
R14_2	Other/unspecified orbital and external disease
R15_2	Benign neoplasm

ResponseID (subgroupID)	Response (Subgroup)
R15_1	Malignant neoplasm
R16_2	Endothelial dystrophy (Fuchs)
R16_1	Keratoconus
R16_3	Other corneal disorders
REXANY	By any provider type
REXPHS	By an ophthalmologist or other physician
REXOPT	By an optometrist or optician
RVNORM	Normal vision
RVANY	Any vision loss
RVIMP	Visual impairment
RVIMIL	Mild visual impairment
RVIMOD	Moderate visual impairment
RVUSB	US-defined blindness
RVWB	WHO-defined blindness
RVMON	Monocular vision loss
RVMISS	Missing acuity
RVURE	Uncorrected refractive error (URE)
RVPNOR	Presenting with normal vision
RVPANY	Presenting with any vision loss
RVPIMP	Presenting with visual impairment
RVPMIL	Presenting with mild visual impairment
RVPMOD	Presenting with moderate visual impairment
RVPUSB	Presenting with US-defined blindness
RVPMON	Presenting with monocular vision loss
RVPMISS	Missing presenting acuity
RVPWB	Presenting with WHO-defined blindness
RAMDANY	Any age related macular degeneration treatment
RCATANY	Any cataract treatment
RTESTANY	Any diagnostic eye test
RGLAANY	Any glaucoma treatment
RDRANY	Any diabetic retinopathy treatment
RVCANY	Any vision correction
RSCNANY	Any vision screening
RVEGF	Anti-VEGF injections
RCATSUR	Cataract surgery

ResponseID (subgroupID)	Response (Subgroup)
RCONTAC	Contact lens or fitting
RGLADRN	Drain
RGLASS	Eyeglasses
RANGIO	Flourescein angiography
RSCNGLA	Glaucoma screening
RGLASUR	Glaucoma surgery
RGONIO	Gonioscopy
RLASER	Laser surgery
RLASPH	Laser/photocoagulation
ROCT	Optical coherence tomography
R17_1	Other eye disorders
RPHOTO	Photodynamic therapy
R1_1	Retinal detachment and defects
RDRRET	Retinal detachment repair
RFUN	Stereo fundus exam
RSURG	Surgery
RTONO	Tonometry test
RDRVIC	Vitrectomy
RSCNVIS	Vision screening
RVISFLD	Visual field testing
RAMDOTH	Other age related macular degeneration treatments
RCATOTH	Other cataract treatment
RGLAOTH	Other glaucoma treatment
RDROTH	Any diabetic retinopathy treatments
RINJECT	Intravitreal injection
RSCNDR	Diabetic Retinopathy Telemedicine Screening
RINJ	Intravitreal injection
R5_VA	Vision affecting glaucoma
R5_NVA	Non-vision affecting glaucoma
R5_NOS	Glaucoma, non-suspect
R5_SUS	Glaucoma, suspect
R6_TX	Diagnosed treated cataract
R6_NTX	Diagnosed untreated cataract
R2_7	Severe non-proliferative
R2_6	Non-proliferative

ResponseID (subgroupID)	Response (Subgroup)
R2_VT	Vision threatening stage
R2_NVT	Non-vision threatening stage
R3_5	Advanced GA or Inactive CNV
R3_VT	Vision threatening stage
R3_NVT	Non-vision threatening stage
RB4_VT	Vision threatening AMD, DR, glaucoma or cataract
RB4_NVT	Non-vision threatening AMD, DR, glaucoma or cataract
RB4_ALL	AMD, DR, glaucoma or cataract
RS_ANY	Any diagnosed eye disorder
RGRX	Glaucoma prescription drugs
R16_4	Cornea disorder related to contact lens
R16_5	Corneal transplant
RVAID	Low Vision Aids
R4_AnyRVO	Retinal vascular occlusion
R4_AnyRAO	Retinal arterial occlusion

Table B5. PUF major age groups

AgeID	Text
AgeAll	All ages
Age017	0-17 years
Age1839	18-39 years
Age4064	40-64 years
Age6584	65-84 years
Age85Plus	85 years and older

Table B6. RDF Modified WHO Age Groups

AgeID	Text
AgeAll	All ages
Age01	Less than 1 year
Age14	1-4 years
Age59	5-9 years
Age1014	10-14 years
Age1519	15-19 years
Age2024	20-24 years
Age2529	25-29 years

AgeID	Text
Age3034	30-34 years
Age3539	35-39 years
Age4044	40-44 years
Age4549	45-49 years
Age5054	50-54 years
Age5559	55-59 years
Age6064	60-64 years
Age6569	65-69 years
Age7074	70-74 years
Age7579	75-79 years
Age8084	80-84 years
Age8589	85-89 years
Age9094	90-94 years
Age9599	95-99 years

Table B7. Other Age Groups

AgeID	Age
AGE064	64 years or less
AGE12PLUS	12 years and older
AGE18PLUS	18 years and older
AGE20PLUS	20 years and older
AGE40PLUS	40 years and older
AGE50PLUS	50 years and older
AGE65PLUS	65 years and older
AGE80PLUS	80 years and older
AGE85PLUS	85 years and older
AGE90PLUS	90 years and older
AGE100PLUS	100 years and older
AGEUNK	Unknown age
AGE011	0-11 years
AGE1217	12-17 years
AGE18100	18-100 years
AGE1824	18-24 years
AGE1864	18-64 years
AGE40100	40-100 years

AgeID	Age
AGE65100	65-100 years
AGE85100	85-100 years

Table B8. Sex

SexID	Sex
GALL	Both sexes
GM	Male
GF	Female
GU	Unknown

Table B9. Race/Ethnicity

RaceEthnicityID	RaceEthnicity
ALLRACE	All races
ASN	Asian
BLK	Black, non-Hispanic
HISP	Hispanic, any race
AIAN	North American Native
WHT	White, non-Hispanic
OTH	Other
UNK	Unknown

Table B10. Risk Factors

RiskFactorID	RiskFactor
RFALL	All patients
RFAPAR	All participants
RFDM	Diabetes
RFHT	Hypertension
RFSM	Smoking
RFTU	Tobacco use
RFNR	No Risk Factors
RFDR	Diabetic retinopathy
RFCAT	Cataract
RFAMD	Age-related macular degeneration
RFGLC	Glaucoma
RFDMDR	Diabetes and diabetic retinopathy
RFDMCAT	Diabetes and cataract

RiskFactorID	RiskFactor
RFDMAMD	Diabetes and AMD
RFDMGLC	Diabetes and glaucoma
RFHTDR	Hypertension and diabetic retinopathy
RFHTCAT	Hypertension and cataract
RFHTAMD	Hypertension and AMD
RFHTGLC	Hypertension and glaucoma
RFERS	All persons
RFPOV	Poverty
RFUNMPL	Unemployed
RFINS	Insurance
RFEDUC	Education
RFHEAR	Hearing difficulty
RFDISBL	Self-care difficulty
RFINDLIV	Independent living difficulty
RFAMBL	Ambulatory difficulty
RFCOGN	Cognitive difficulty

Table B11. Risk Factor Response

RiskFactorID	RiskFactorResponseID	RiskFactorResponse
RFALL	RFALL	All patients
RFALL	RFTOT	Total
RFAMBL	RAD	Ambulatory difficulty
RFAMBL	RNAD	No ambulatory difficulty
RFAMD	RFYES	Yes
RFAPAR	RFALLPAR2	All participants
RFCAT	RFYES	Yes
RFDM	RFYES	Yes
RFDMAMD	RFYES	Yes
RFDMCAT	RFYES	Yes
RFDMDR	RFYES	Yes
RFDMGLC	RFYES	Yes
RFDR	RFYES	Yes
RFGLC	RFYES	Yes
RFHT	RFYES	Yes
RFHTAMD	RFYES	Yes
RFHTCAT	RFYES	Yes

RiskFactorID	RiskFactorResponseID	RiskFactorResponse
RFHTDR	RFYES	Yes
RFHTGLC	RFYES	Yes
RFSM	RFNO	No
RFSM	RFYES	Yes
RFTU	RFNO	No
RFTU	RFYES	Yes

Table B12. National and States

LocationId	LocationAbbr	LocationDesc	GeoLocation
59	US	National (States and DC)	
01	AL	Alabama	(32.84057112200048, -86.63186076199969)
02	AK	Alaska	(64.84507995700051, -147.72205903599973)
04	AZ	Arizona	(34.865970280000454, -111.76381127699972)
05	AR	Arkansas	(34.74865012400045, -92.27449074299966)
06	CA	California	(37.63864012300047, -120.99999953799971)
08	CO	Colorado	(38.843840757000464, -106.13361092099967)
09	CT	Connecticut	(41.56266102000046, -72.64984095199964)
10	DE	Delaware	(39.008830667000495, -75.57774116799965)
12	FL	Florida	(28.932040377000476, -81.92896053899966)
13	GA	Georgia	(32.83968109300048, -83.62758034599966)
16	ID	Idaho	(43.682630005000476, -114.3637300419997)
17	IL	Illinois	(40.48501028300046, -88.99771017799969)
18	IN	Indiana	(39.766910452000445, -86.14996019399968)
19	IA	Iowa	(42.46940091300047, -93.81649055599968)
20	KS	Kansas	(38.34774030000045, -98.20078122699965)
31	NE	Nebraska	(41.6410409880005, -99.36572062299967)
40	OK	Oklahoma	(35.47203135600046, -97.52107021399968)
44	RI	Rhode Island	(41.70828019300046, -71.52247031399963)
47	TN	Tennessee	(35.68094058000048, -85.77449091399967)
15	HI	Hawaii	(21.304850435000446, -157.85774940299973)
22	LA	Louisiana	(31.31266064400046, -92.44568007099969)
23	ME	Maine	(45.254228894000505, -68.98503133599962)
24	MD	Maryland	(39.29058096400047, -76.60926011099963)
25	MA	Massachusetts	(42.27687047000046, -72.08269067499964)
26	MI	Michigan	(44.6613195430005, -84.71439026999968)

LocationId	LocationAbbr	LocationDesc	GeoLocation
27	MN	Minnesota	(46.35564873600049, -94.79420050299967)
28	MS	Mississippi	(32.745510099000455, -89.53803082499968)
29	MO	Missouri	(38.635790776000476, -92.56630005299968)
30	MT	Montana	(47.06652897200047, -109.42442064499971)
32	NV	Nevada	(39.493240390000494, -117.07184056399967)
33	NH	New Hampshire	(43.65595011300047, -71.50036091999965)
34	NJ	New Jersey	(40.13057004800049, -74.27369128799967)
35	NM	New Mexico	(34.52088095200048, -106.24058098499967)
36	NY	New York	(42.82700103200045, -75.54397042699964)
37	NC	North Carolina	(35.466220975000454, -79.15925046299964)
38	ND	North Dakota	(47.47531977900047, -100.11842104899966)
39	OH	Ohio	(40.06021014100048, -82.40426005599966)
41	OR	Oregon	(44.56744942400047, -120.15503132599969)
42	PA	Pennsylvania	(40.79373015200048, -77.86070029399963)
45	SC	South Carolina	(33.998821303000454, -81.04537120699968)
46	SD	South Dakota	(44.353130053000484, -100.37353063699997)
48	TX	Texas	(31.827240407000488, -99.42677020599967)
49	UT	Utah	(39.360700171000474, -111.58713063499971)
50	VT	Vermont	(43.62538123900049, -72.51764079099962)
51	VA	Virginia	(37.54268067400045, -78.45789046299967)
53	WA	Washington	(47.52227862900048, -120.47001078999972)
54	WV	West Virginia	(38.66551020200046, -80.71264013499967)
55	WI	Wisconsin	(44.39319117400049, -89.81637074199966)
56	WY	Wyoming	(43.23554134300048, -108.10983035299967)
11	DC	District of Columbia	(38.89037138500049, -77.03196112699965)
21	KY	Kentucky	(37.645970271000465, -84.77497104799966)
72	PR	Puerto Rico	(18.2208330,-66.5901490)
66	GU	Guam	(13.4443040,144.7937310)
78	VI	U.S. Virgin Islands	(18.3357650,-64.8963350)
69	MP	Northern Mariana Islands	(15.097900,145.673900)
68	MH	Marshall Islands	(11.3246908,166.84174239999993)
70	PW	Palau	(7.5149799999999999,134.58251999999993)
60	AS	American Samoa	(-14.3016396,-170.69618149999997)

Table B13. Data Value Types

DataValueTypeID	DataValueType
CRDPREV	Crude Prevalence
AGEADJPREV	Age-adjusted Prevalence
ADJPREV	Adjusted Prevalence