



# 2021 ANNUAL REPORT



HARRIS COUNTY  
INSTITUTE OF FORENSIC SCIENCES



The **MISSION** of the Harris County Institute of Forensic Sciences is to provide medical examiner and crime laboratory services of the highest quality in an unbiased manner with uncompromised integrity.



# Our Accreditations

- Accreditation Council for Graduate Medical Education
- American Board of Forensic Toxicology
- ANSI National Accreditation Board ISO/IEC 17025 Program (Crime Laboratory)
- ANSI National Accreditation Board ISO/IEC 17020 Program (Forensic Anthropology)
- Lloyd's Register Quality Assurance ISO 9001 Program (Quality Management System)
- National Association of Medical Examiners
- Texas Forensic Science Commission
- Texas Medical Association for Continuing Medical Education

# Medical Examiner Services

Has the statutory duty to determine cause and manner of death in accordance with Article 49.25 of the Texas Code of Criminal Procedure



# Texas Medical Examiner Jurisdiction

1. When a person dies within **twenty-four hours** after admission to a hospital
2. When any person is **killed**
3. When the body or a body part of a person is **found**
4. When the circumstances of the death are such as to lead to suspicion that the death was by **unlawful means**
5. When any person commits **suicide**
6. When a person dies **without** having been attended by a duly licensed and **practicing physician**
7. When the person is a child who is younger than **six years** of age
8. When a person dies who has been attended immediately preceding their death by a duly licensed and practicing physician, and such physician is not certain as to the cause of death and is **unable to certify** with certainty the cause of death

# Statistical Summary

- Harris County (HC) remains the **third most populous county** in the nation, exceeded only by Los Angeles and Cook counties
  - **4.72+ million** estimated HC population in 2021 \*
  - **40,216** HC death certificates filed in 2021 \*\*
  - **34%** (13,868) of HC deaths reported to HCIFS in 2021
- **7,077** deaths were certified in 2021, including:
  - **5,952** Harris County ML cases (all brought to HCIFS for examination)
  - **53** out-of-county cases examined
  - **1,072** certification only
- **6,844** inquest only cases reported\*\*\*

*\* Population estimate for 2021 obtained from the US Census Bureau*

*\*\* Provisional death certificate data from the Texas Department of State Health Services*

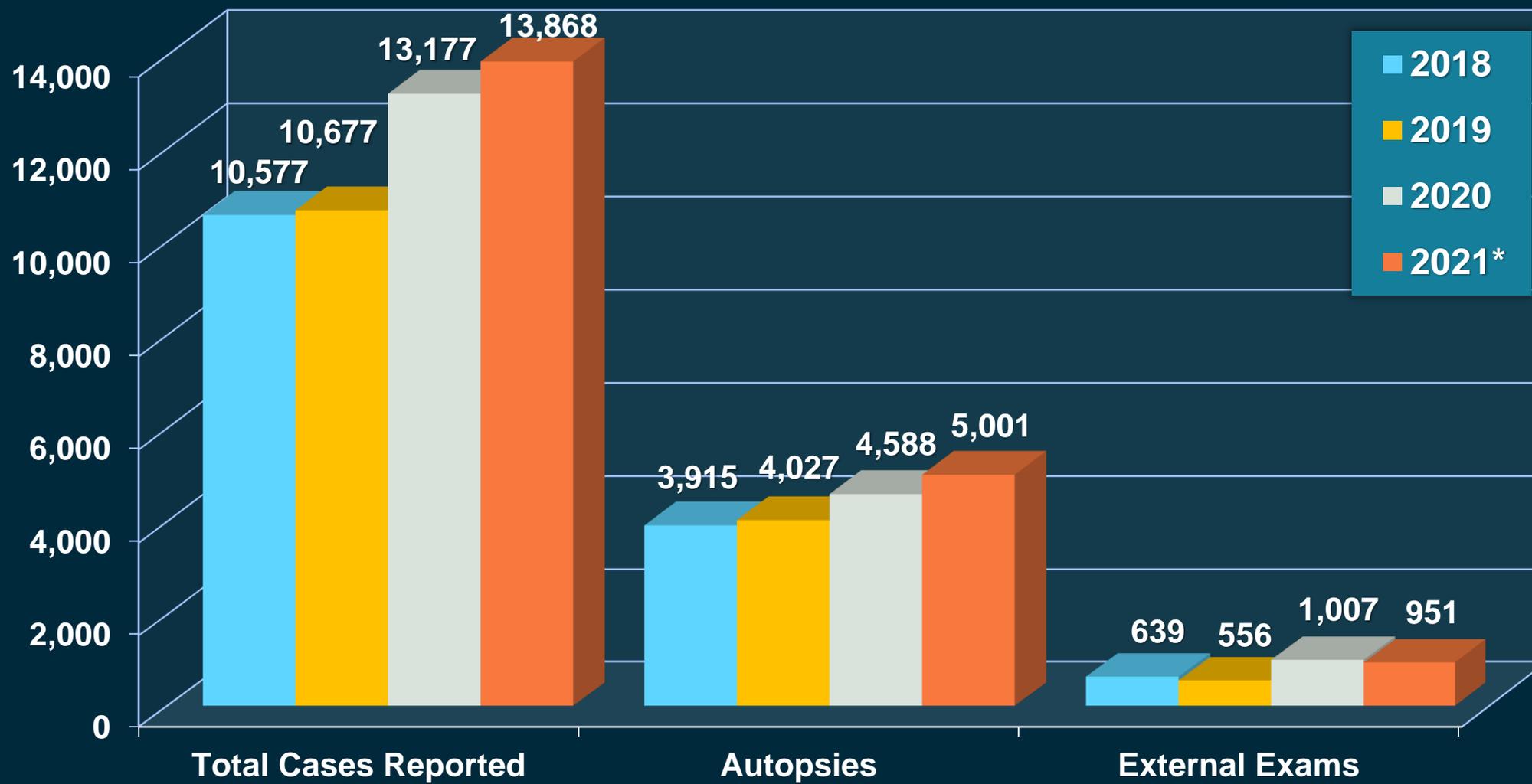
*\*\*\*Inquest only cases are reported deaths that are released from medical examiner jurisdiction*

# Statistical Summary

- **84%** of ML cases (**5,001**) received an autopsy examination\*
  - **16%** of ML cases (**951**) received an external examination
- **4,143** scenes attended by Forensic Investigators
- **336** referrals to Harris County Bereavement Services
- **13** decedents remain unidentified after six months or longer

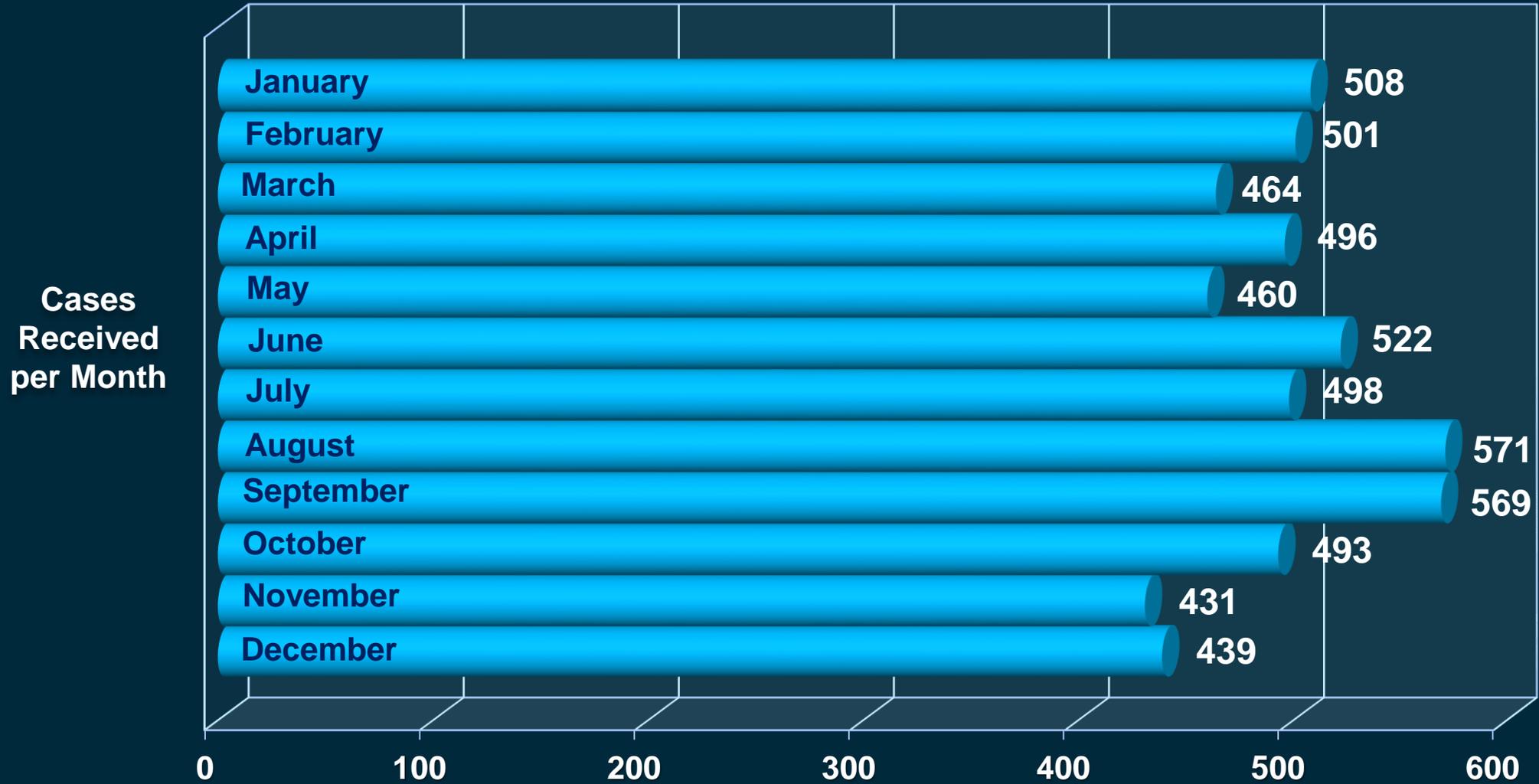
*\* Includes partial autopsy examinations (13)*

# Total County Caseload (2018 - 2021)



*\*2021 total cases reported show a 5% increase from 2020. The autopsy case number increase occurred despite modified criteria that increased external examinations and certification only.*

# Monthly Medicolegal Caseload 2021



# Average Daily Medicolegal Caseload

## Months with **HIGHEST** Average Daily Caseload

- 2021 August: **19** cases
- 2020 July: **19** cases
- 2019 December: **14** cases

## Top 5 Days with **HIGHEST** Cases Received

2020	# of Cases	2021	# of Cases
July 15	<b>31</b>	January 1	<b>31</b>
May 6	<b>30</b>	January 13	<b>30</b>
August 28	<b>30</b>	December 4	<b>30</b>
November 9	<b>29</b>	April 24	<b>29</b>
February 3	<b>28</b>	August 1	<b>28</b>

**2021**

**16.3 cases**

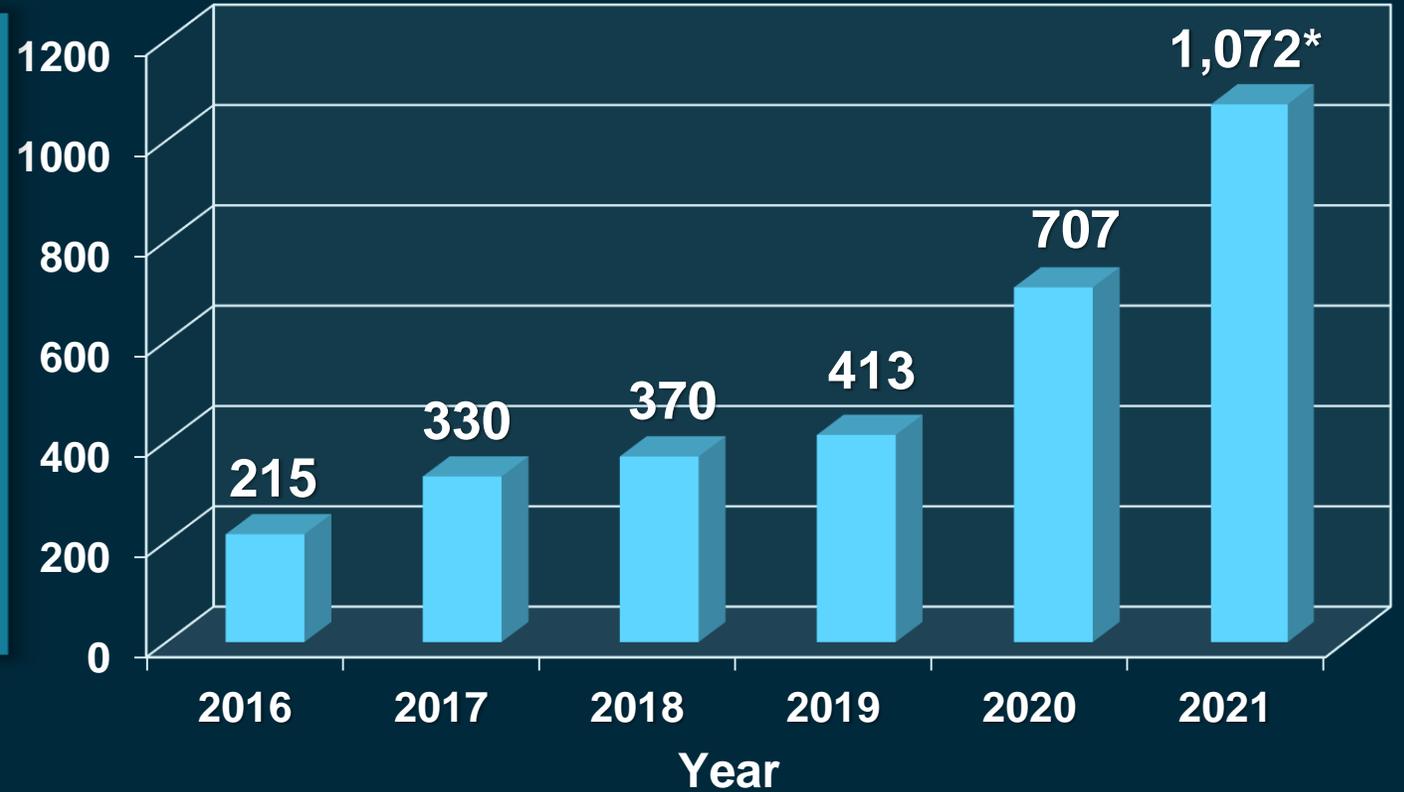
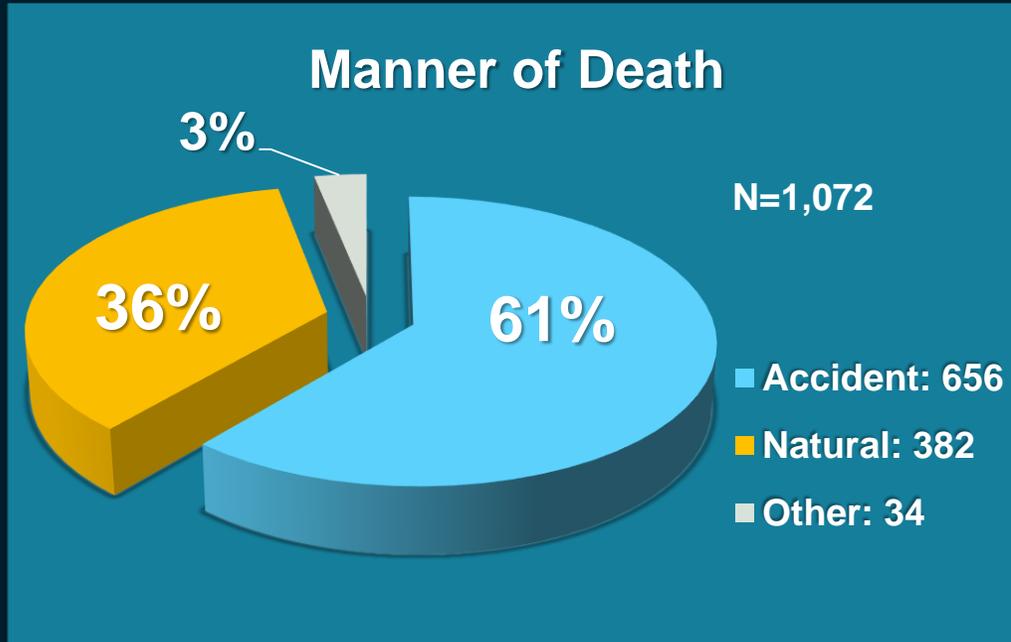
**2020**

**15.3 cases**

**2019**

**12.5 cases**

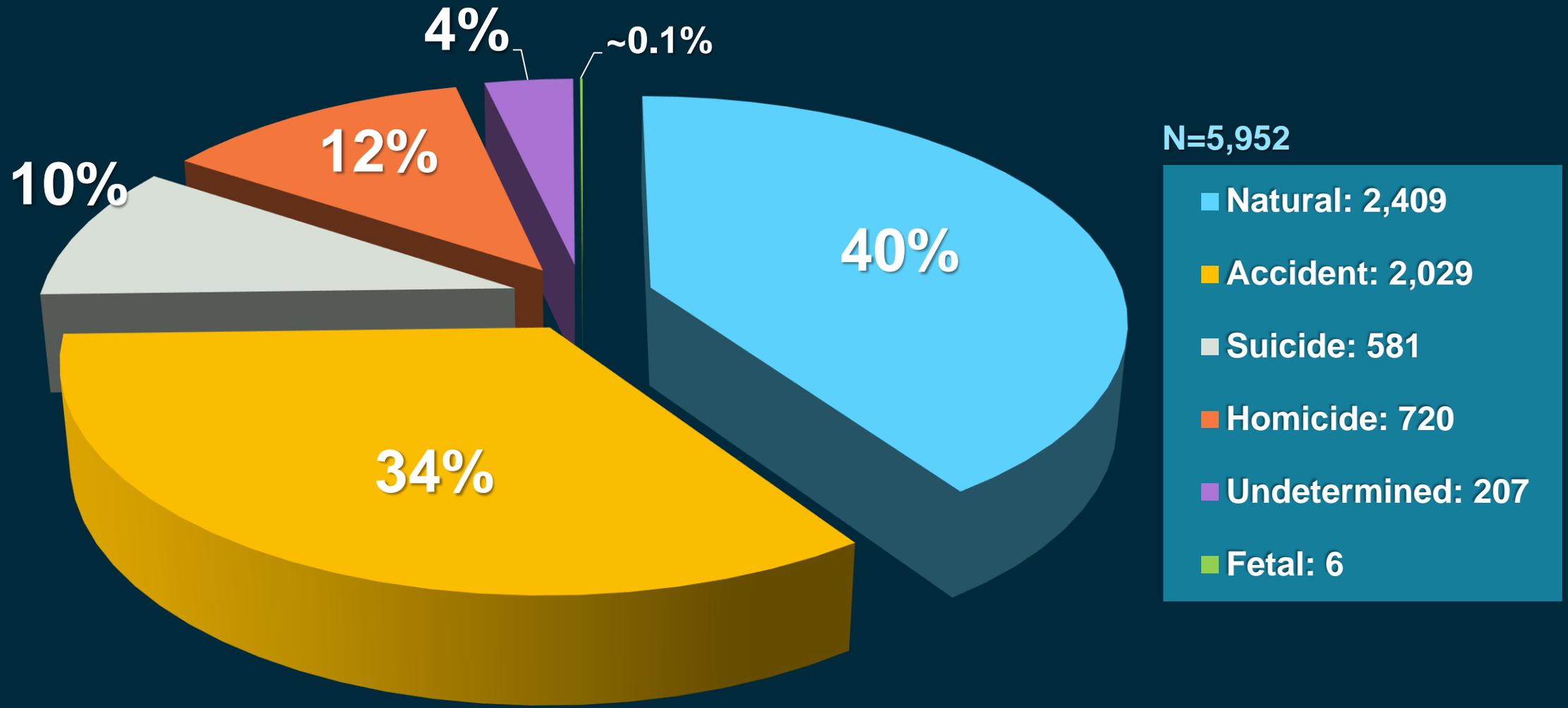
# Certification Only Cases



“Certification only” is a death investigation in which the medical examiner accepts jurisdiction and completes the death certificate, but the body of the deceased is not brought to HCIFS. There is sufficient medical/clinical information and investigative findings to properly classify the cause and manner of death. Hip fractures and head injuries after a fall are common examples.

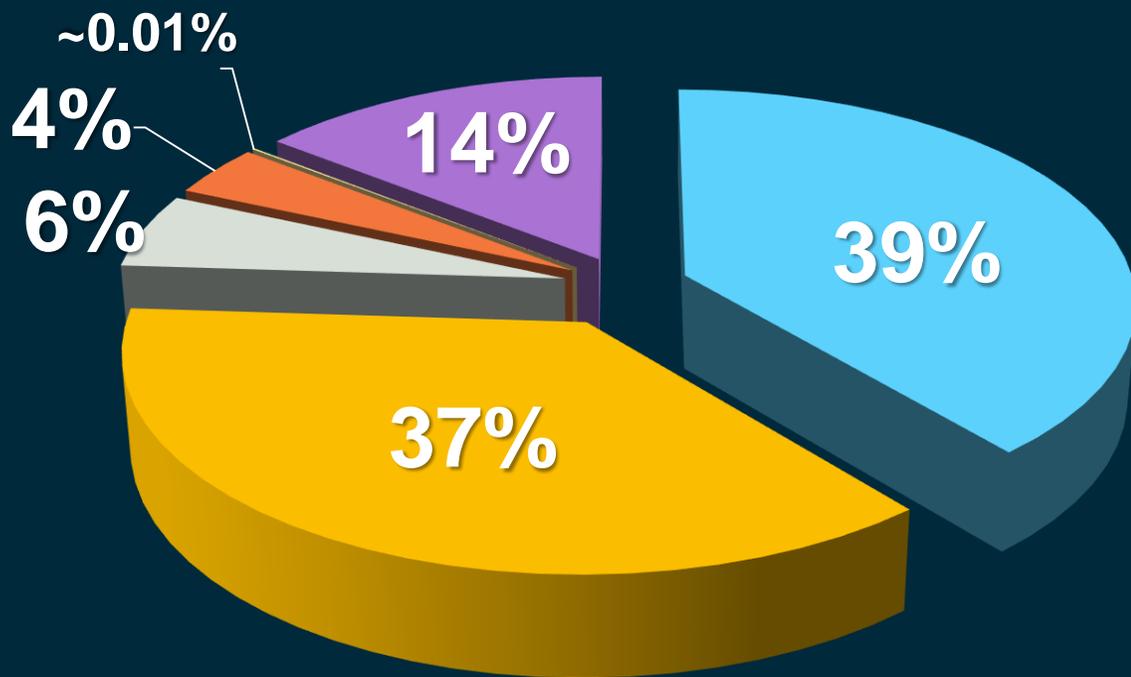
\*2021 had a 52% increase from 2020; a record high for certification only cases.

# Manner of Death - Autopsy and External Examinations Combined



# Manner of Death by Autopsy and External Examinations

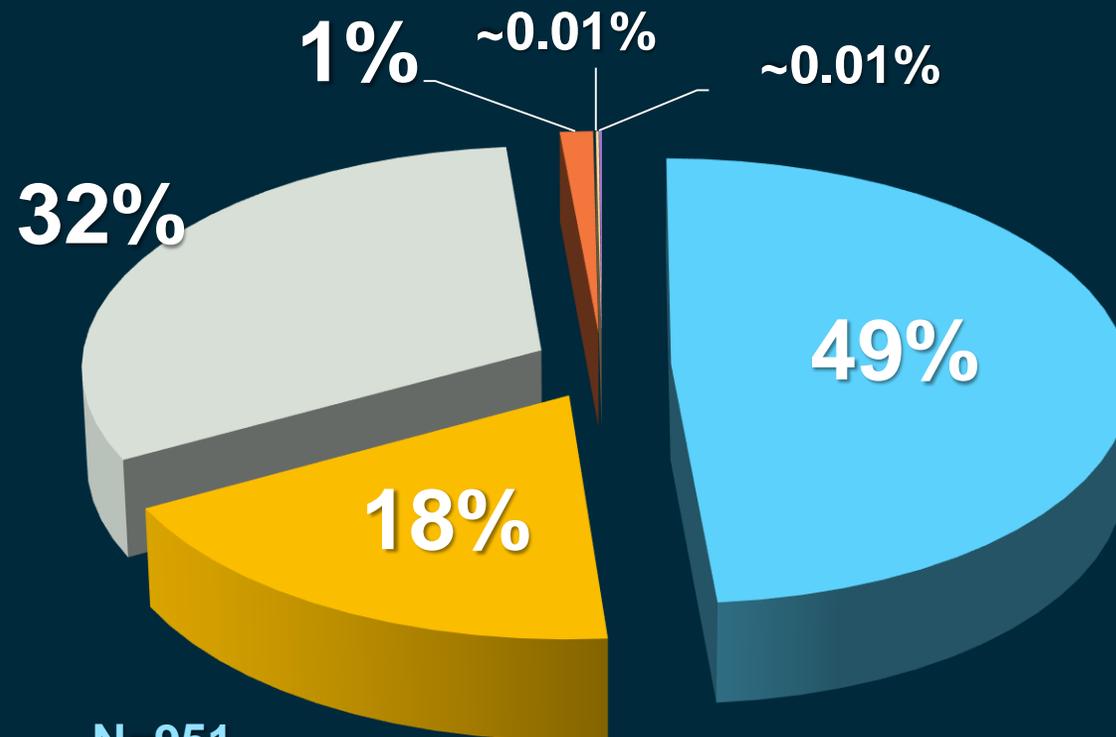
## Autopsy Examinations



N=5,001

- Natural: 1,946
- Accident: 1,855
- Suicide: 281
- Undetermined: 195
- Fetal: 5
- Homicide: 719

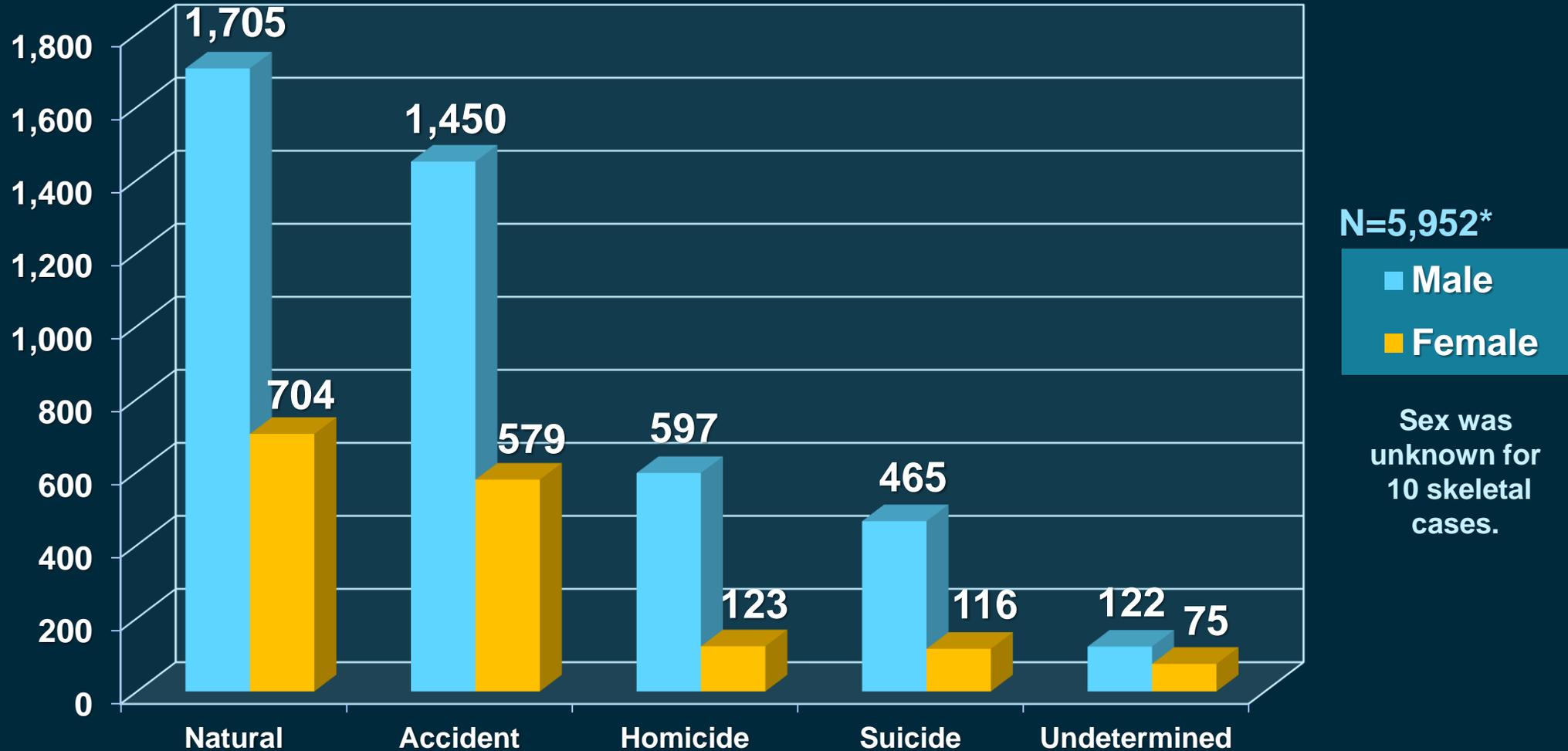
## External Examinations



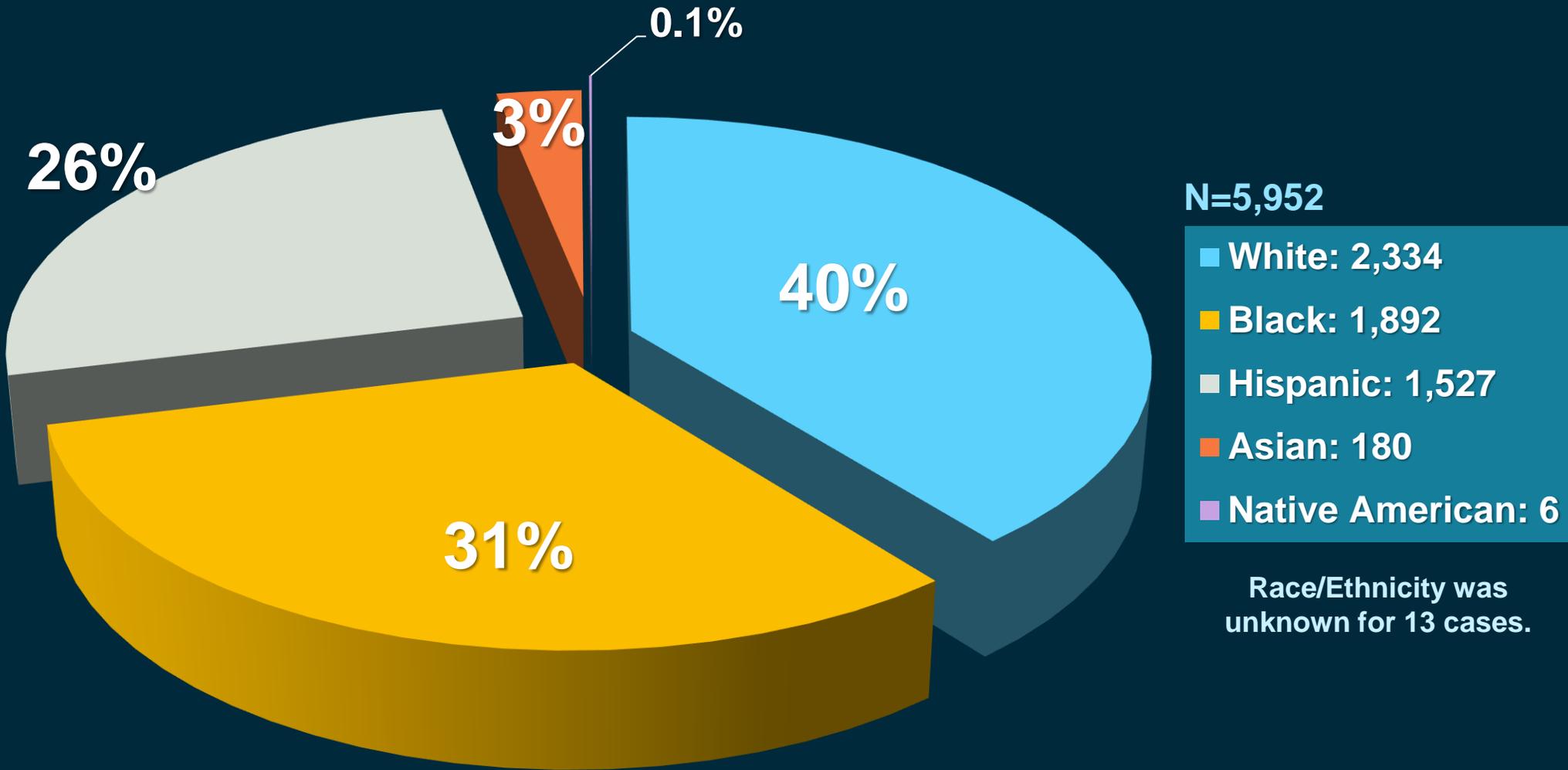
N=951

- Natural: 463
- Accident: 174
- Suicide: 300
- Undetermined: 12
- Fetal: 1
- Homicide: 1

# Manner of Death by Sex

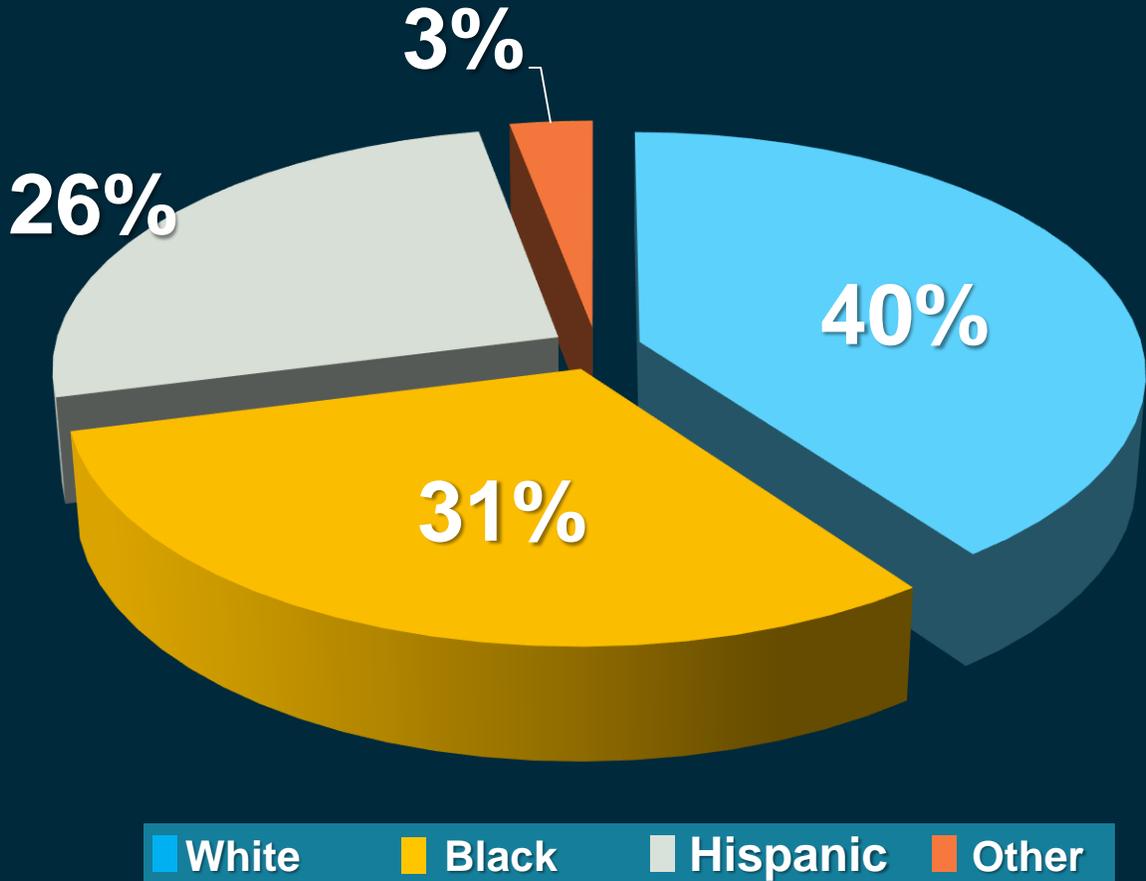


# Race/Ethnicity of Medicolegal Cases

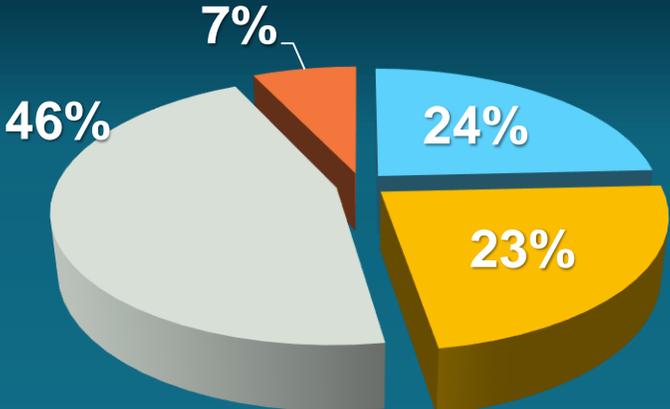


# Race/Ethnicity Demographics Compared to Population

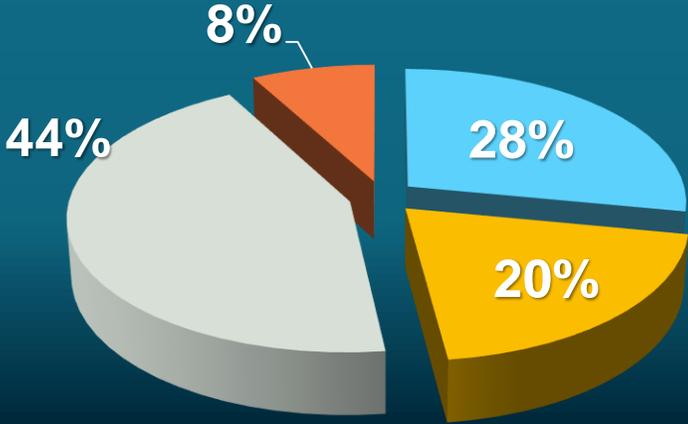
HCIFS Decedent Population\*



Houston City Population\*\*



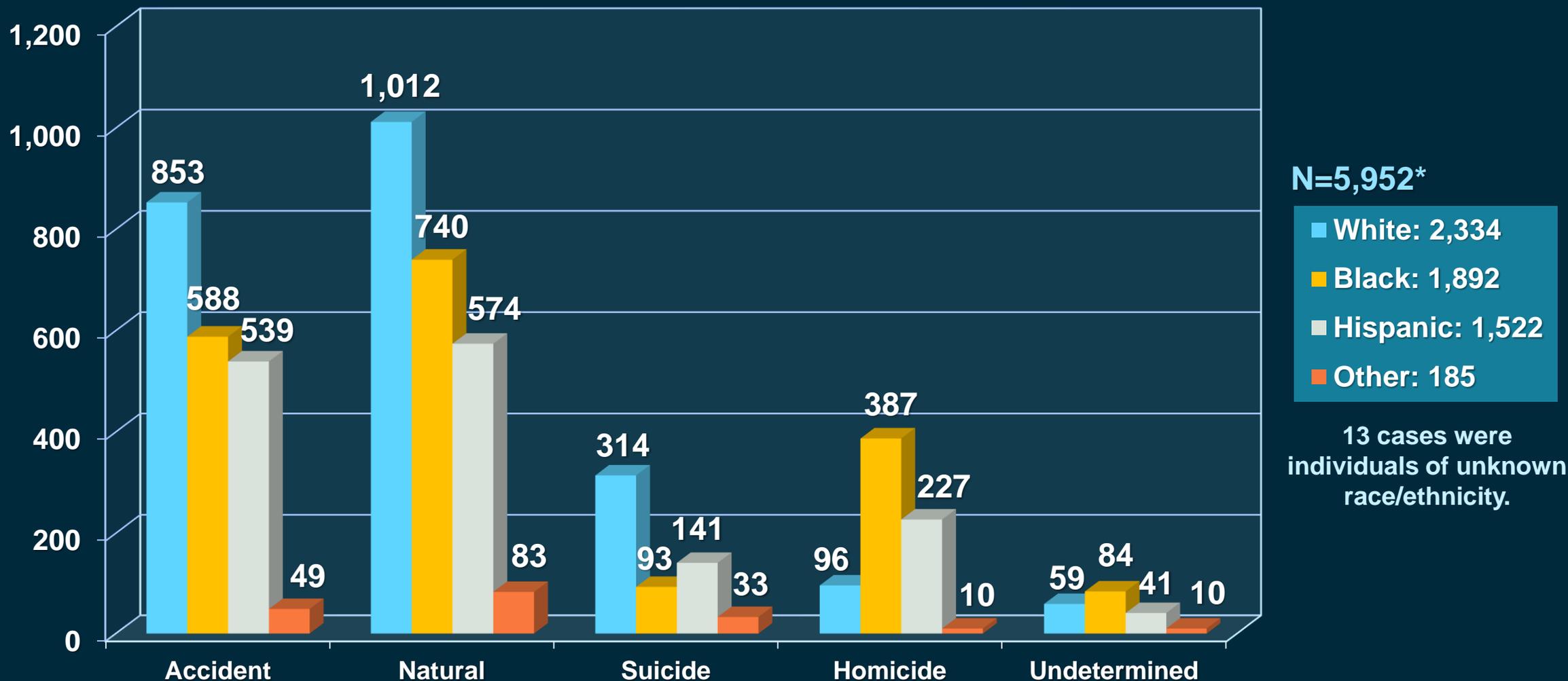
Harris County Population\*\*\*



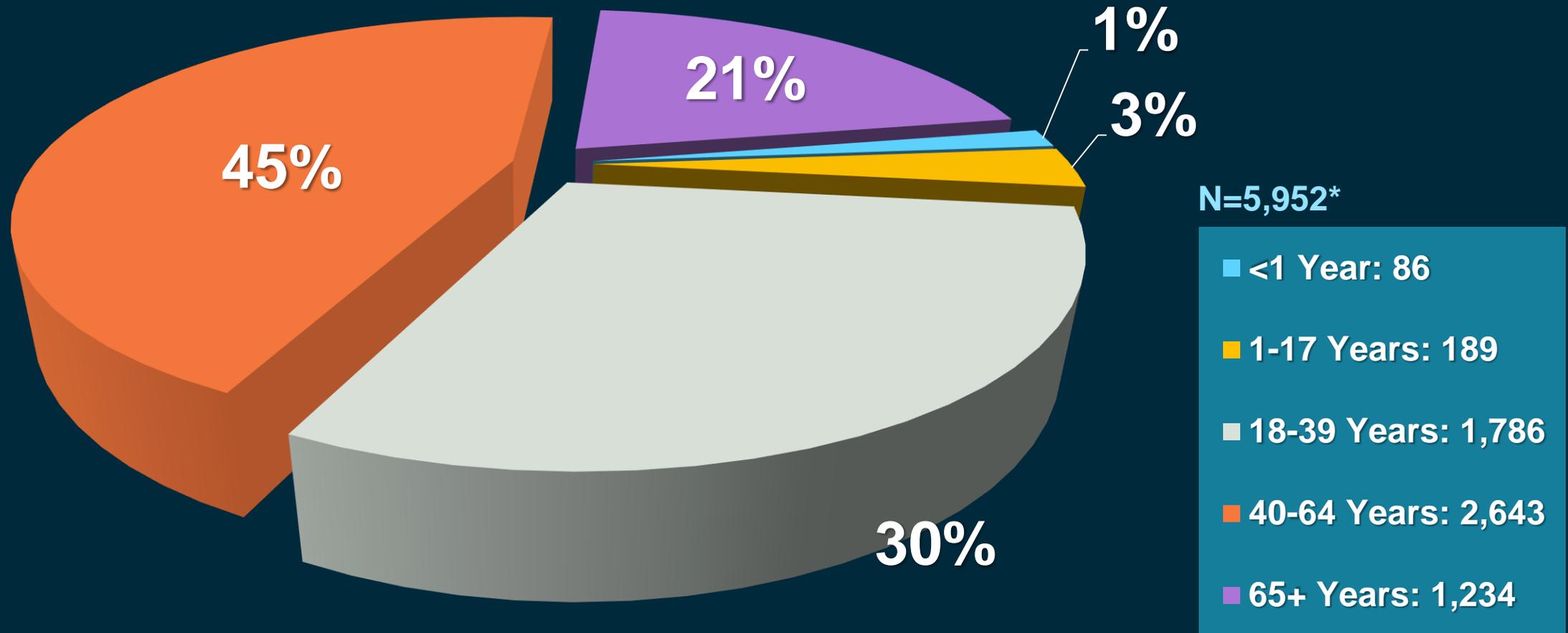
■ White   
 ■ Black   
 ■ Hispanic   
 ■ Other

\* HCIFS decedent population for 2021, N=5,939, excludes unknown race/ethnicity  
 \*\* City of Houston population for 2021, N=2,288,250, estimated by U.S. Census Bureau  
 \*\*\* Harris County population for 2021, N=4,728,030, estimated by Texas DSHS Center for Health Statistics

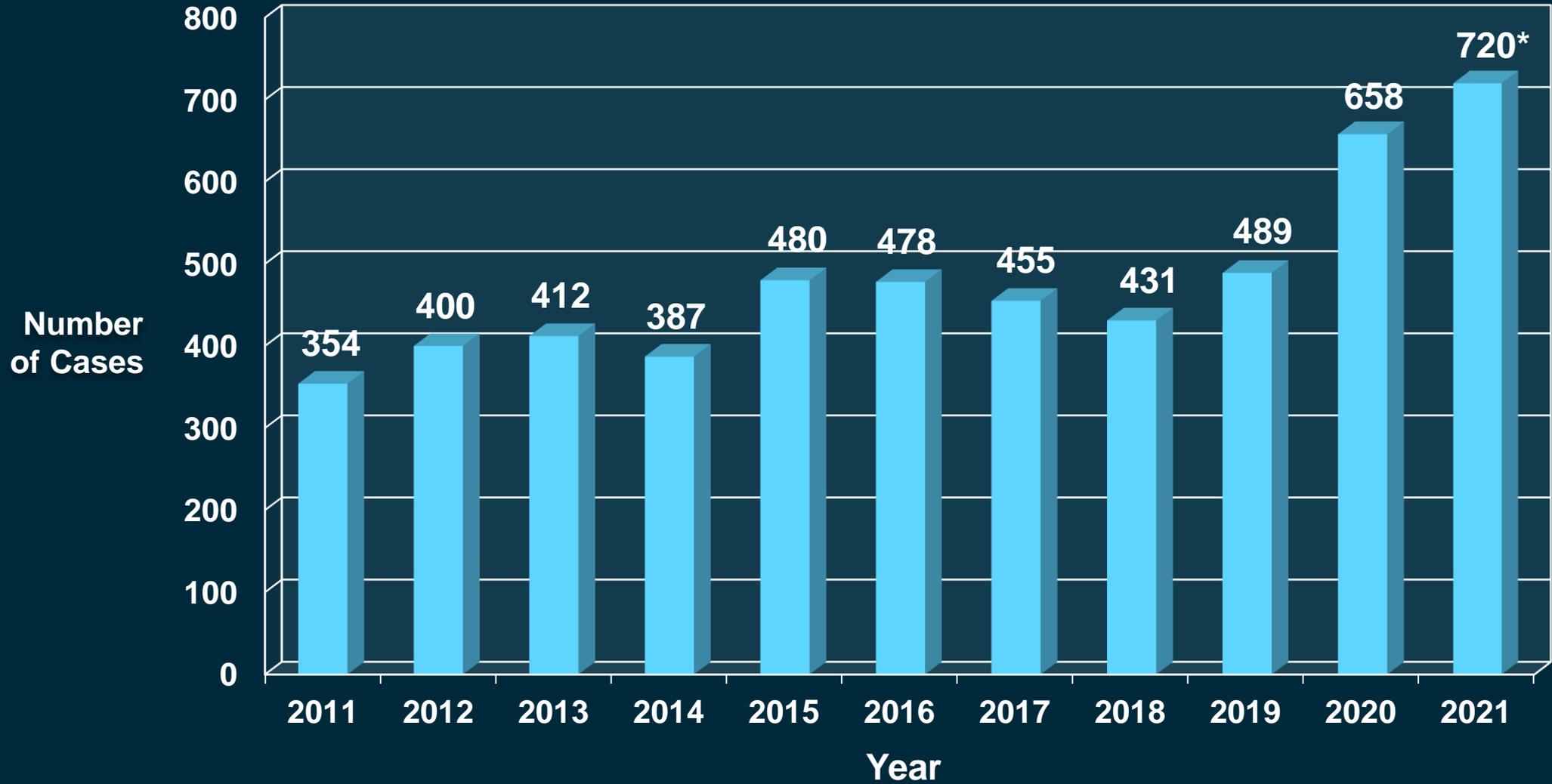
# Medicolegal Cases by Manner and Race/Ethnicity



# Medicolegal Cases by Age



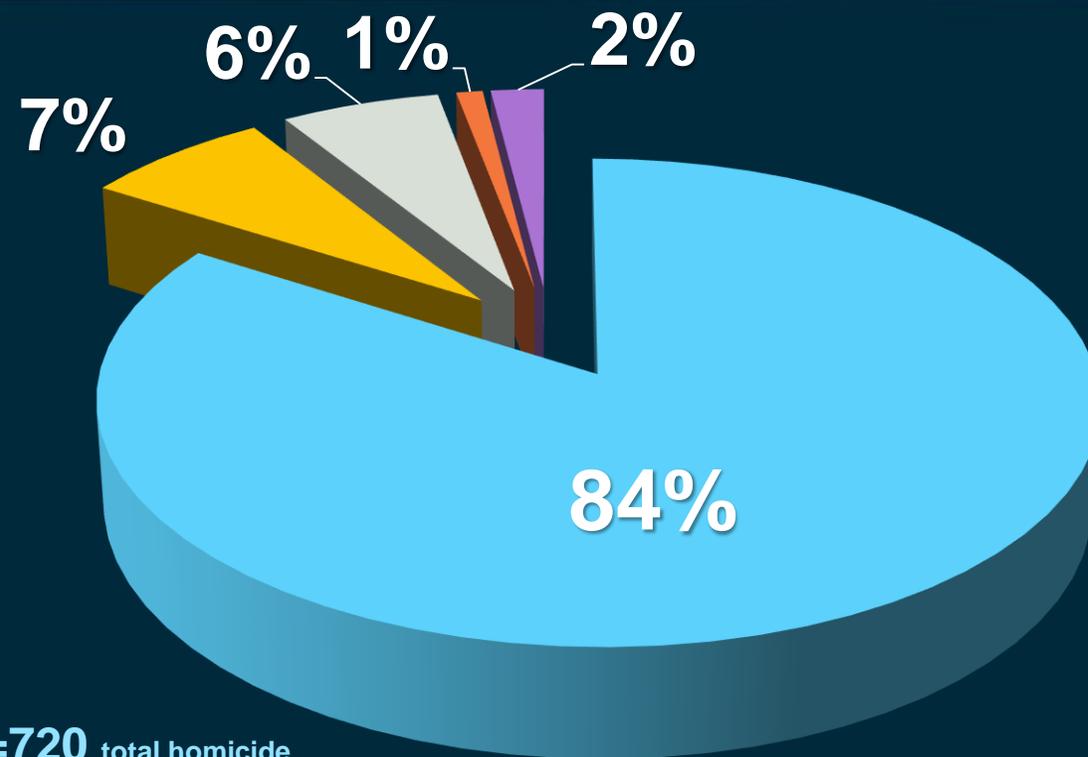
# Homicide Cases



*\*This is a 9% increase from 2020 and a 103% increase from 2011.*

# Cause of Death in Homicide Cases

- **41** cases were linked to at least one other ML case (e.g., double homicide, homicide suicide)
- At least **60** homicide cases were associated with domestic violence
- **4** homicide deaths occurred “while at work”

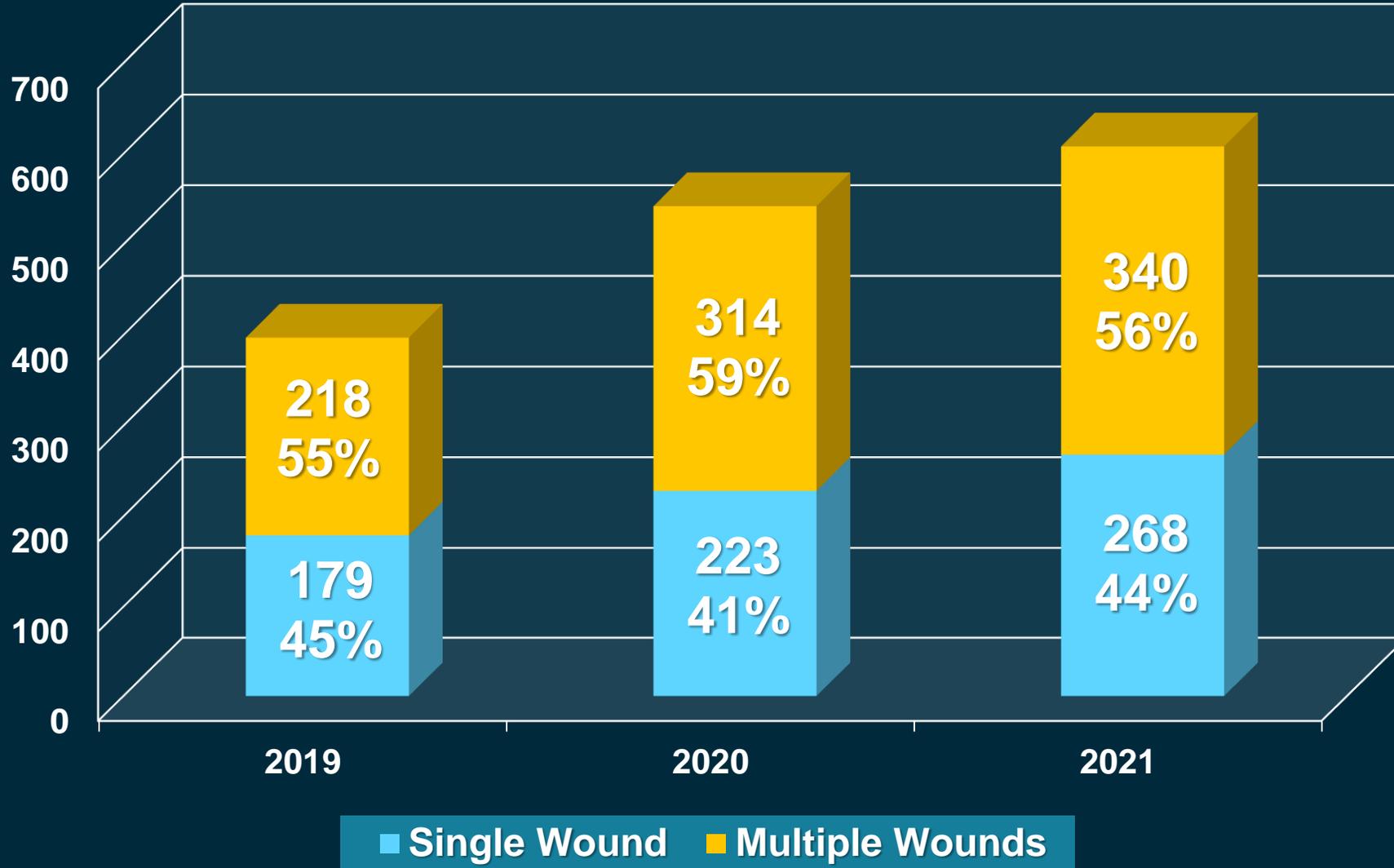


N=720 total homicide

■ Firearm: 592	■ Blunt Force: 50
■ Sharp Force: 42	■ Asphyxia/Strangulation: 7
■ Other: 14*	

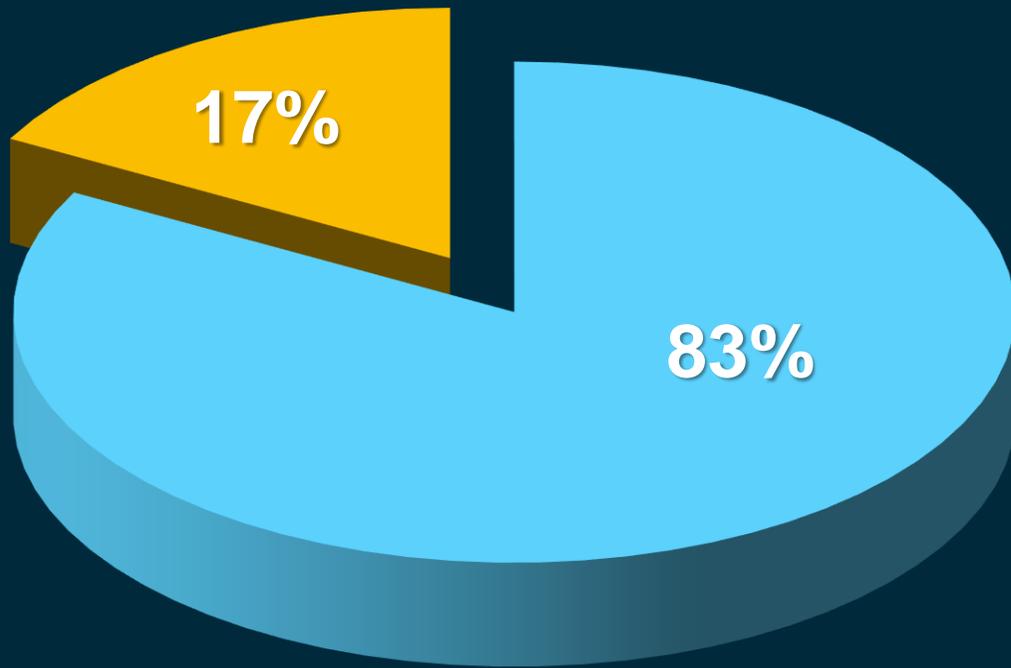
Cases with mixed causes of death include gunshot/sharp/blunt-force trauma (15), not included in graph.

# Homicide Deaths by Firearms



# Homicide Cases by Demographics

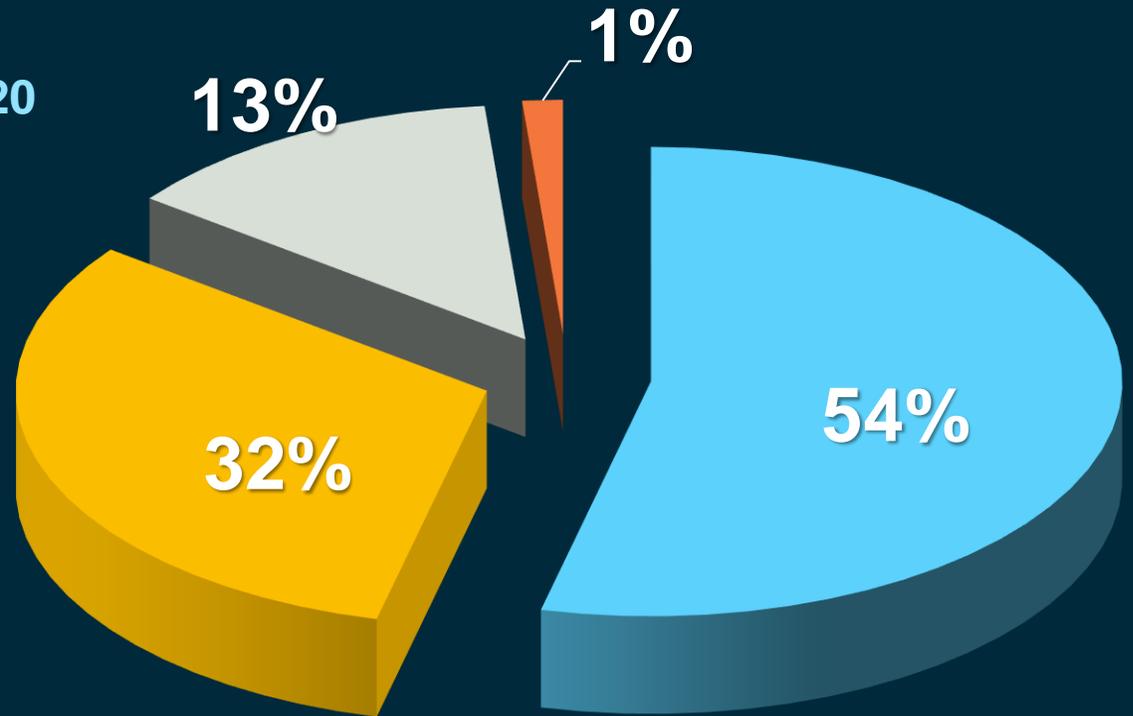
## Sex



■ Male: 597 ■ Female: 123

## Race/Ethnicity

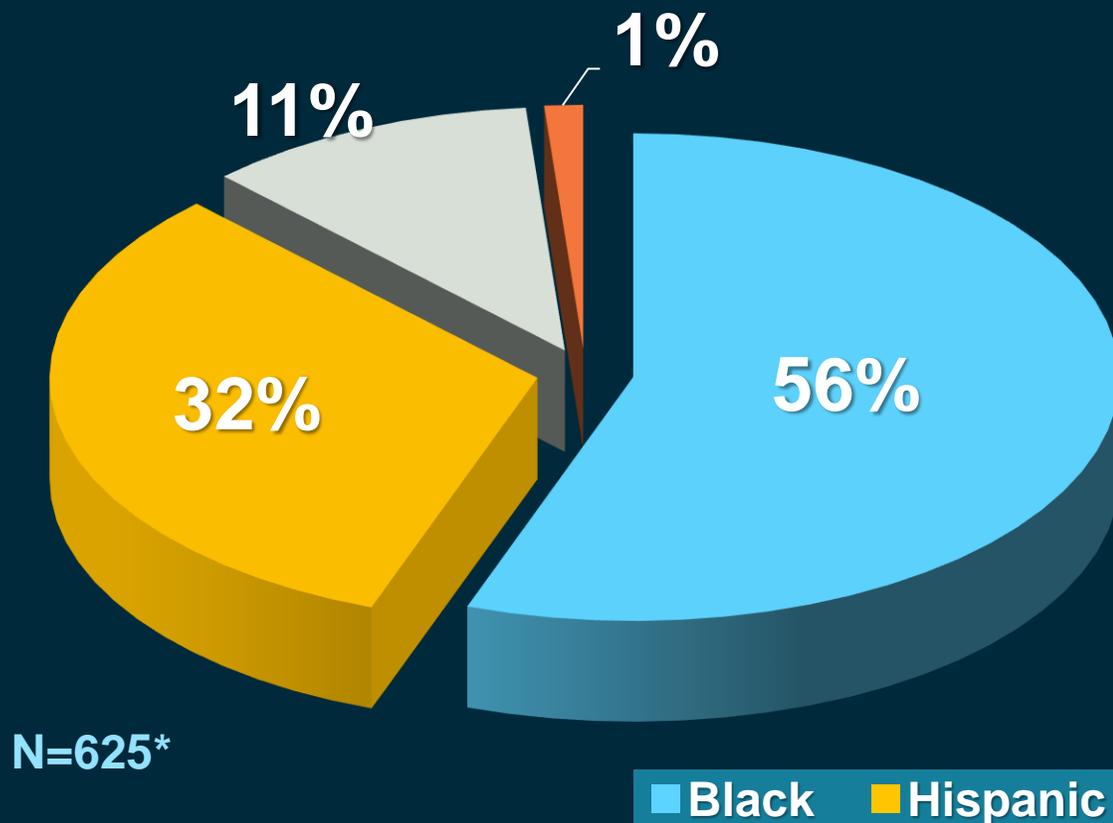
N=720



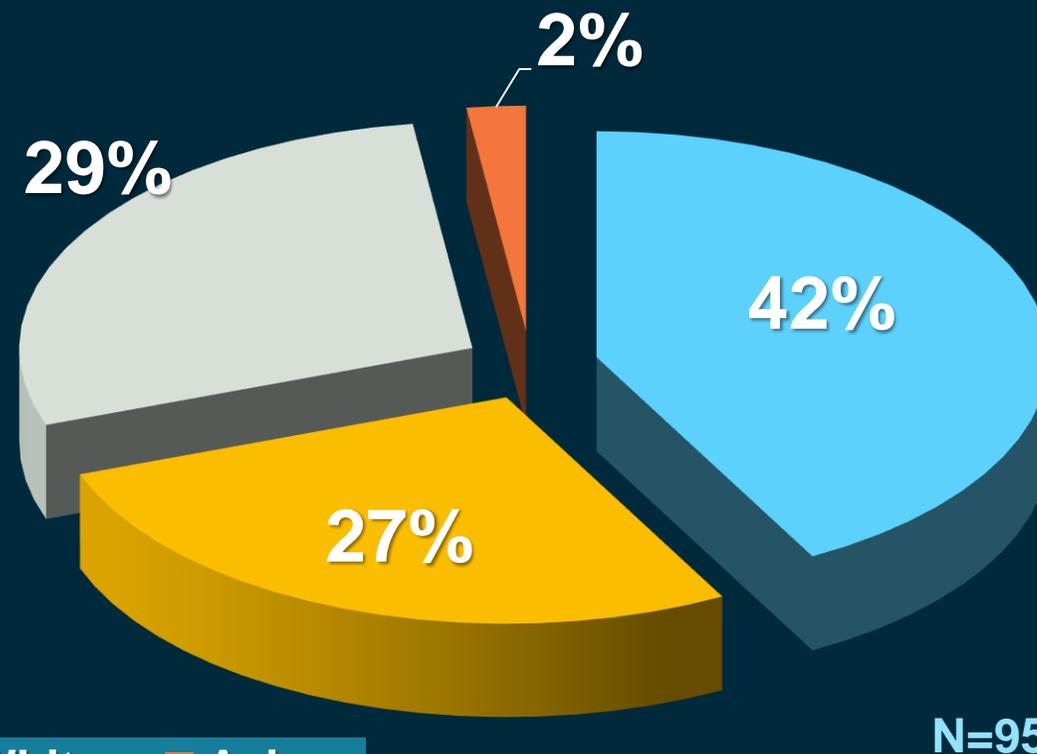
■ Black: 387 ■ Hispanic: 227  
■ White: 96 ■ Asian: 10

# Homicide Cases by Race/Ethnicity and Location

## City of Houston

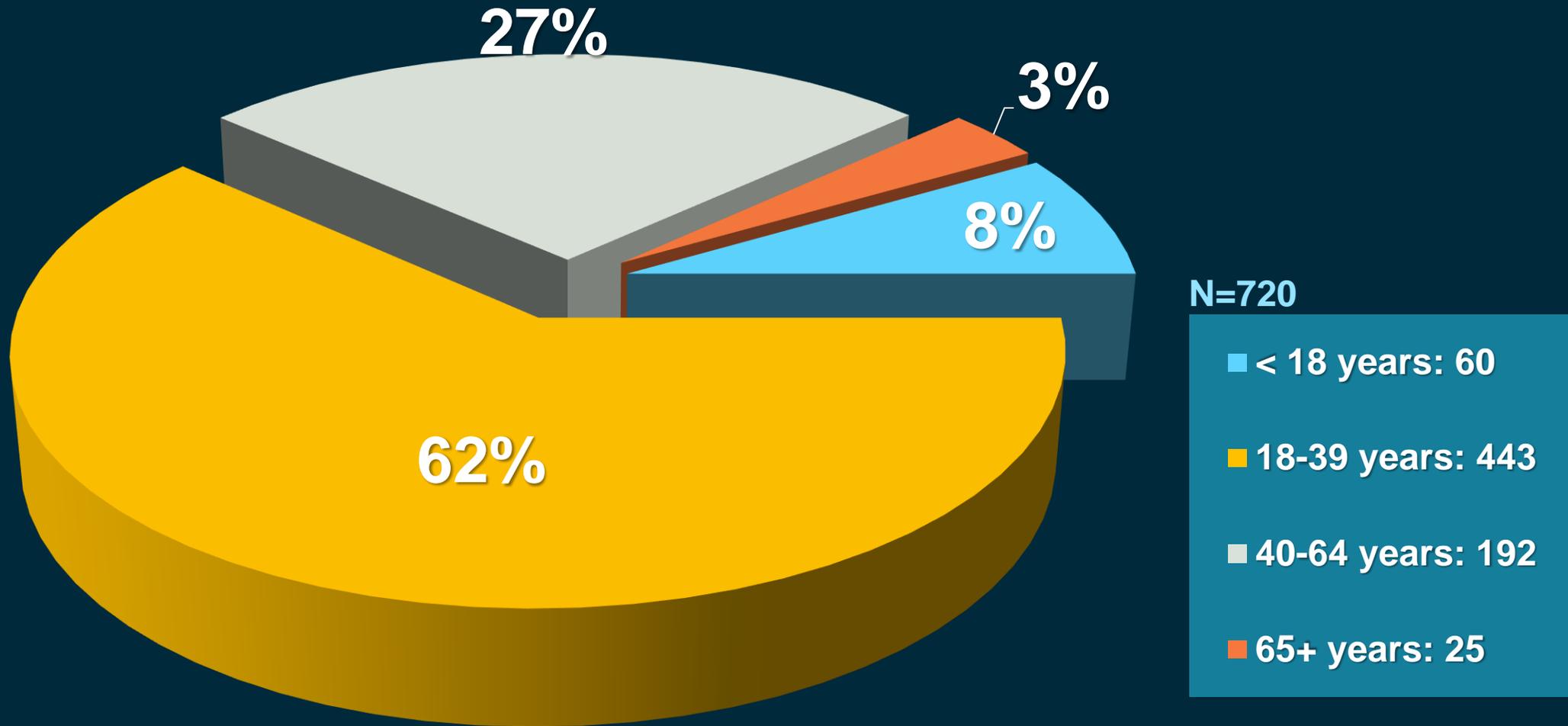


## Harris County Excluding the City of Houston

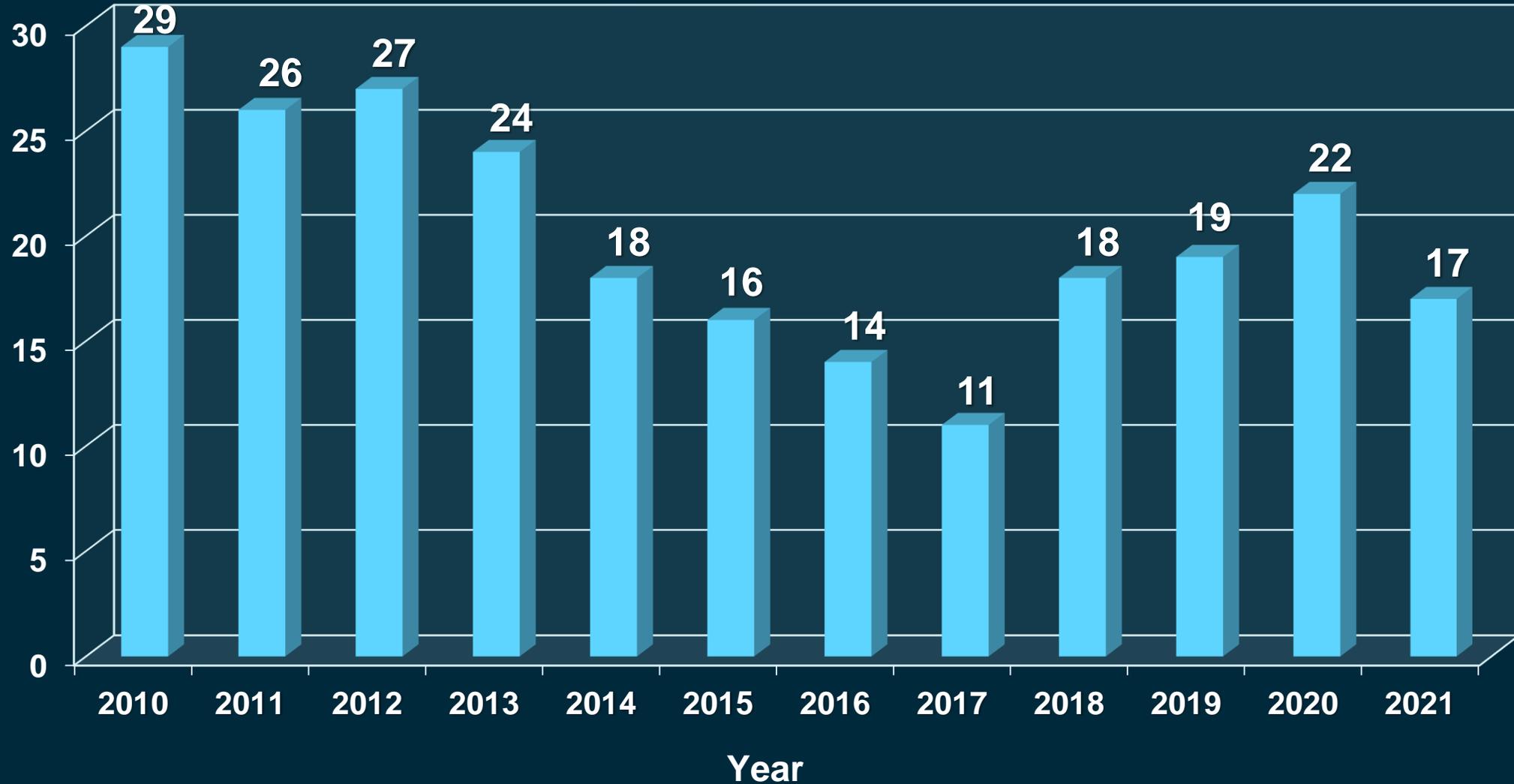


\*625 homicide cases were attributed to injury locations within the City of Houston based on the address of the place of injury and law enforcement jurisdiction.

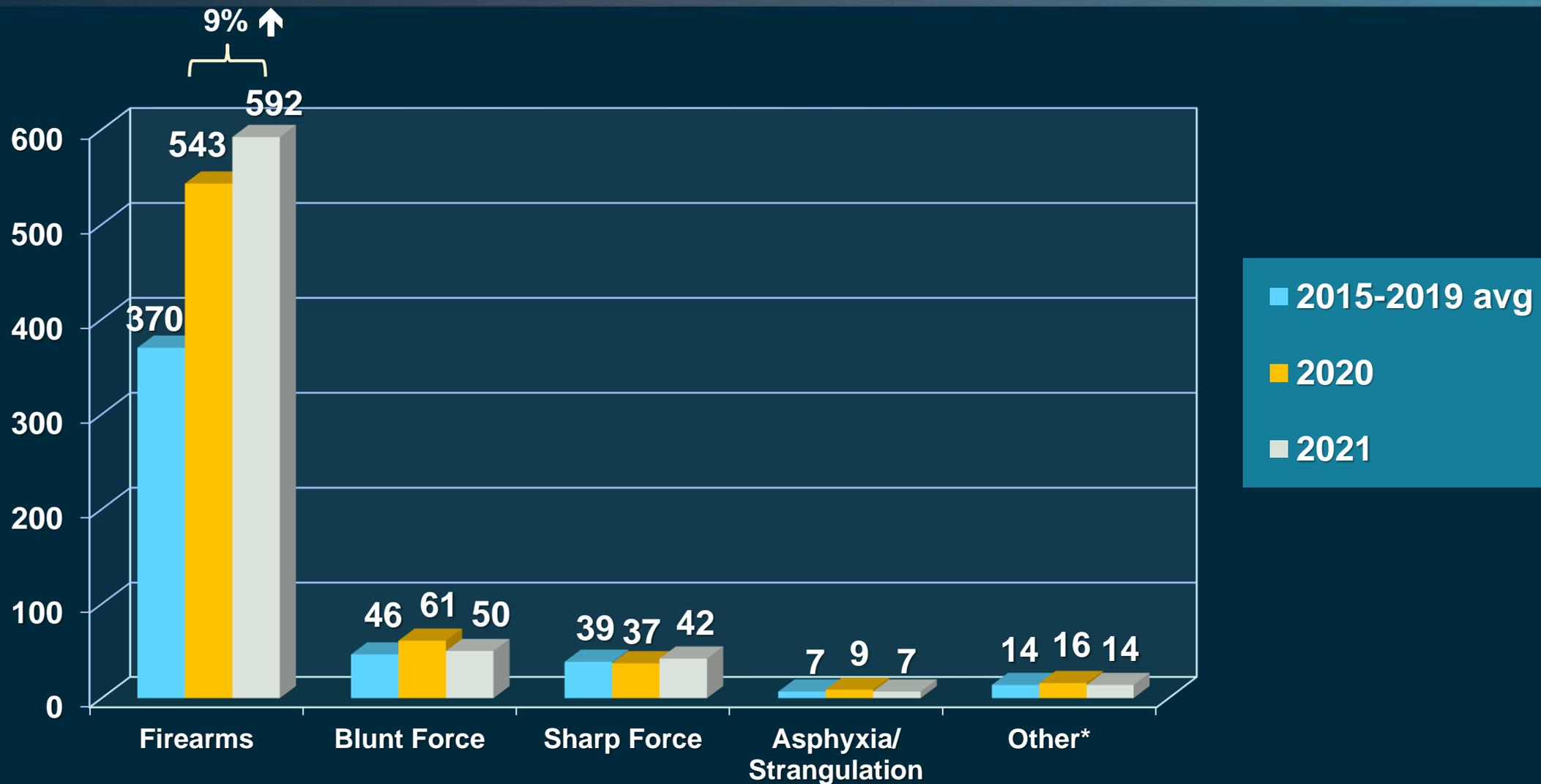
# Homicide Cases by Age



# Homicide Deaths of Infants and Toddlers (Age 0 - 4)

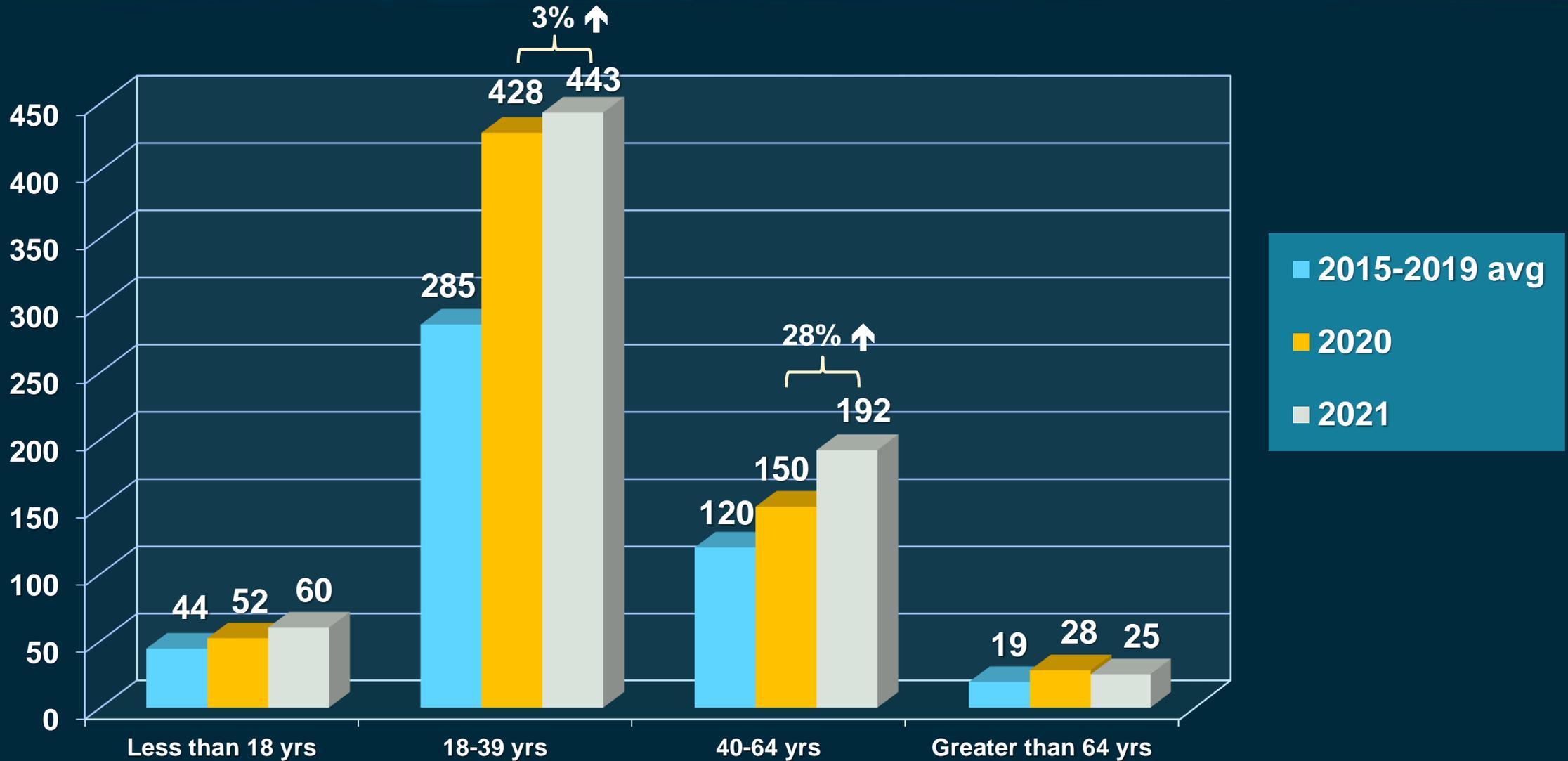


# Homicide Case Comparison Between Years by Cause

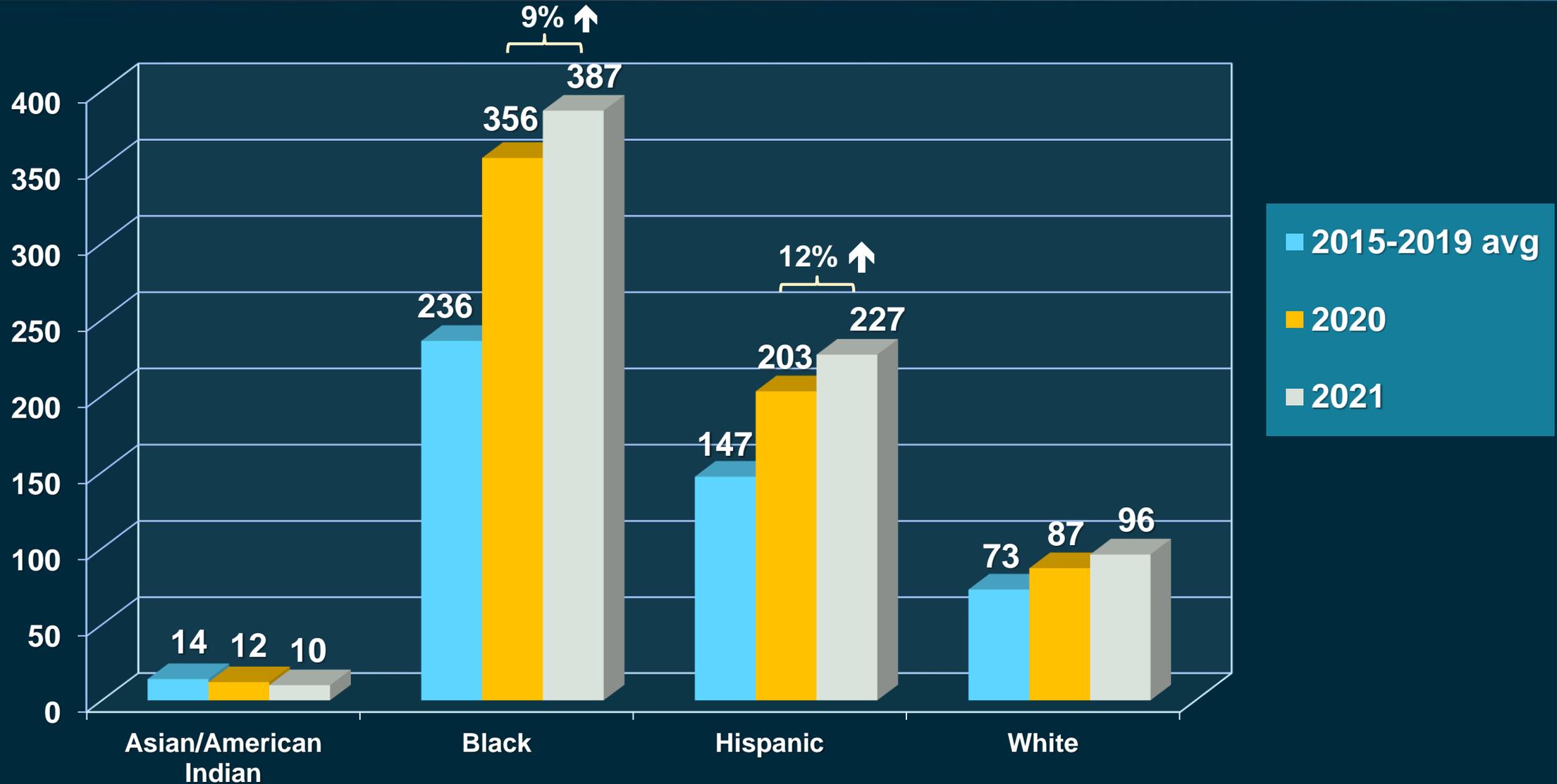


\*Other causes include the use of drugs, thermal injuries, homicidal violence, and drowning. Excludes (15) cases with a combination of causes of death.

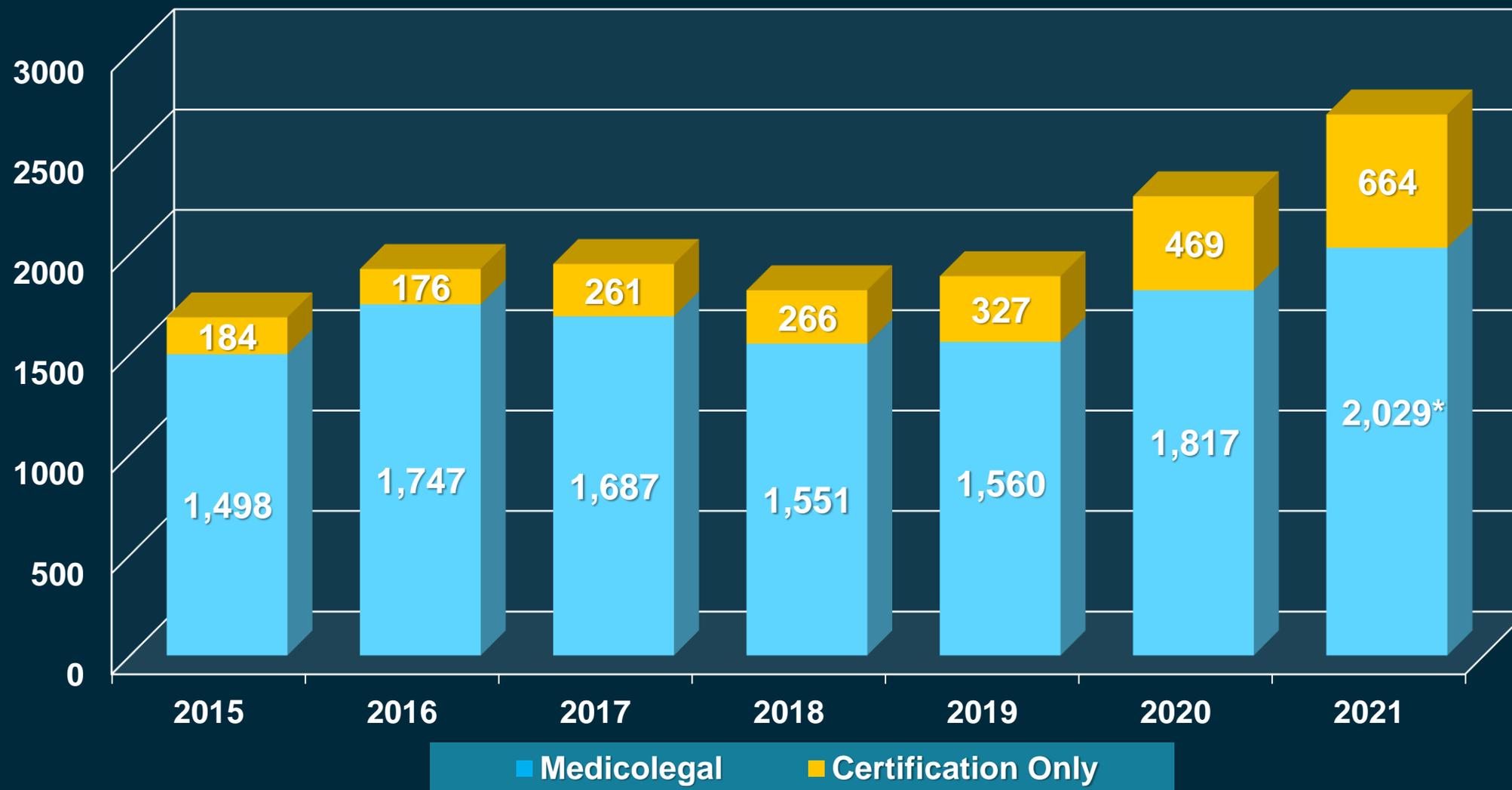
# Homicide Case Comparison Between Years by Age



# Homicide Case Comparison Between Years by Race

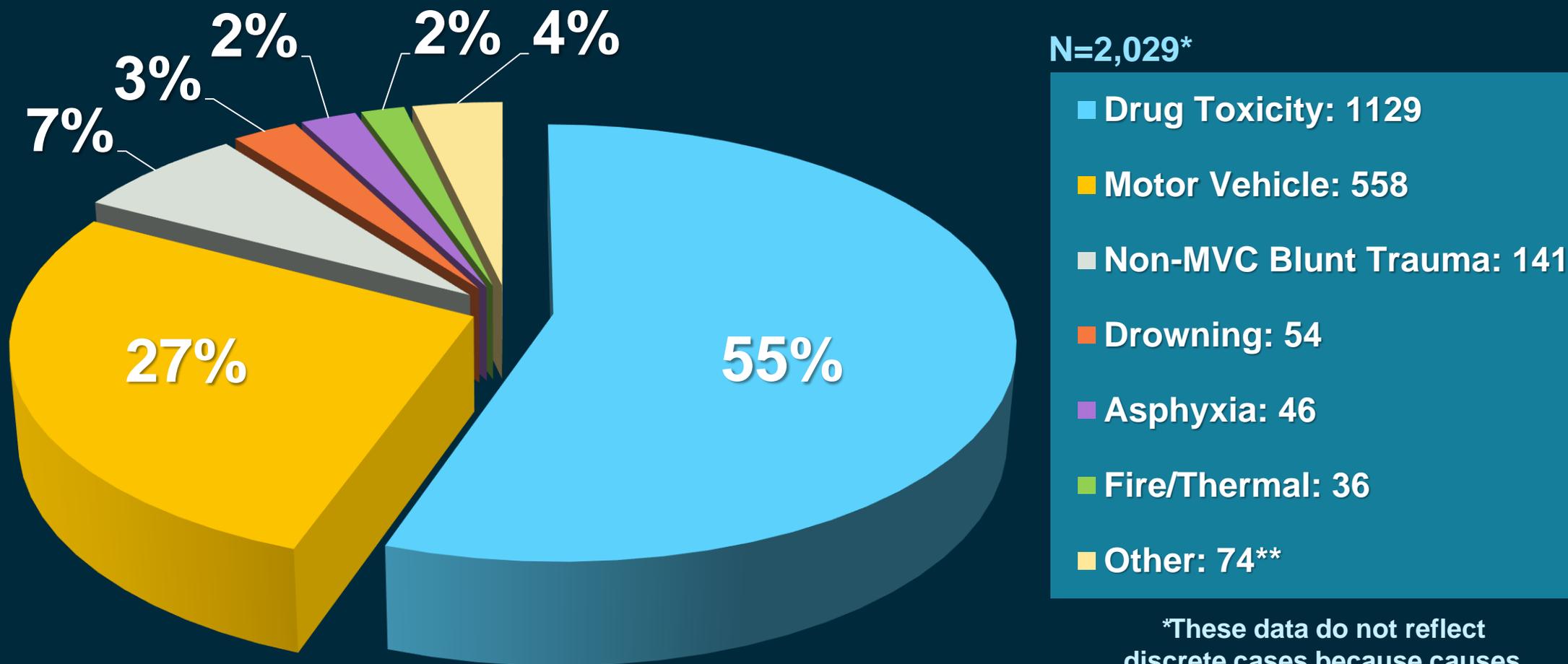


# Accidental Deaths



*\*12% increase from 2020 for medicolegal cases and a 18% increase for both medicolegal and certification only cases combined*

# Most Common Causes of ML Accidental Deaths



N=2,029\*

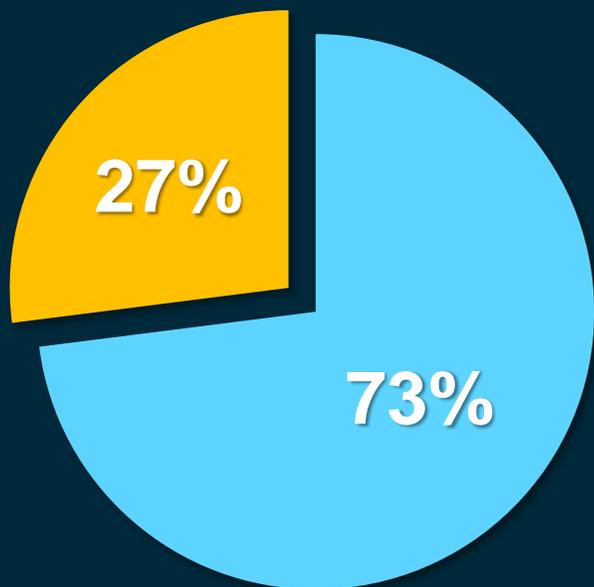
- Drug Toxicity: 1129
- Motor Vehicle: 558
- Non-MVC Blunt Trauma: 141
- Drowning: 54
- Asphyxia: 46
- Fire/Thermal: 36
- Other: 74\*\*

\*These data do not reflect discrete cases because causes may be combined within a case.

\*\*Other includes firearm injuries, sharp force injuries, hyperthermia, hypothermia, carbon monoxide intoxication and therapeutic complications.

# Drug Toxicity in ML Accidental Deaths

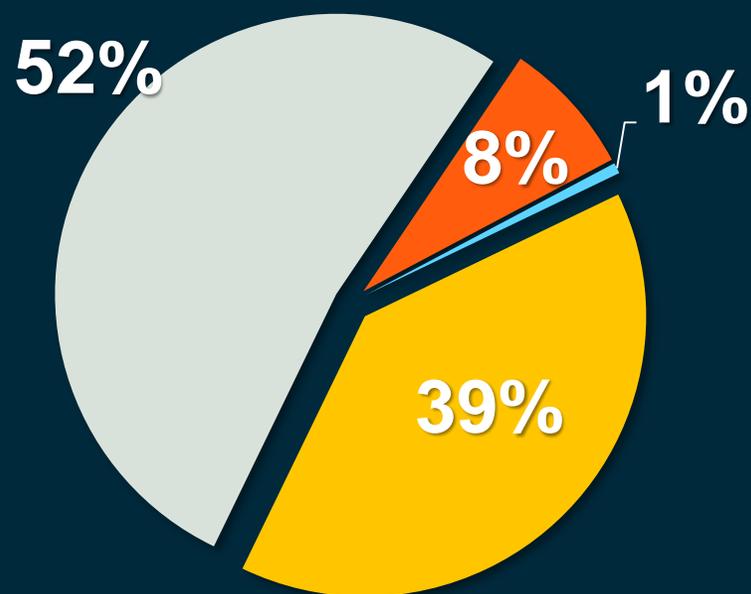
## Sex



N=1,129

- Male: 824
- Female: 305

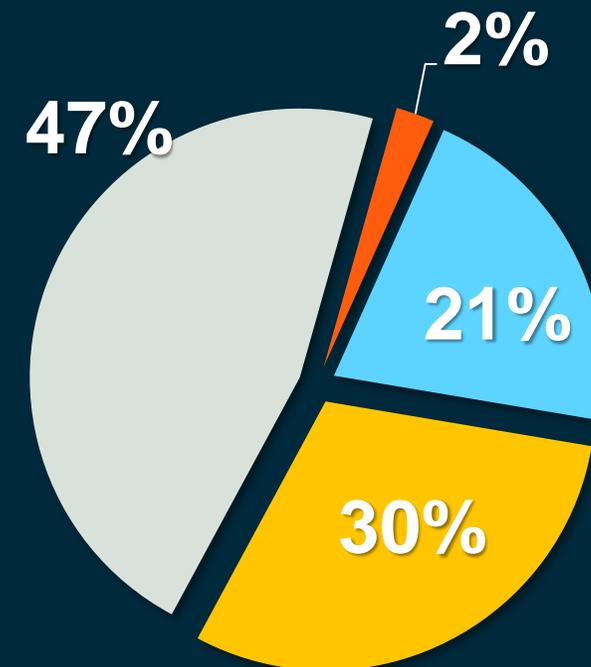
## Age



N=1,129

- Under 18 years: 7
- 18 - 39 years: 444
- 40 - 64 years: 590
- 65+ years: 88

## Race

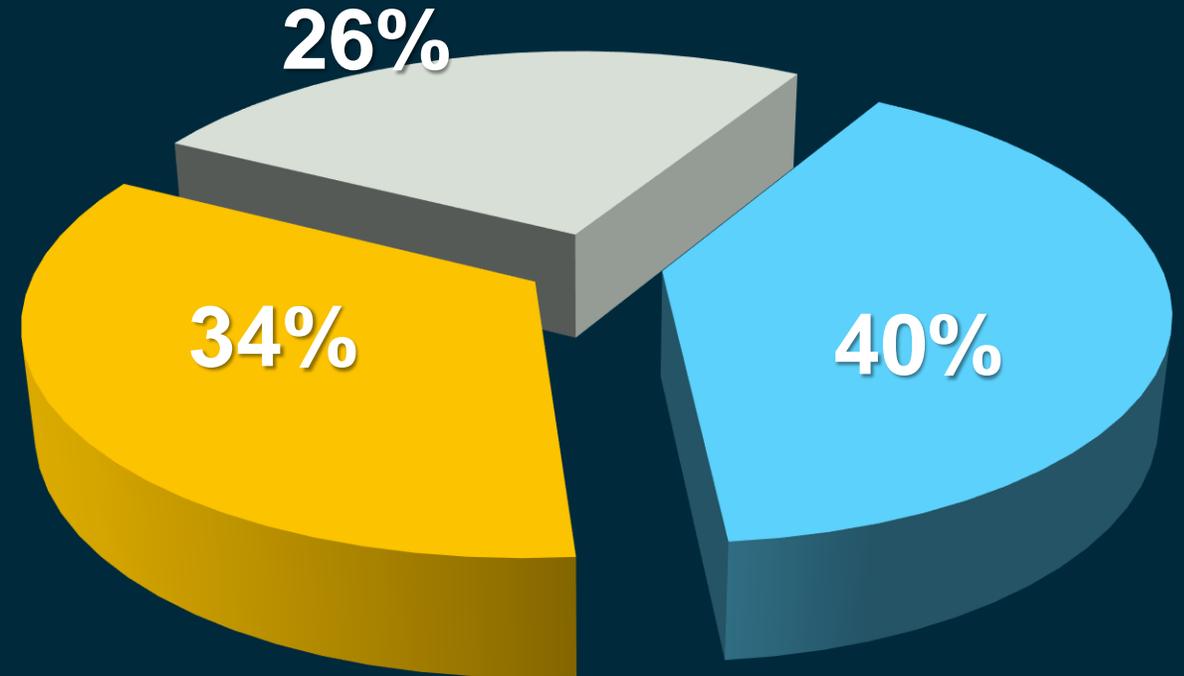


N=1,129

- Hispanic: 237
- Black: 341
- White: 525
- Asian: 26

# Motor Vehicle Crash (MVC) Cases in ML Accidental Deaths

- MVC fatalities include **34** children ages 6 months to 17 years old
- **2** children were pedestrians, 2 years to 6 years old
- **23%** of driver fatalities (**51**) were under 25 years old
- **33** stranded motorists were hit and killed

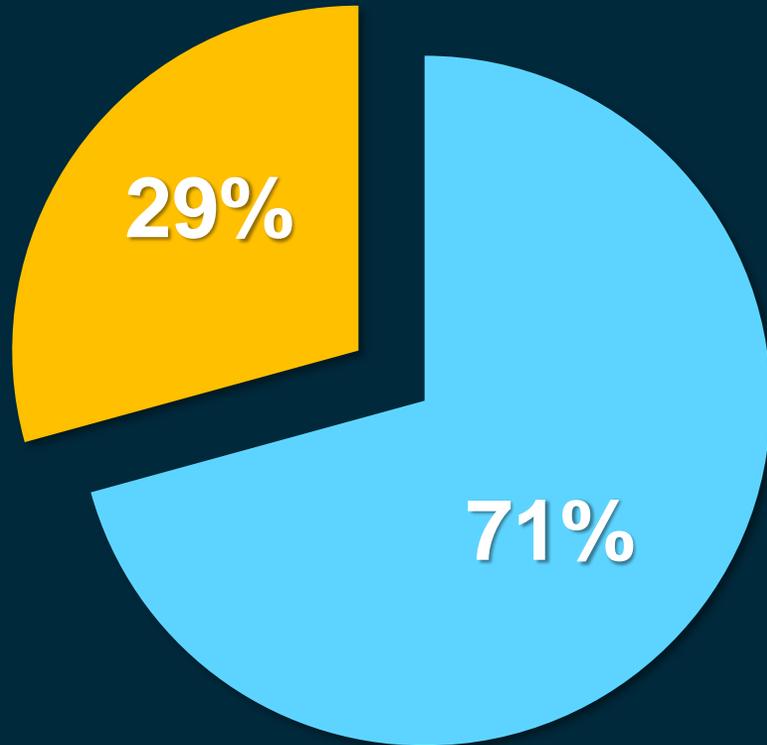


N=558

- Driver: 222
- Passenger or Unknown Position: 188
- Pedestrian: 148

# MVC in ML Accidental Deaths

## Driver's Sex

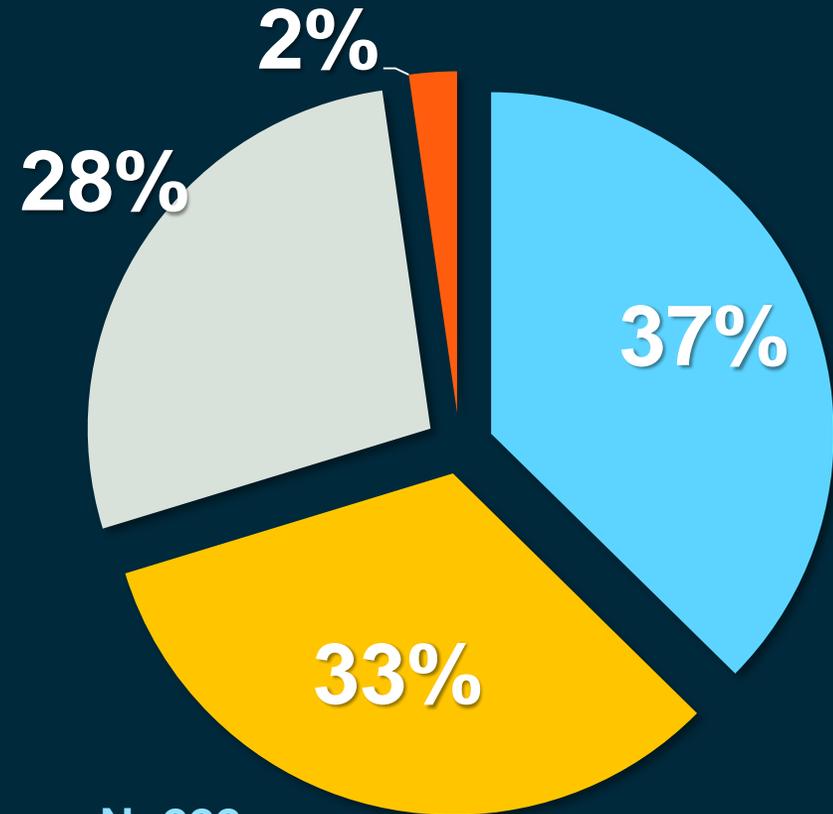


N=222

■ Male: 157

■ Female: 65

## Driver's Race



N=222

■ Hispanic: 83

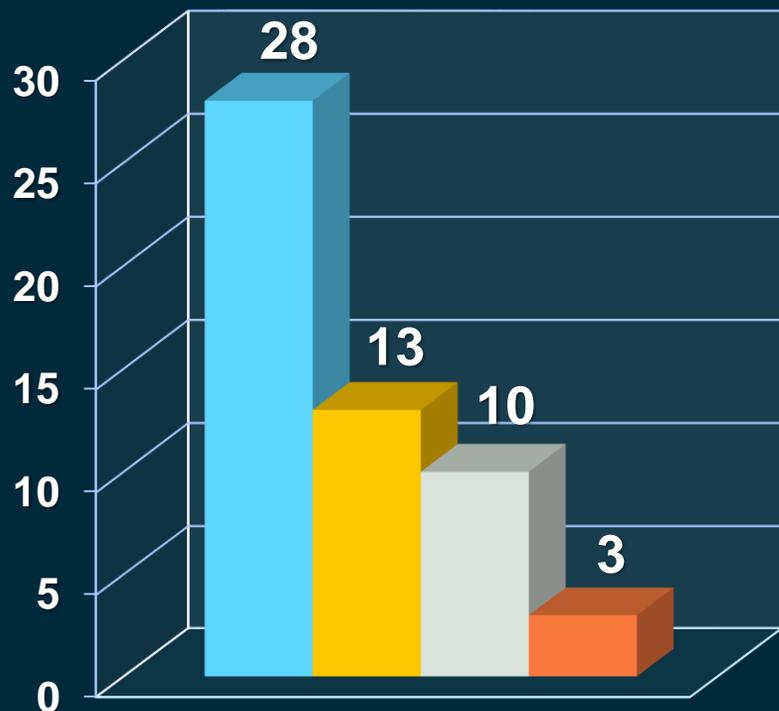
■ Black: 73

■ White: 61

■ Asian: 5

# Medicolegal Accidental Drownings

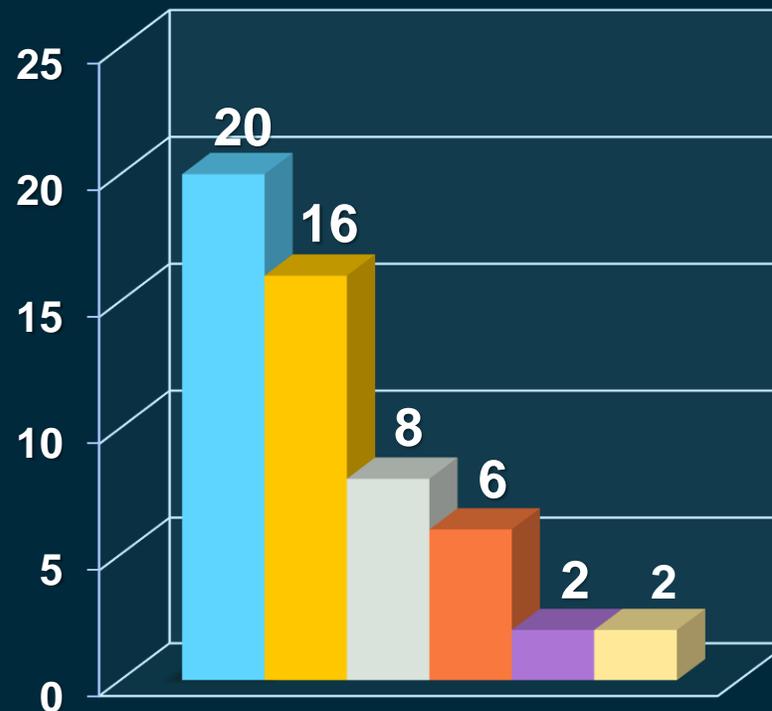
## Race/Ethnicity



N=54\*



## Type of Water

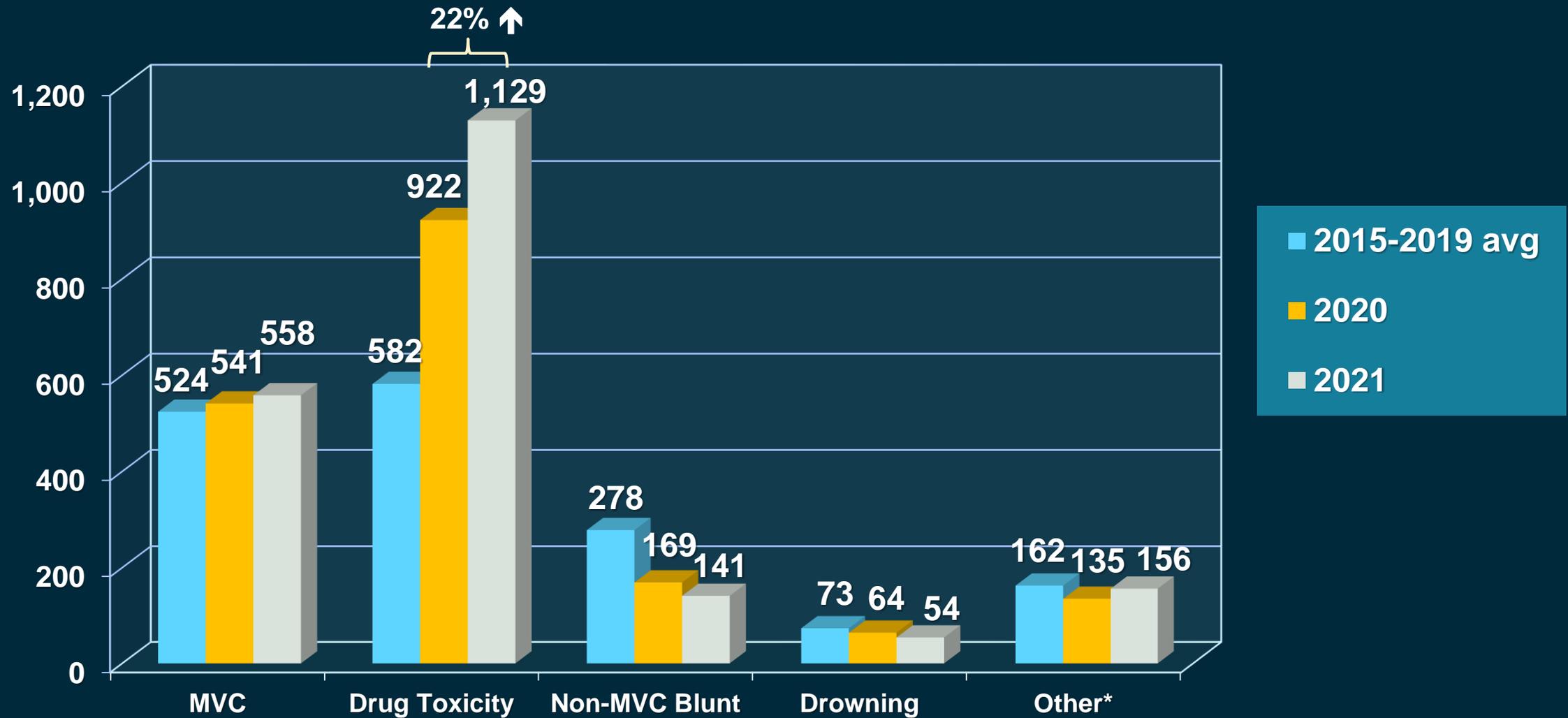


N=54\*



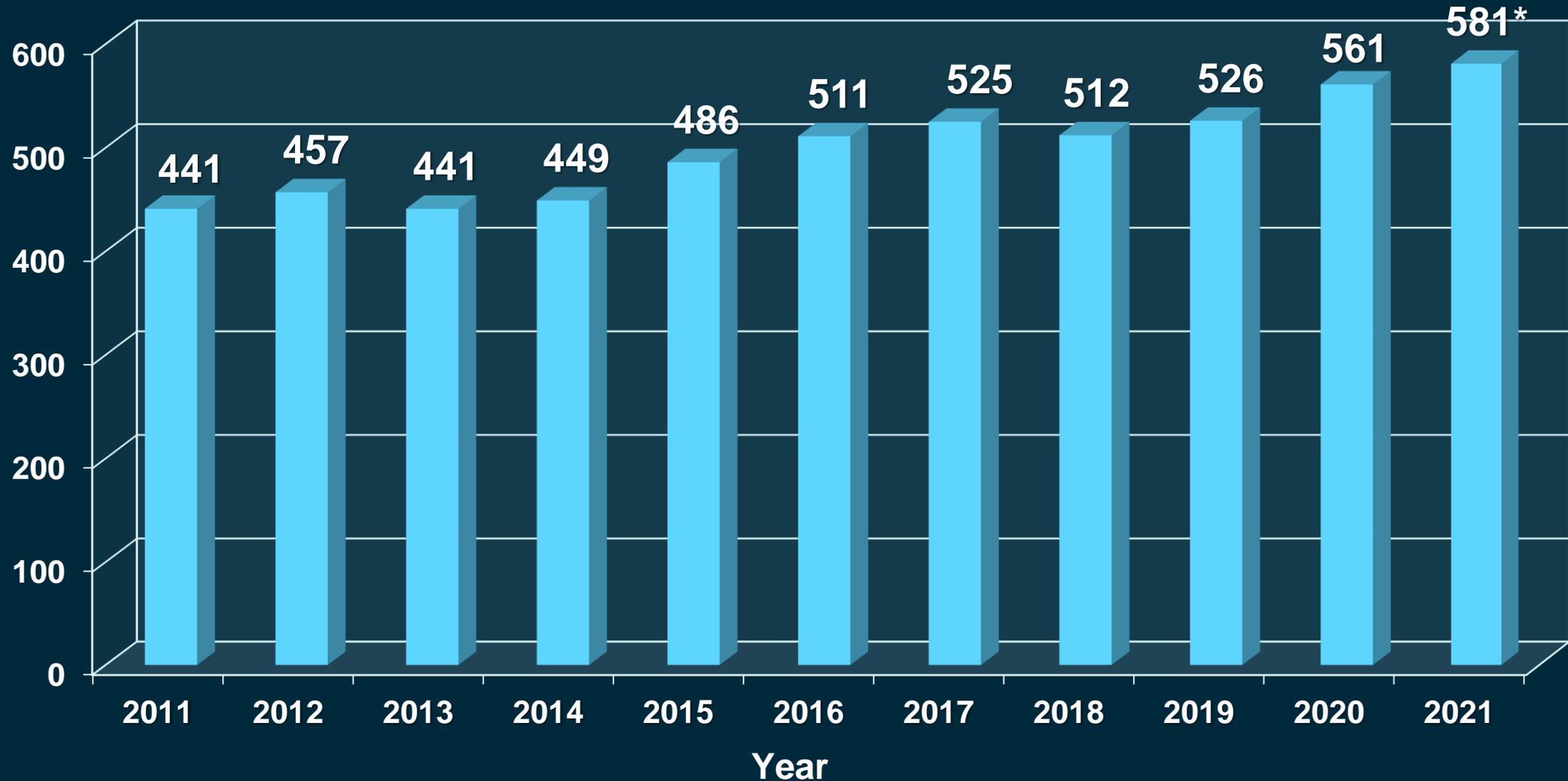
\*Includes 15 children, ages 2 to 10 years and male to female ratio 30:24.  
 \*\*Other category includes near a roadway, parking lot, open areas, and ditches.

# ML Accidental Case Comparison Between Years by Cause



\*Other includes asphyxia, thermal injuries, firearm injuries, sharp force injuries, hyperthermia, hypothermia, and therapeutic complications.

# Medicolegal Suicide Cases

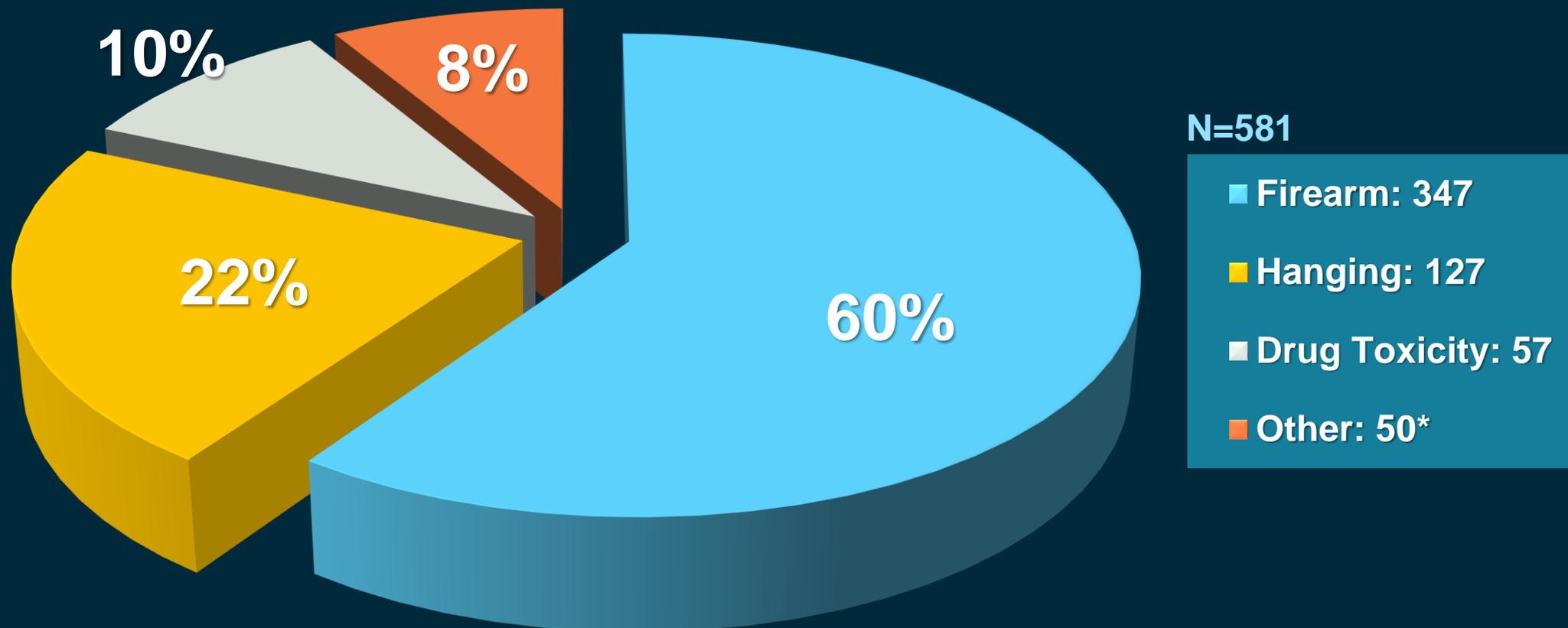


*\*This is a 4% increase from 2020 and a 32% increase from 2011.*

# Medicolegal Suicide Demographics

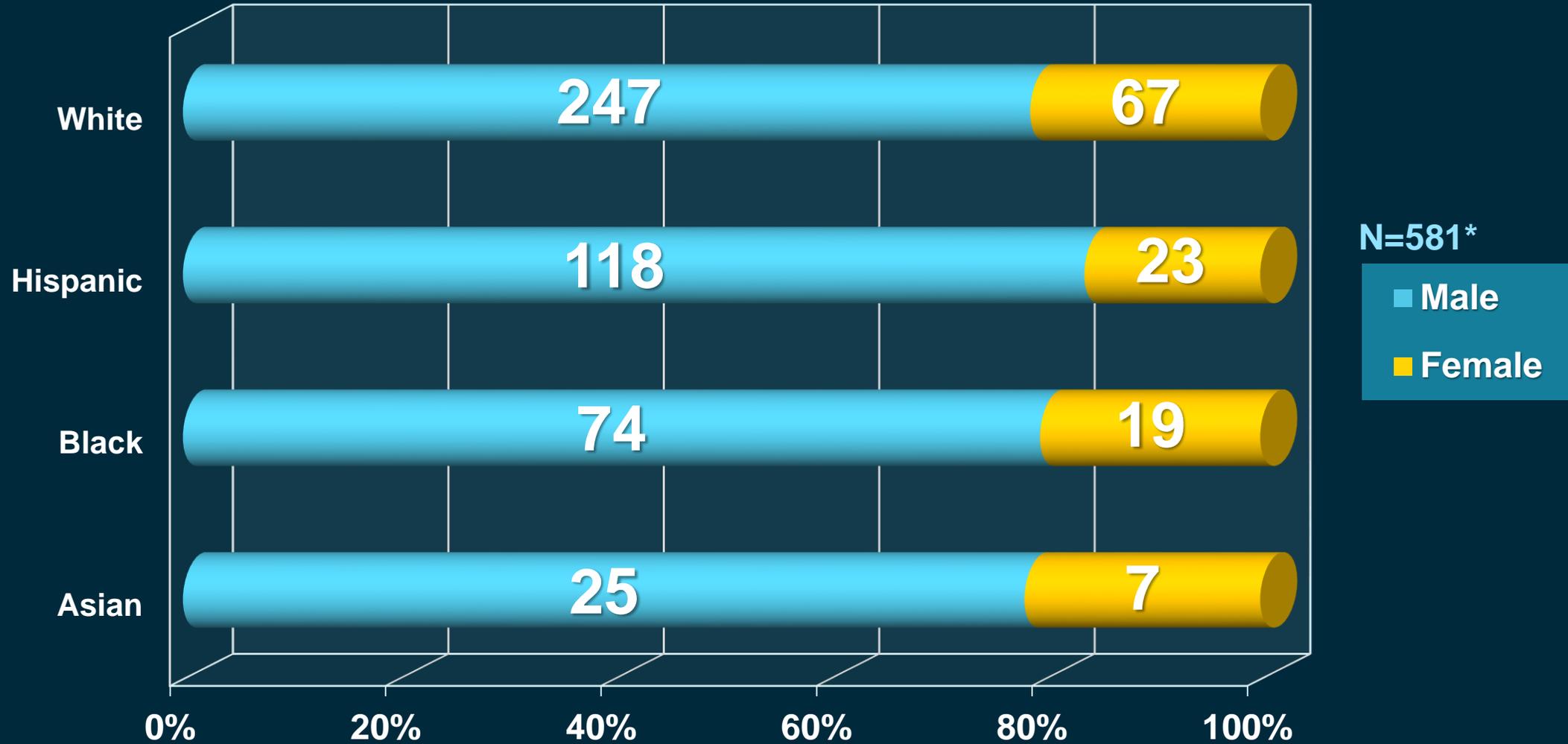
- Male to female ratio is **4 to 1**.
- Age range is **11 to 100** years.
- Suicide among races are **54% White; 24% Hispanic; 16% Black; 6% Asian/American Indian**, with the lowest White suicide rate in the past 5 years.
- Number of companion suicide/homicide cases:
  - 2018: 14
  - 2019: 10
  - 2020: 13
  - **2021: 13**

# Causes of Death in Suicides



\*Other category includes blunt force trauma (29), asphyxiation-not due to hanging (5), sharp force (12), thermal (3) and drowning (1).

# Suicide Cases by Sex and Race/Ethnicity



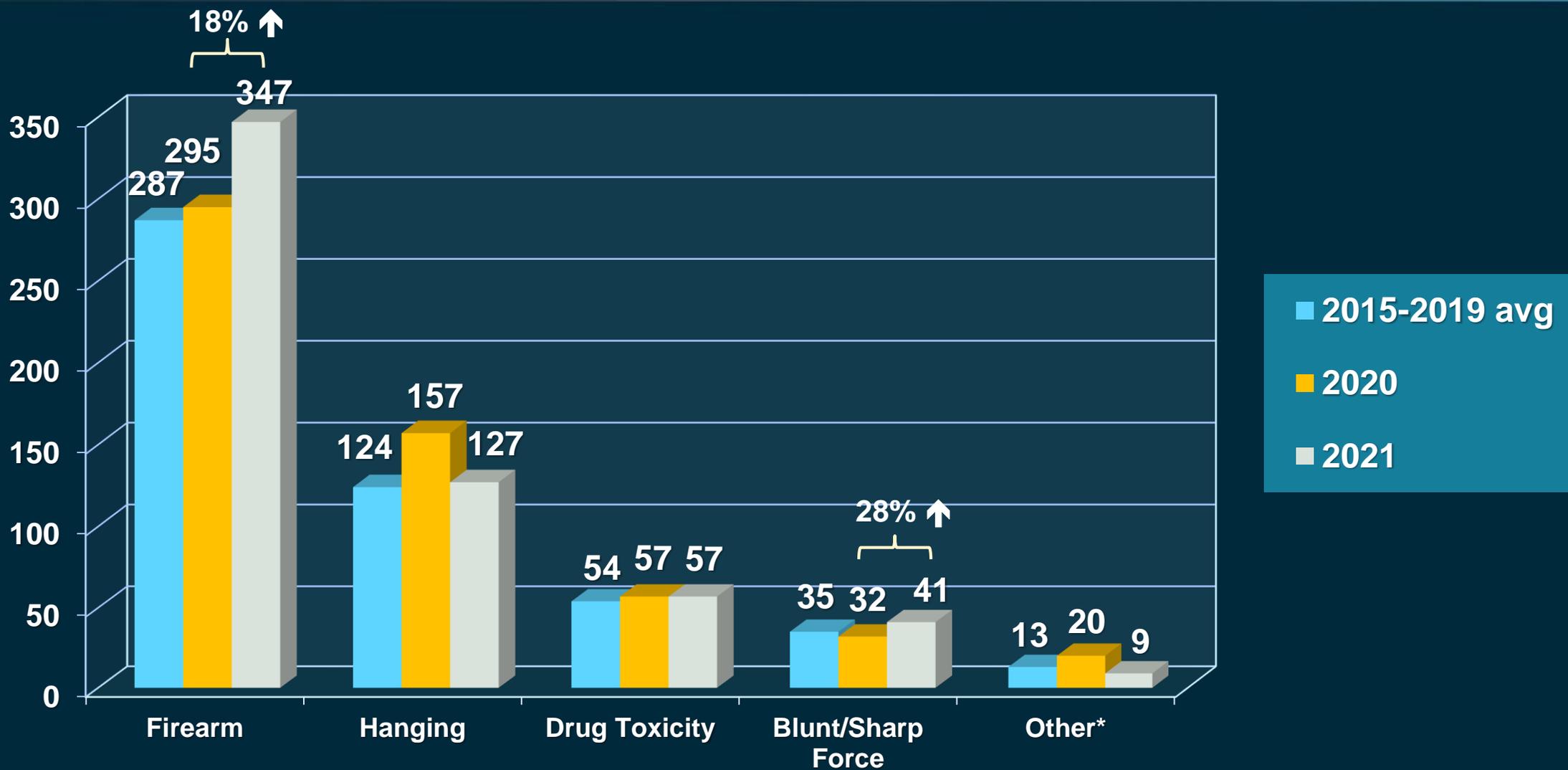
N=581\*

■ Male

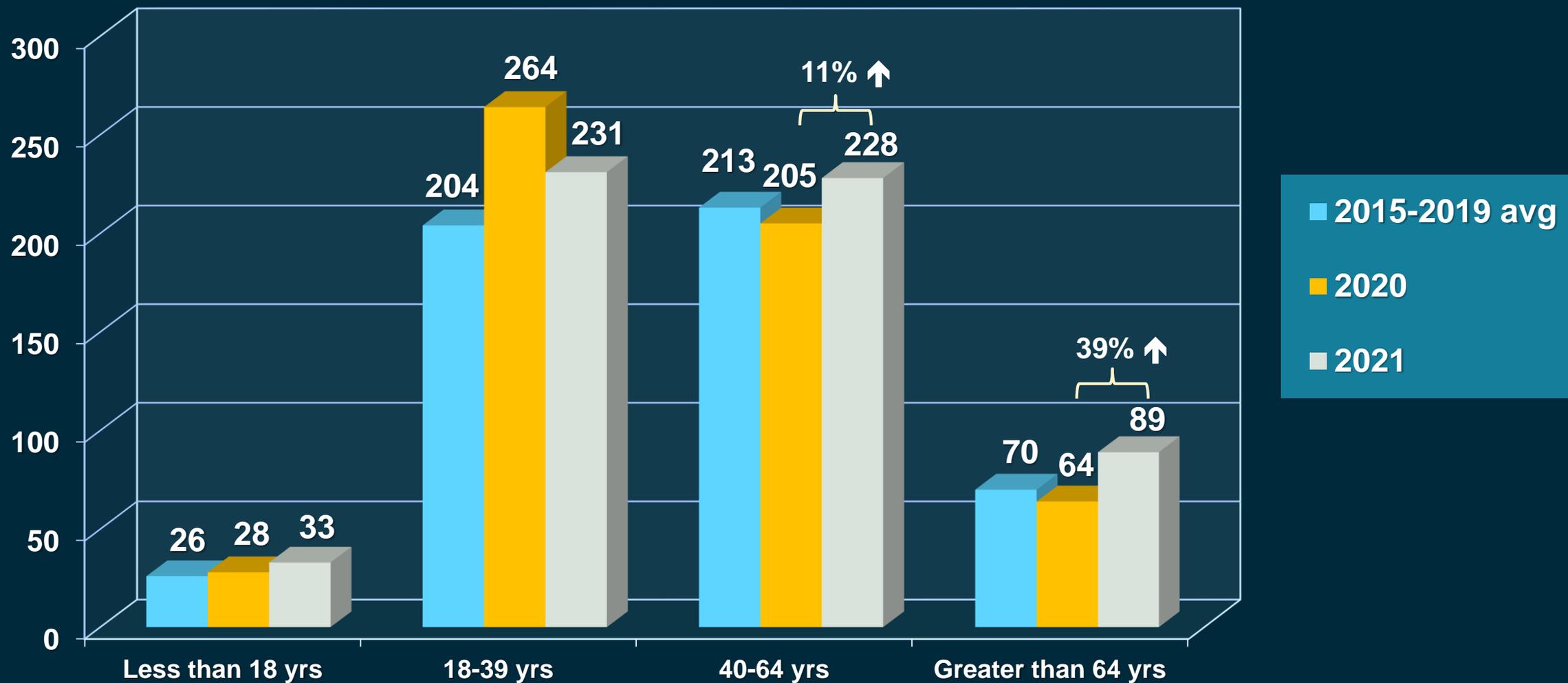
■ Female

\*Sex was unknown for 1 suicide case.

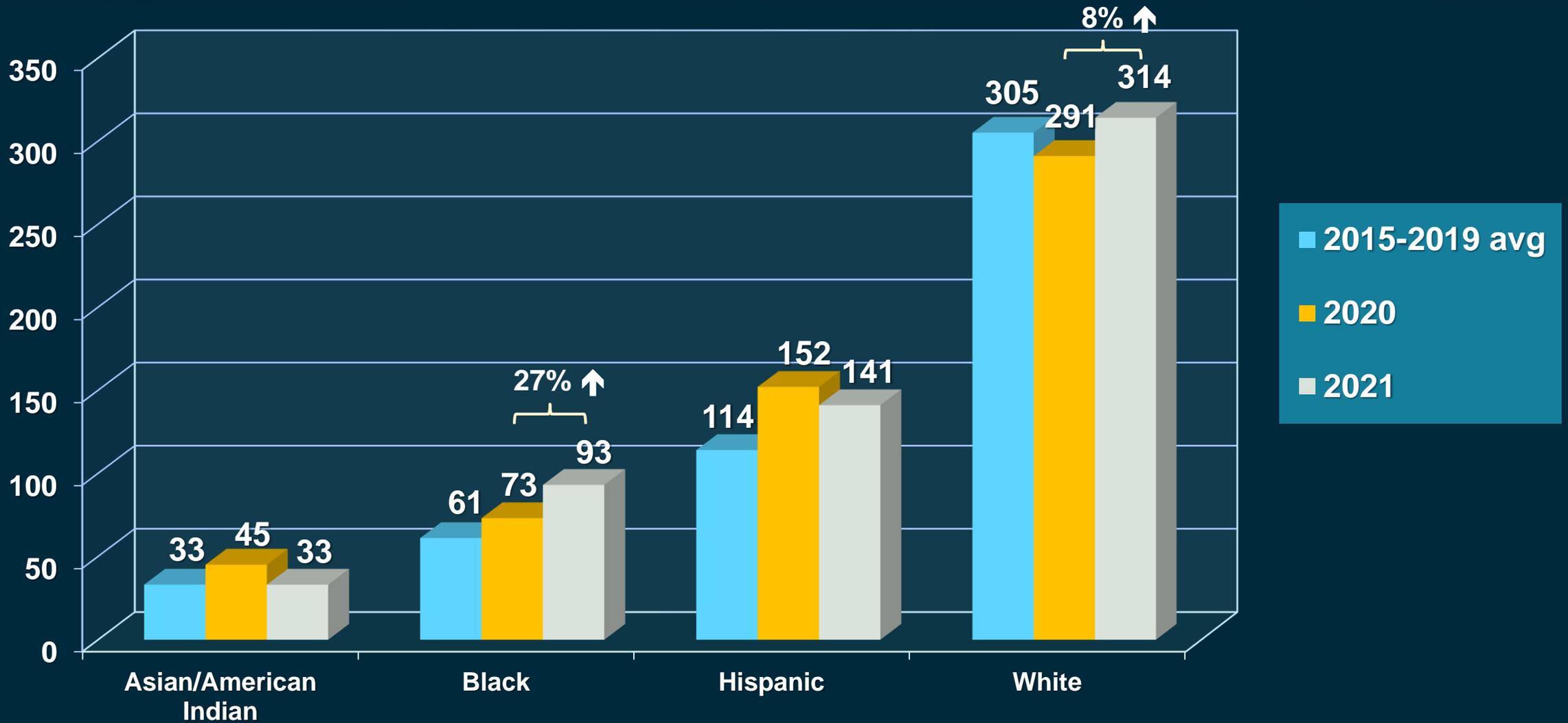
# Suicide Case Comparison Between Years by Cause



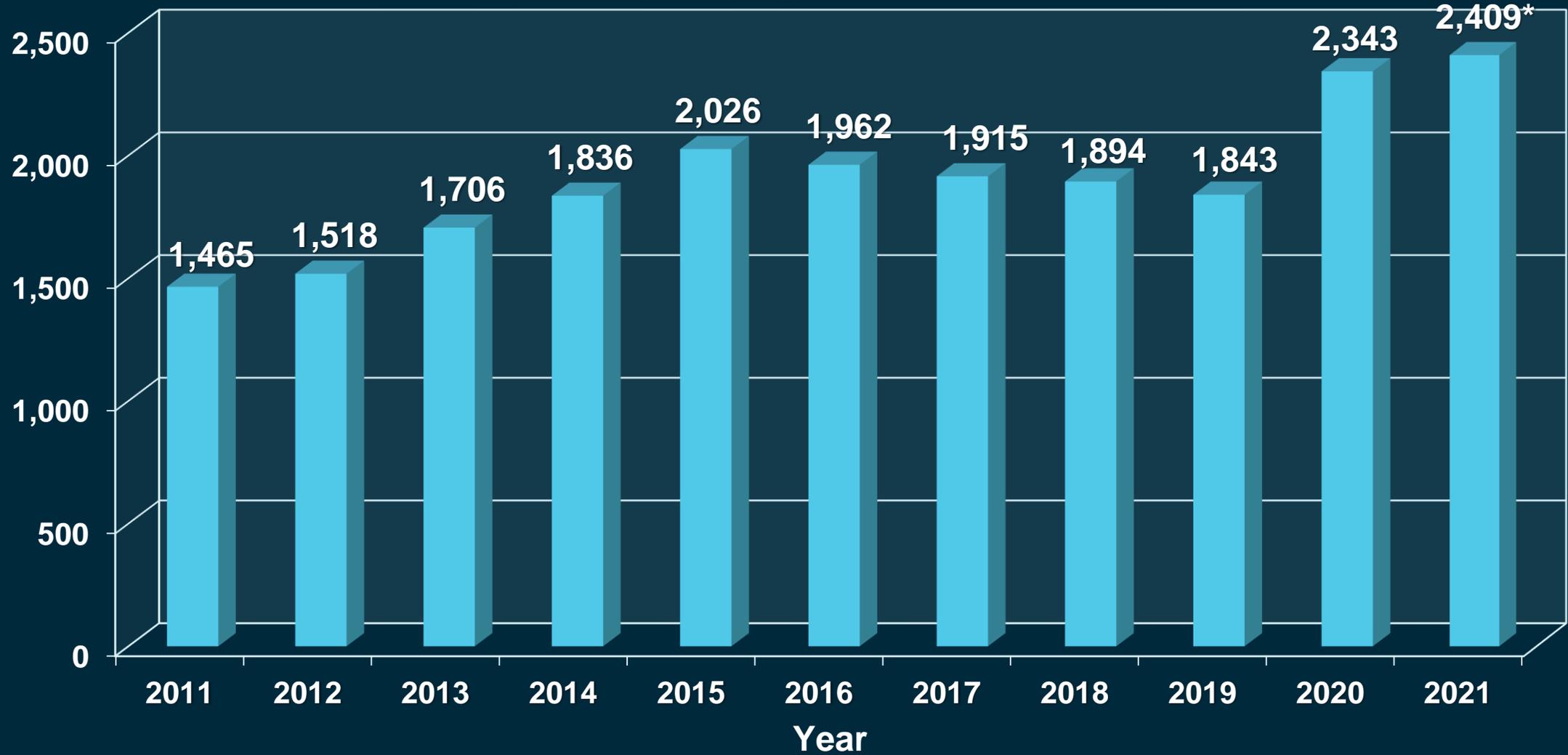
# Suicide Case Comparison Between Years by Age



# Suicide Case Comparison Between Years by Race

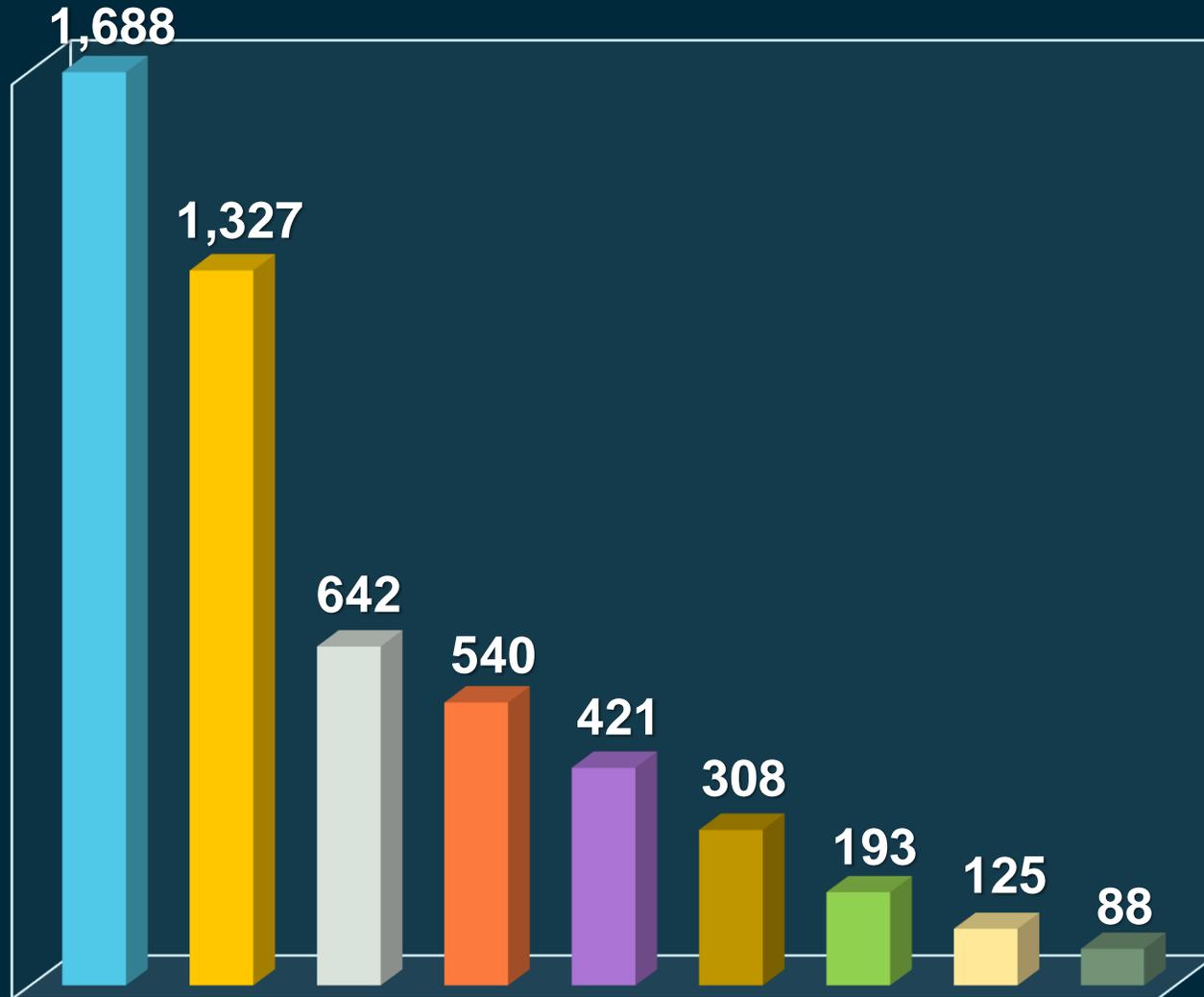


# Medicolegal Natural Cases



*\*This is a 3% increase from 2020 and a 64% increase from 2011.*

# Most Frequent Causes of Medicolegal Natural Death

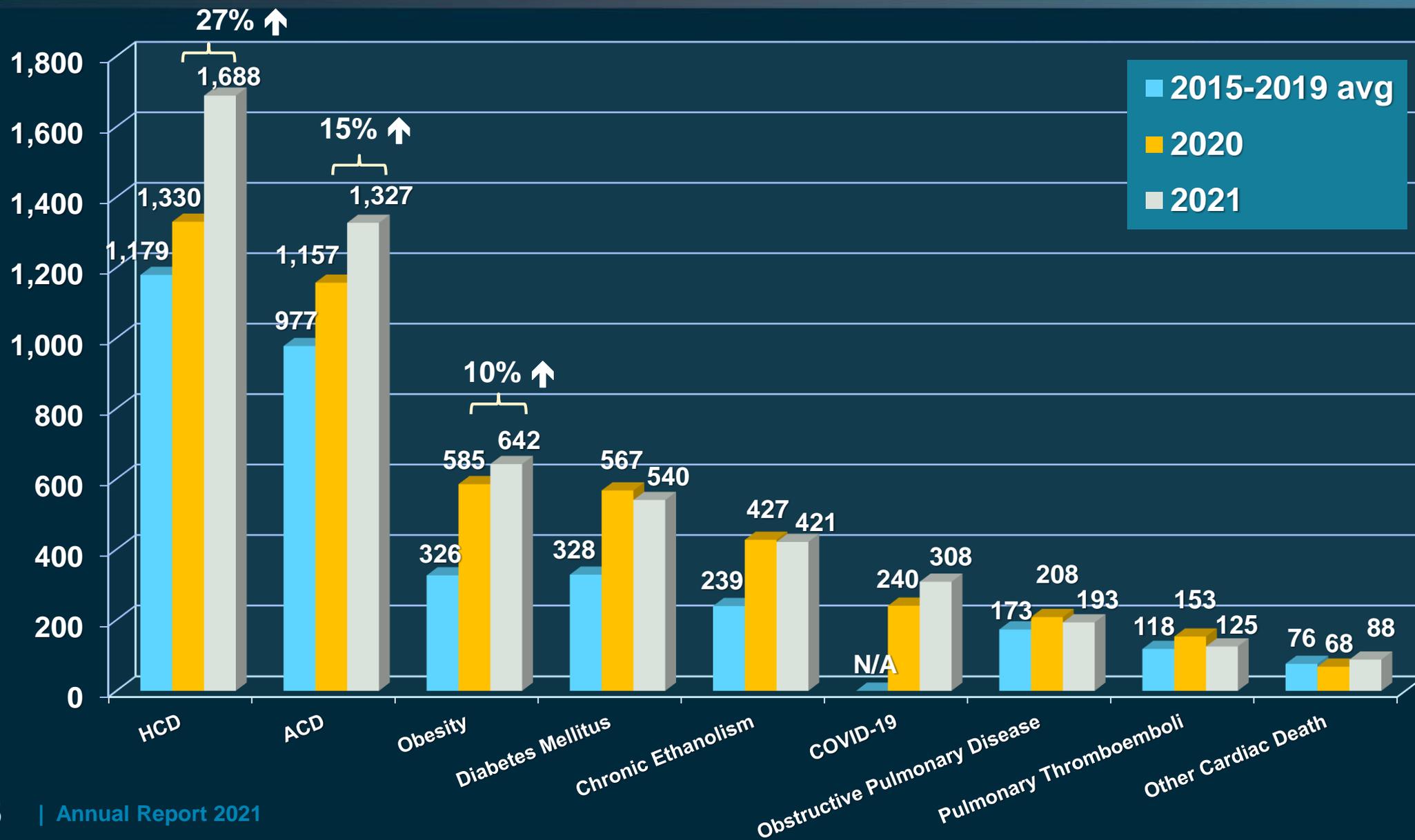


## 2,409 Natural Deaths in 2021

- Hypertensive Cardiovascular (HCD)
- Atherosclerotic Cardiovascular (ACD)
- Obesity
- Diabetes Mellitus
- Chronic Ethanolism
- COVID-19
- Chronic Obstructive Pulmonary Disease
- Pulmonary Thromboemboli/Embolus
- Other forms of cardiac death

These data do not reflect discrete cases because diseases may be combined within a case.

# Natural Case Comparison Between Years by Cause

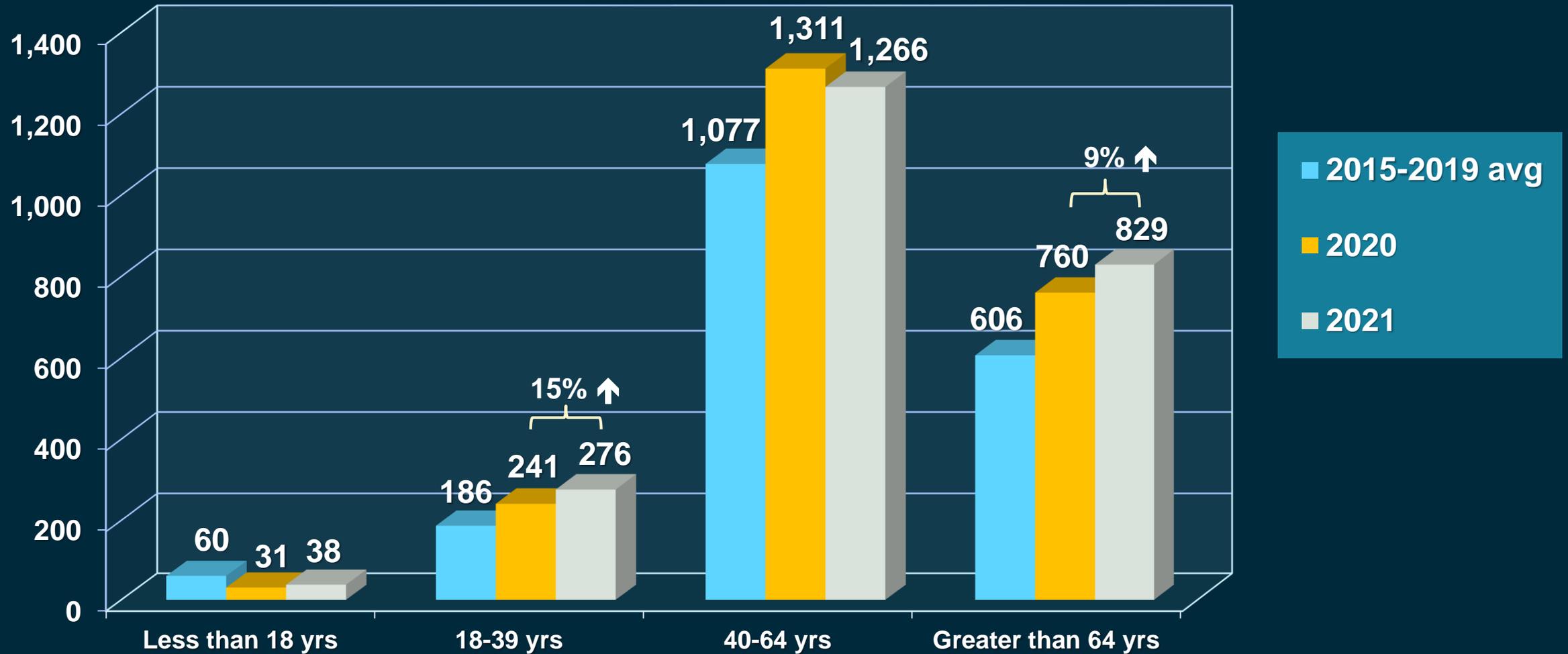


These data do not reflect discrete cases because diseases may be combined within a case.

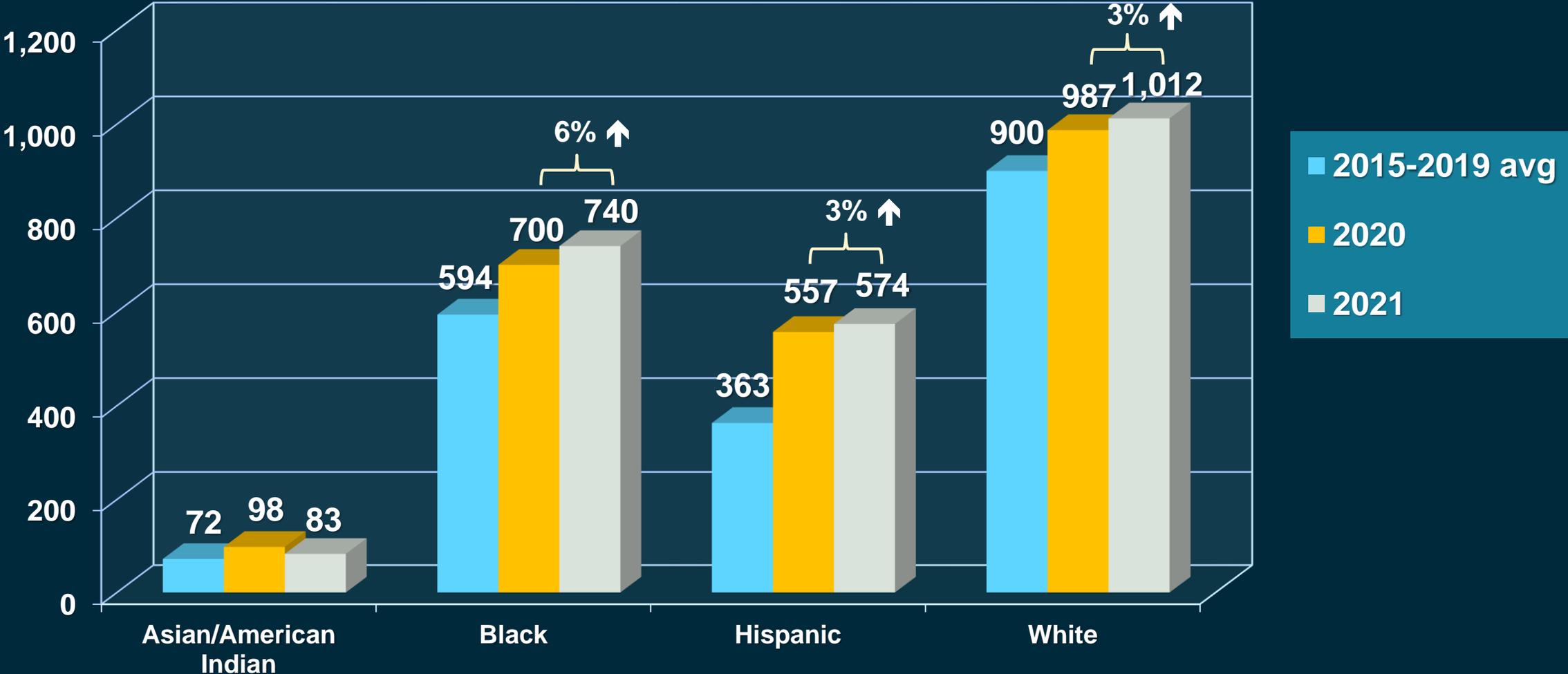
# Diabetes and Obesity

- For **573** decedents, diabetes mellitus was listed as the primary cause (**116**) or the contributing cause (**457**) of death
  - **68%** (**391**) were either overweight or obese (*Body Mass Index, BMI = 25+*)
- BMI was calculated for **5,675** decedents age 13 years or older, at least 60” tall and weighing at least 100 pounds:
  - **1,544** (27%) were obese with a BMI of 30 or greater
  - **1,878** (33%) were overweight with a BMI between 25 and 29
  - **2,253** (40%) decedents were of normal weight or underweight
  - **29** decedents weighed more than 400 lbs.

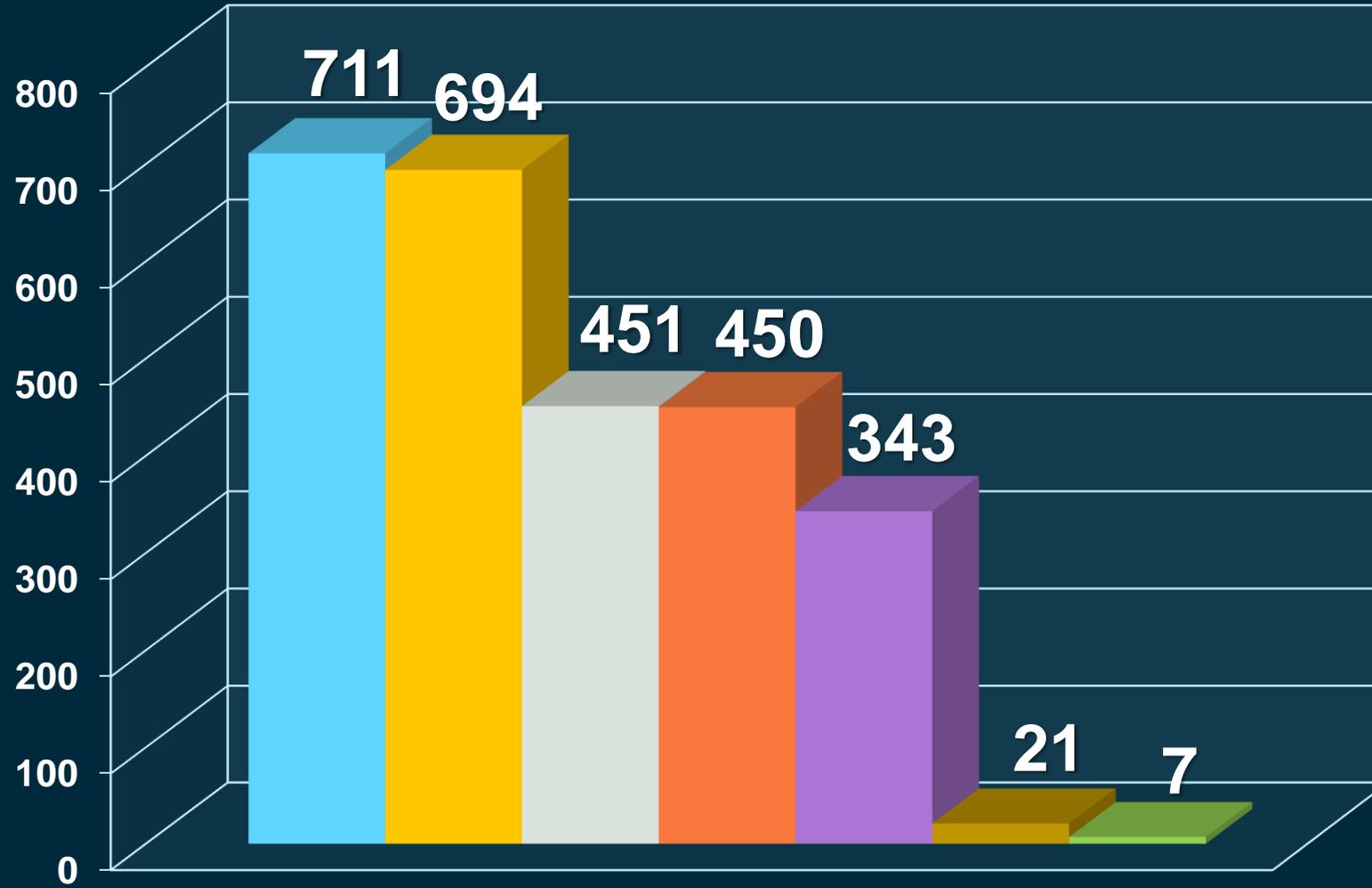
# Natural Case Comparison Between Years by Age



# Natural Case Comparison Between Years by Race



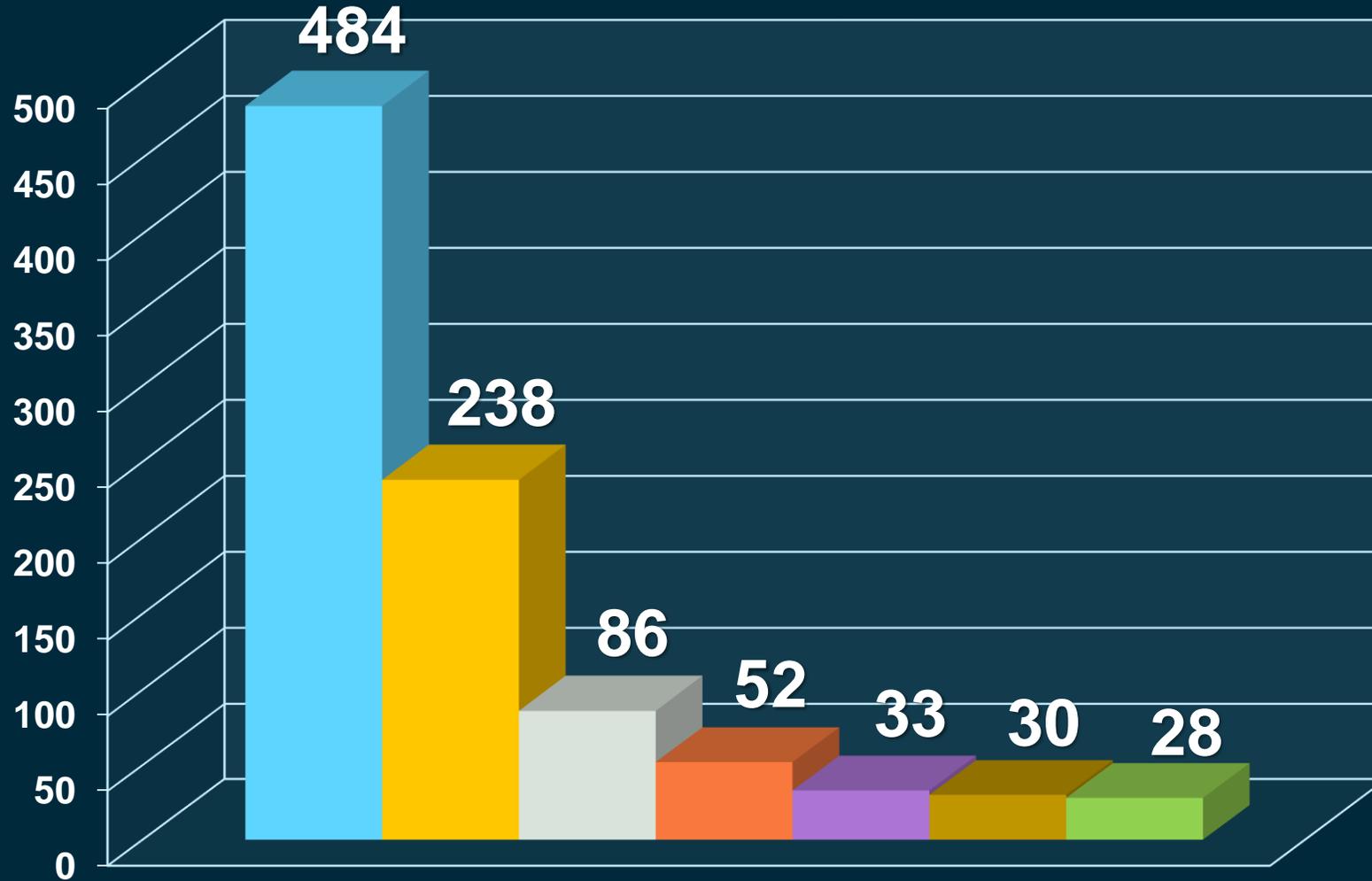
# Most Frequent Substances Listed in Cause of Death for ML Cases



- Ethanol
- Opiates/Opioids
- Amphetamine/Meth
- Cocaine
- Benzodiazepines
- Carisoprodol
- Acetaminophen

These data do not reflect discrete cases because drugs may be combined within a case.

# Opiates/Opioids Listed in Cause of Death for ML Cases

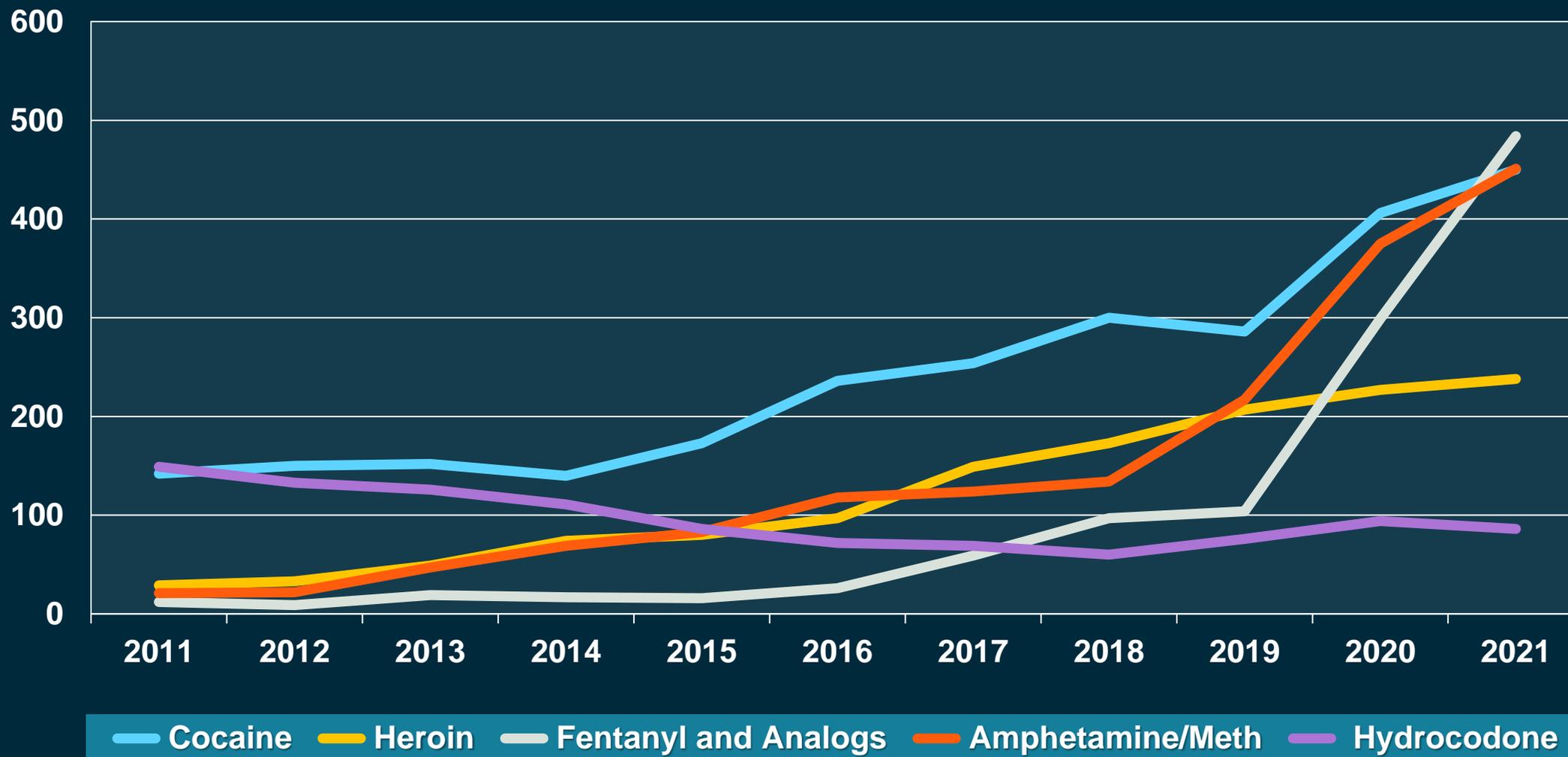


N=694

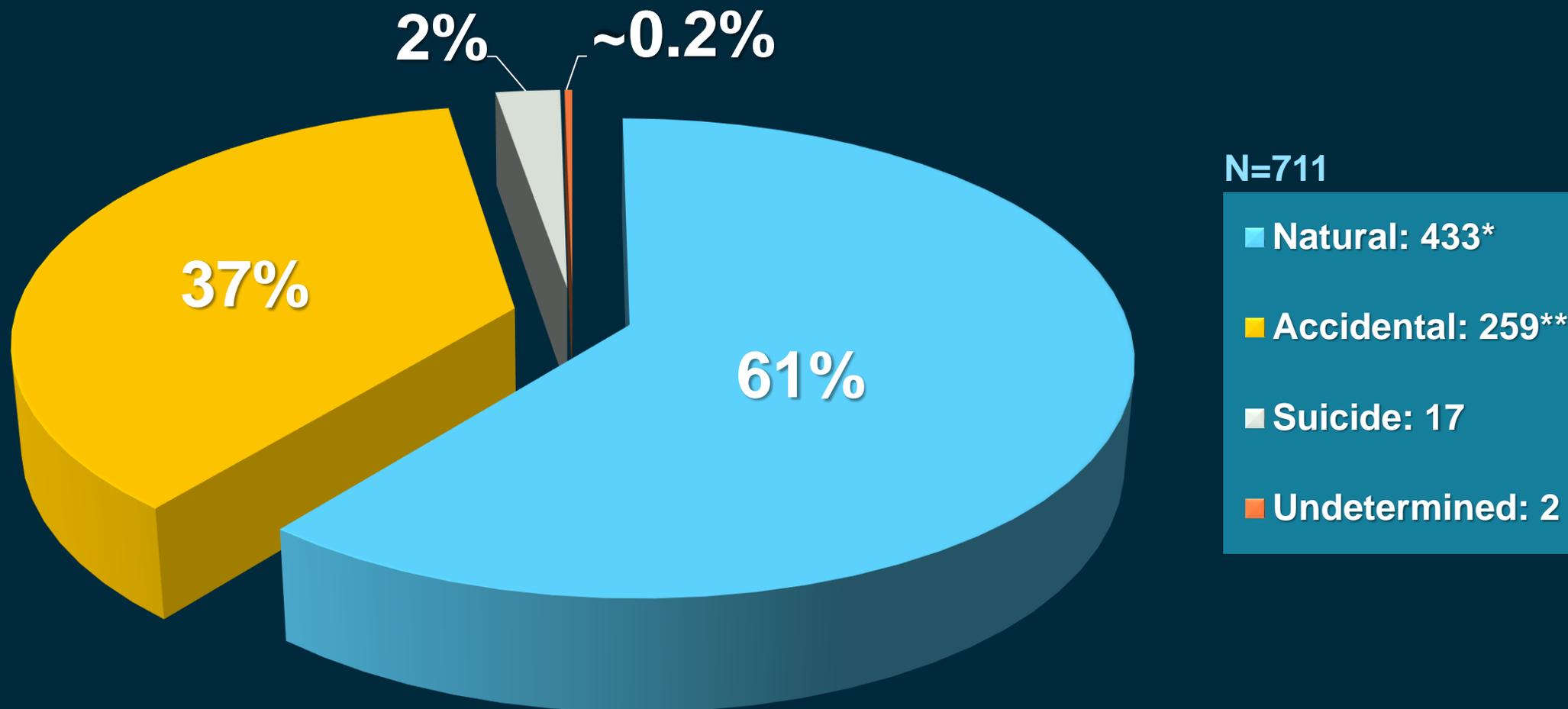
- Fentanyl and Analogs
- Heroin
- Hydrocodone
- Oxycodone
- Morphine
- Methadone
- Codeine

These data do not reflect discrete cases because drugs may be combined within a case.

# Trends in Death from Selected Drugs



# Cause of Death Due to Ethanol



\*For 96 deaths, the primary cause of death was attributed solely to chronic alcoholism.

\*\*Ethanol is the sole intoxicant in 29 accidental cases (including 19 cases of acute alcohol toxicity).

# Unexplained Sudden Death in Infants

The historical cause of the death designation Sudden Infant Death Syndrome, or SIDS, is an outdated term and was completely phased out in 2020. The accepted practice at this time is to acknowledge these deaths as unexplained, wherein no specific cause of death can be determined. The deaths are still acknowledged as “sudden” in that they are unexpected.

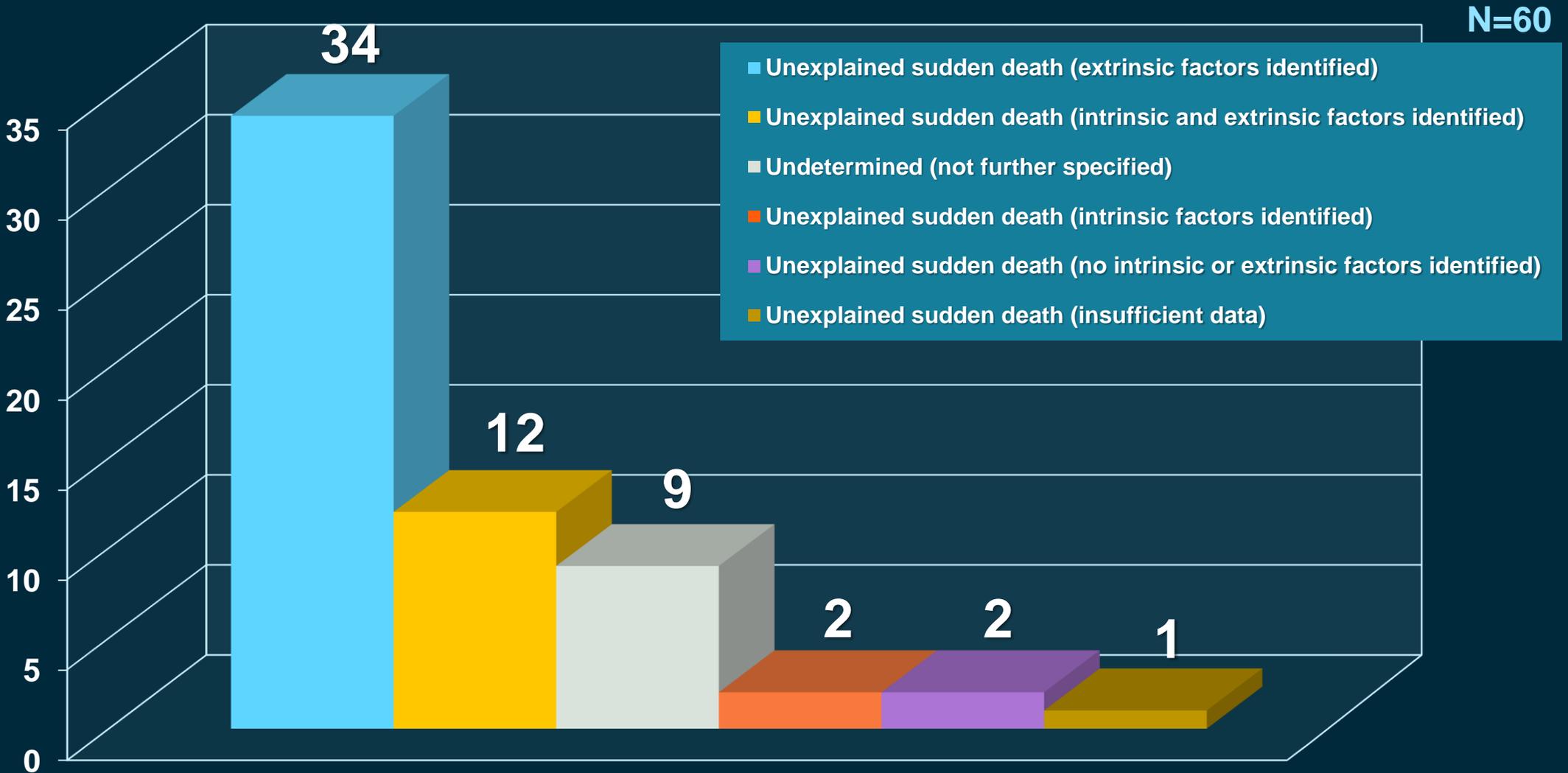
Although no mechanism of death can be identified for these infants, some risk factors may be identified. These associated findings may or may not contribute to the death, but their existence are acknowledged in the revised cause of death classification scheme. These associated findings may be intrinsic to the decedent (some natural disease) or extrinsic (such as an unsafe sleep environment). Some infant deaths are unexplained, but other factors relating to the investigation are found that do not really fit into the above categories. The term “undetermined (not further specified)” is used in these instances. Finally, when such a death occurs and investigative information is incomplete after all avenues to obtain that information have been exhausted, the classification “undetermined (insufficient data)” is used.

The revised classification scheme includes the following causes of death (The manner of death in each of these categories is undetermined):

1. Unexplained Sudden Death (No Identified Intrinsic or Extrinsic Factors)
2. Unexplained Sudden Death (Intrinsic Factors Identified)
3. Unexplained Sudden Death (Extrinsic Factors Identified)
4. Unexplained Sudden Death (Intrinsic and Extrinsic Factors Identified)
5. Undetermined (Not Further Specified)
6. Undetermined (Insufficient Data)

Reference: *Bundock E.A and Corey T.S., editors, Unexplained Pediatric Deaths: Investigation, Certification and Family Needs, 1<sup>st</sup> edition Academic Forensic Pathology International, San Diego, CA, 2019.*

# Unexplained Sudden Death in Infants

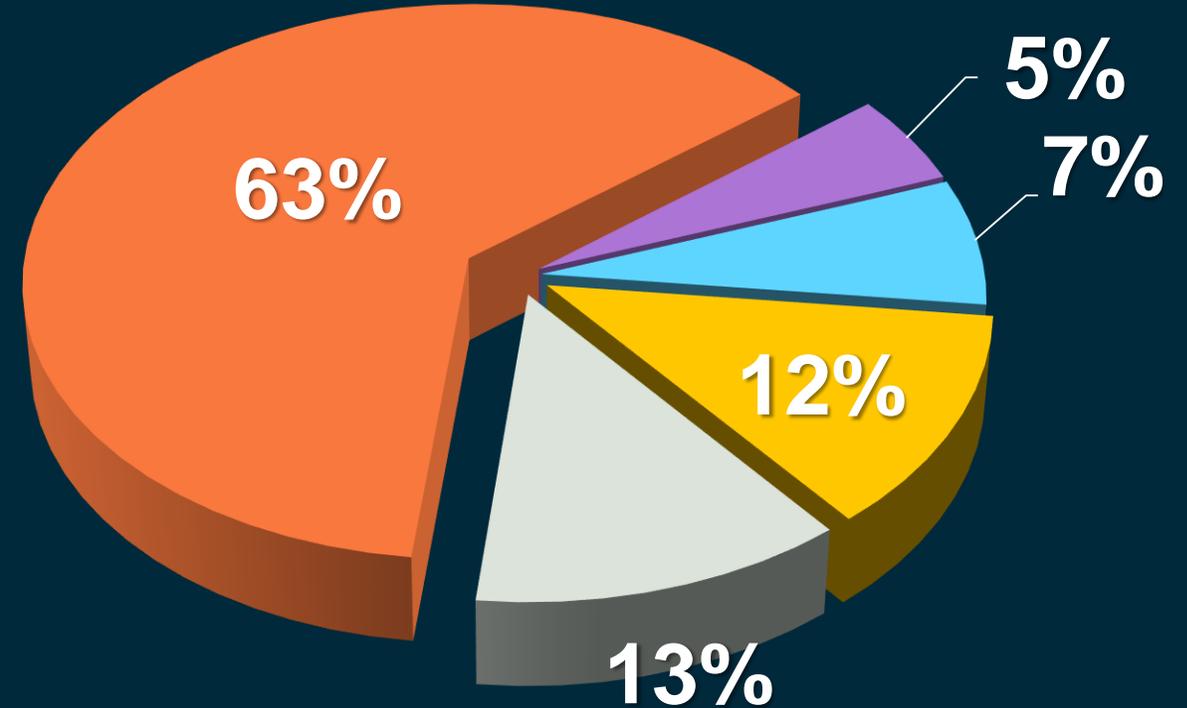


# Infant/Fetal Deaths

The birth count for Harris County was estimated to be 70,644 for 2021.

*(Data provided by Texas Department of State Health Services)*

- **96** infant/fetal death cases  
*(less than or equal to 1 year old)*
- **60** cases of Undetermined Manner

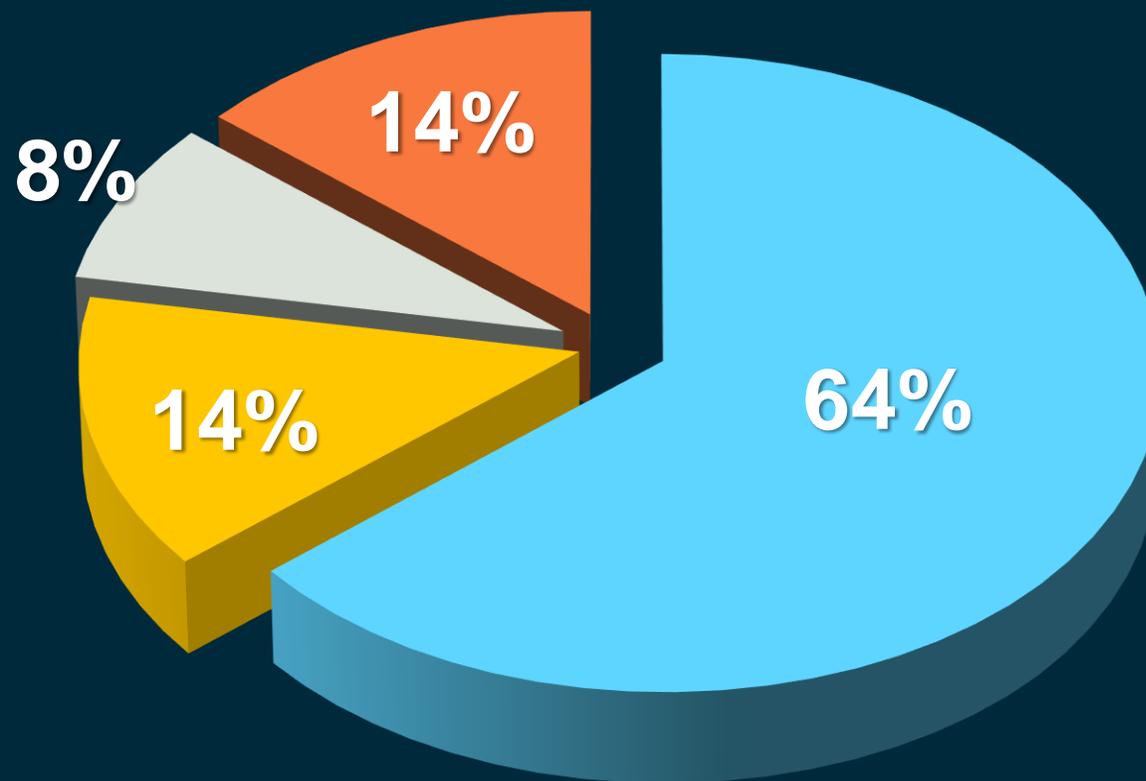


N=96

- |               |                    |
|---------------|--------------------|
| ■ Accident: 7 | ■ Homicide: 12     |
| ■ Natural: 12 | ■ Undetermined: 60 |
| ■ Fetal: 5    |                    |

# Toddler Deaths (Age 1 – 4 Years)

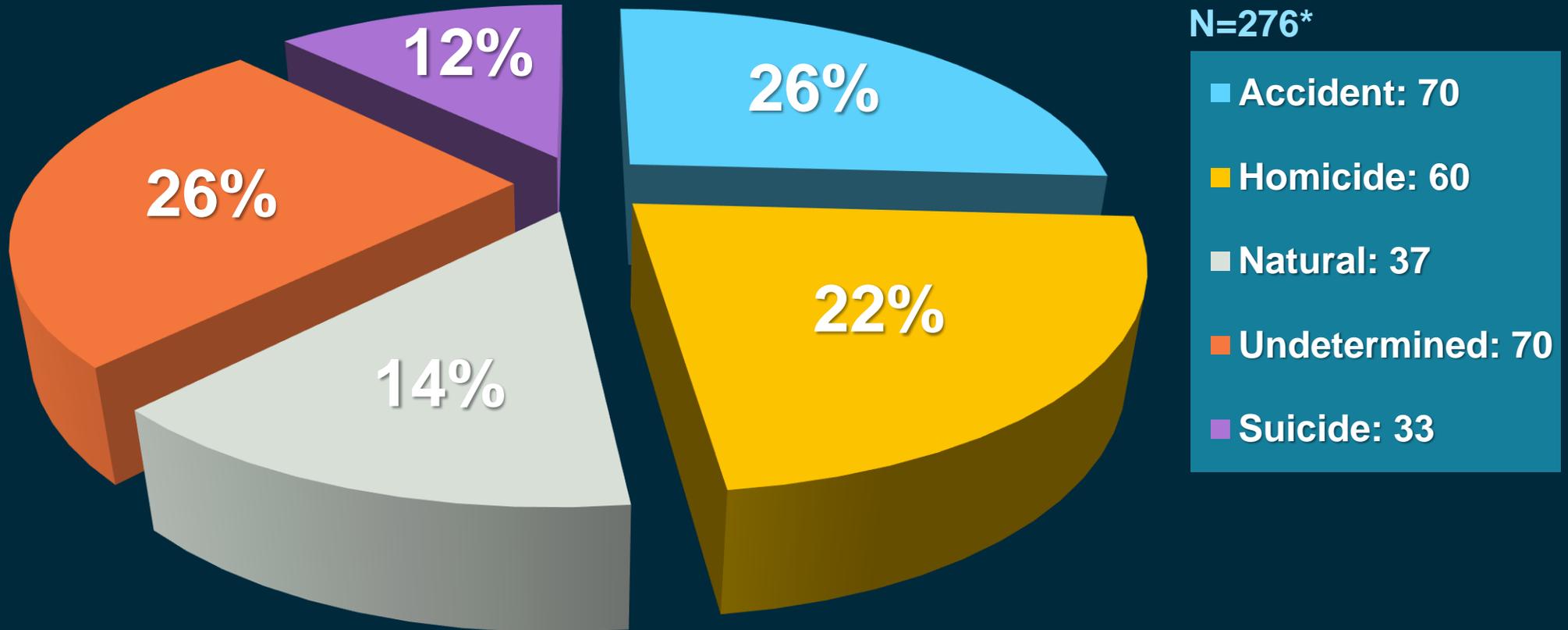
- **Non-natural Deaths Include:**
  - **9** toddlers died in motor vehicle crashes
  - **11** toddlers died by accidental drowning
  - **5** homicide cases
    - 4 males
    - 1 female



N=36

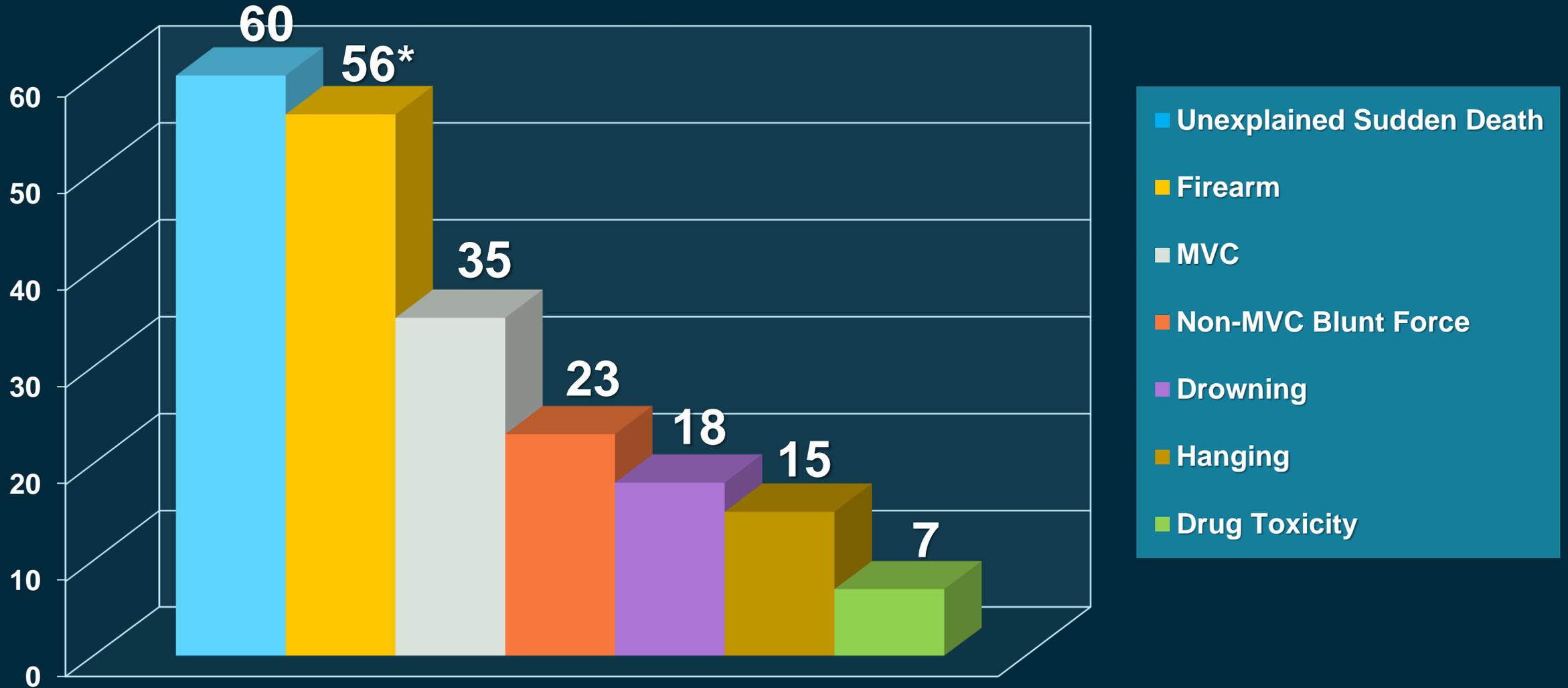
■ Accident: 23	■ Homicide: 5
■ Natural: 3	■ Undetermined: 5

# Pediatric Manners of Death (Age 0 – 17 Years)

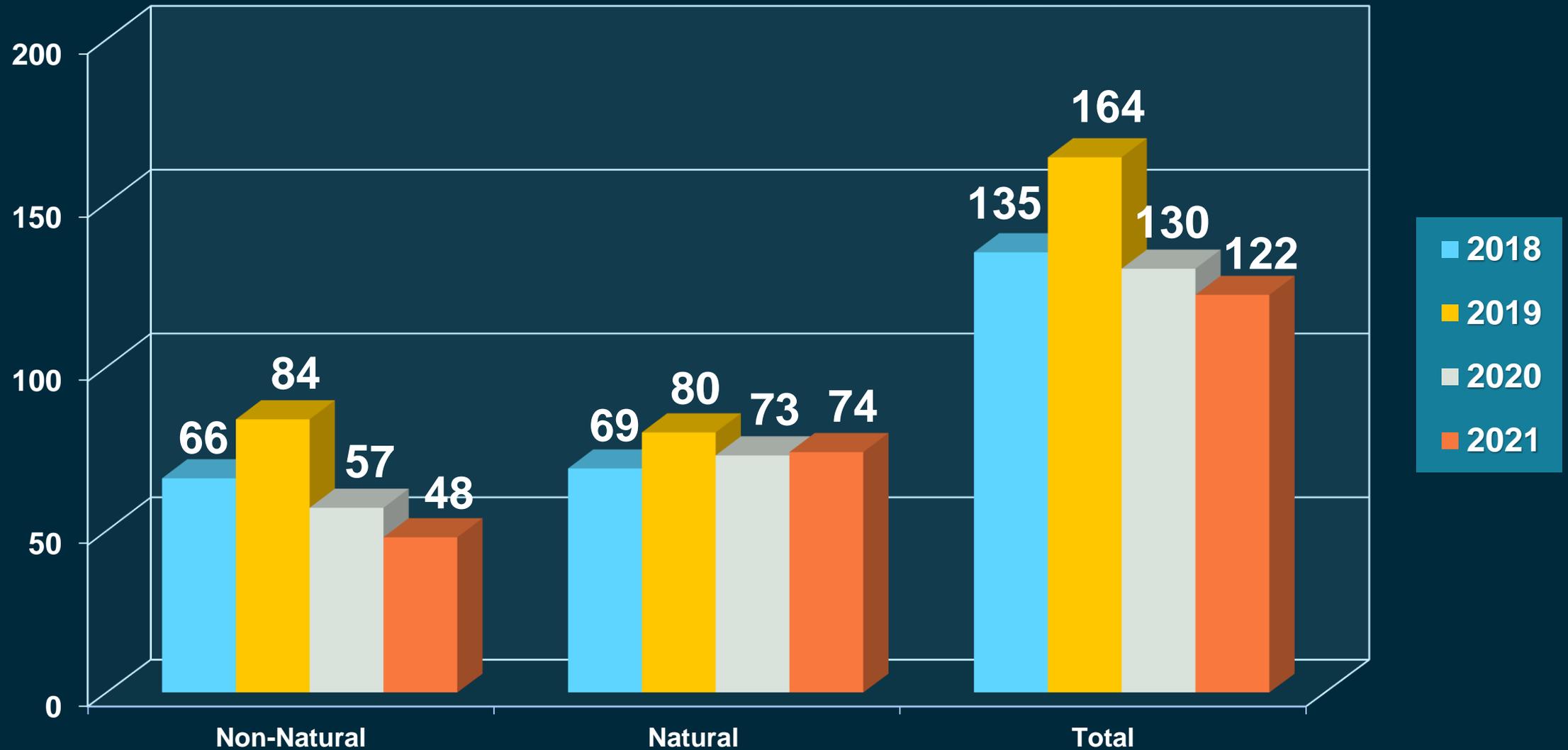


\*Excludes fetal deaths (6)

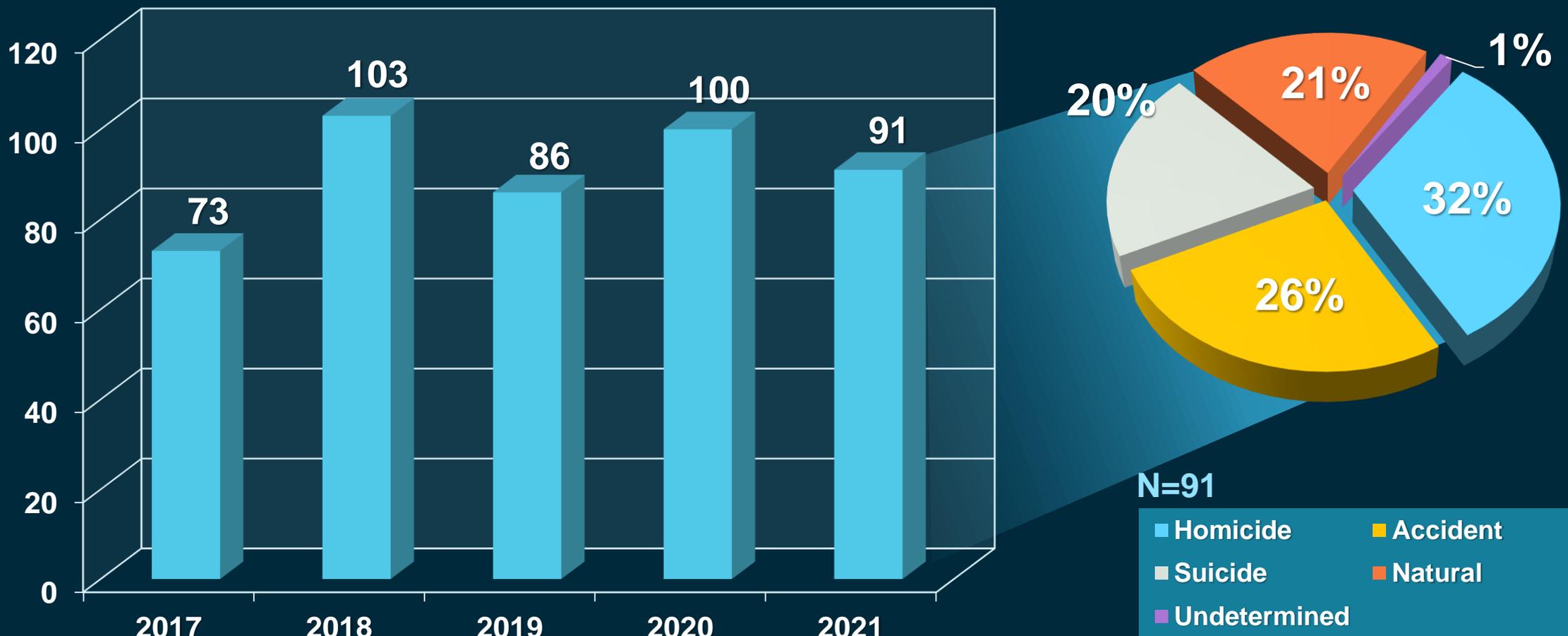
# Most Frequent Cause of Pediatric Deaths (Age 0 – 17 Years)



# “While at Work” Deaths

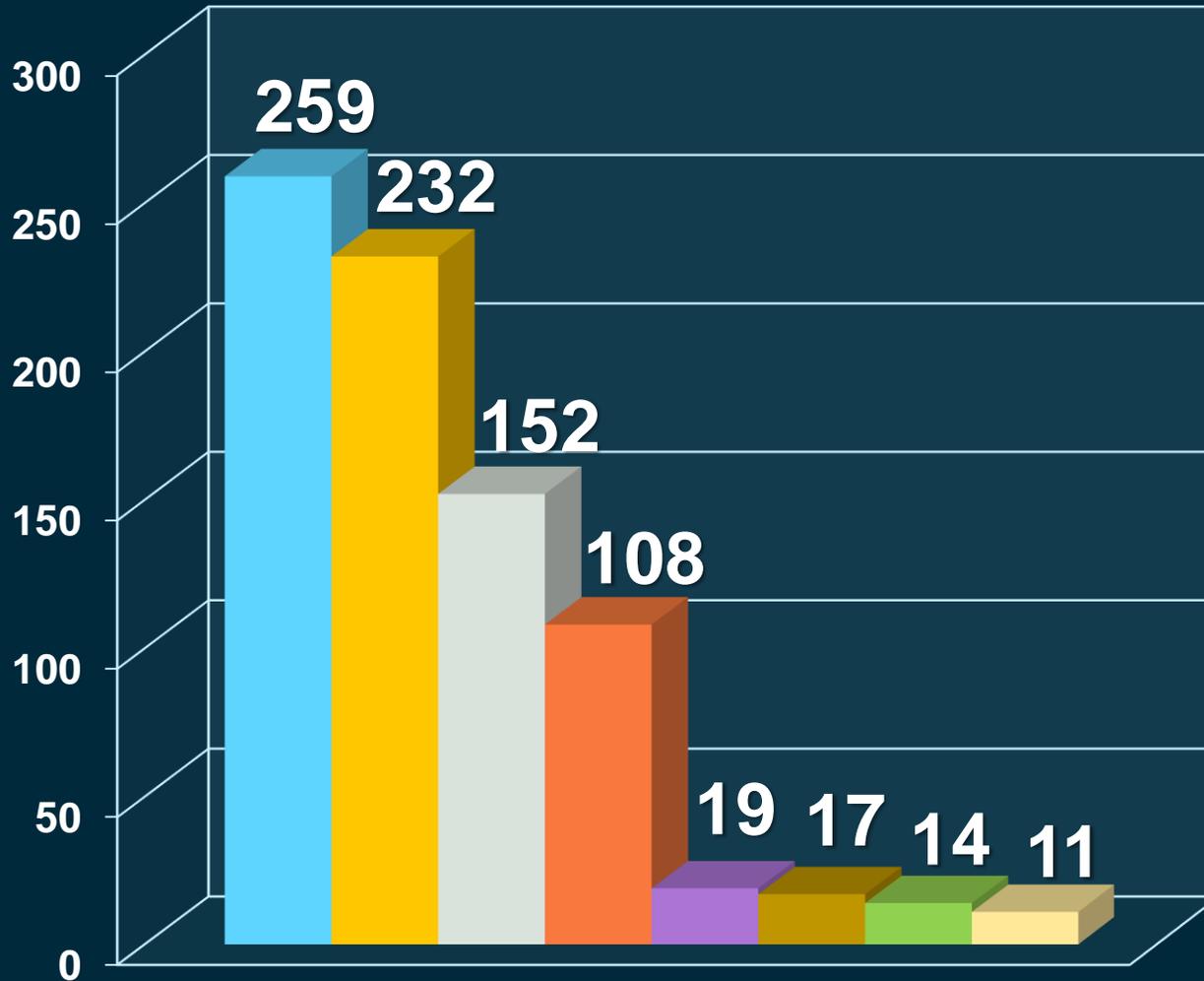


# Deaths During Police Intervention\*



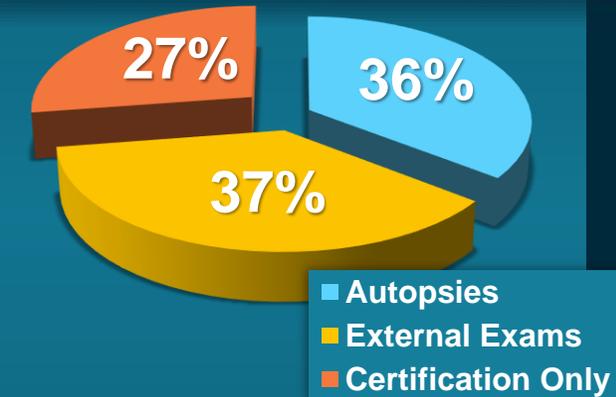
\*These include deaths in which the circumstances of the death place the decedent in either direct or indirect contact with law enforcement, such as incarceration, apprehension, and pursuit. This category of death is not limited to police shootings, arrest-related deaths, apprehension deaths, or in-custody deaths.

# HCIFS Certified COVID-19 Deaths with Comorbidities



N=434\*

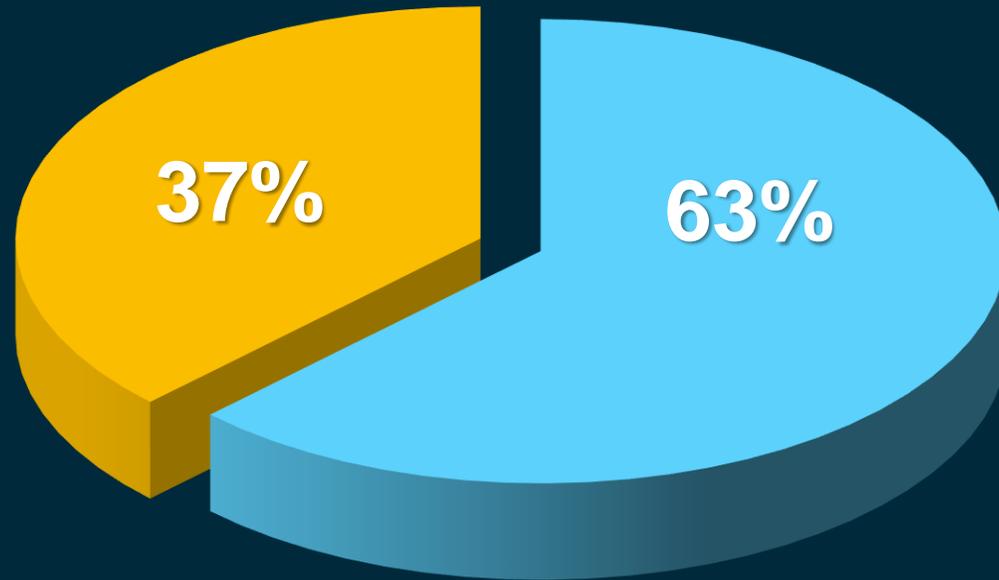
- Hypertensive cardiovascular disease
- Obesity
- Diabetes mellitus
- Atherosclerotic cardiovascular disease
- Chronic obstructive pulmonary disease
- Asthma
- Pulmonary thromboembolism
- Chronic ethanolism



These data do not reflect discrete cases because diseases may be combined within a case.

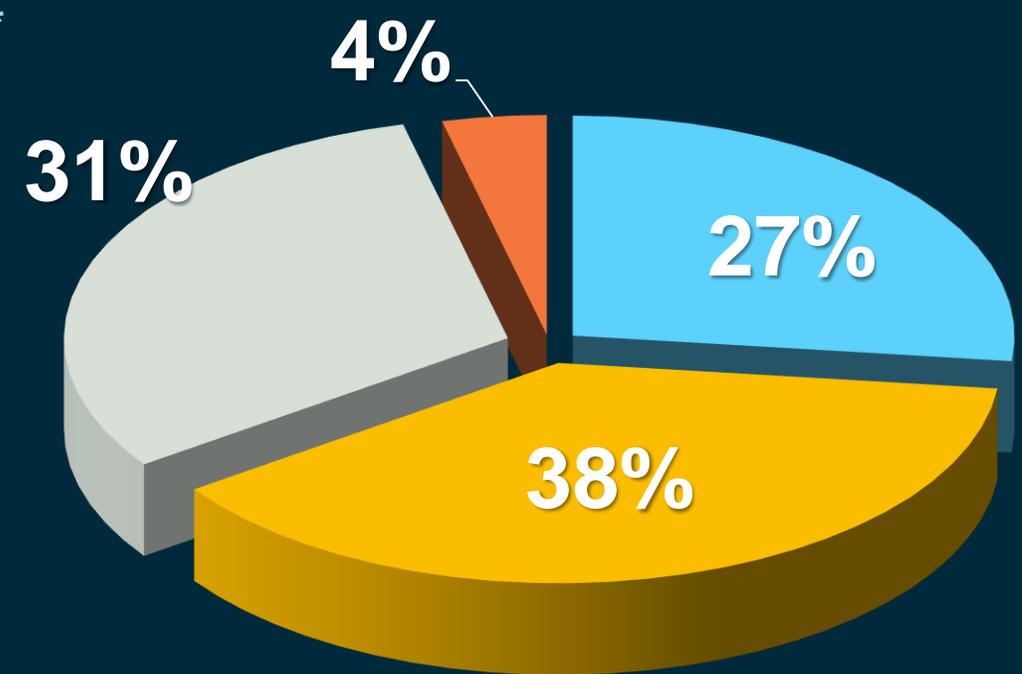
# HCIFS Received COVID-19 Cases Demographics in 2021

## Sex



■ Male: 692   ■ Female: 414

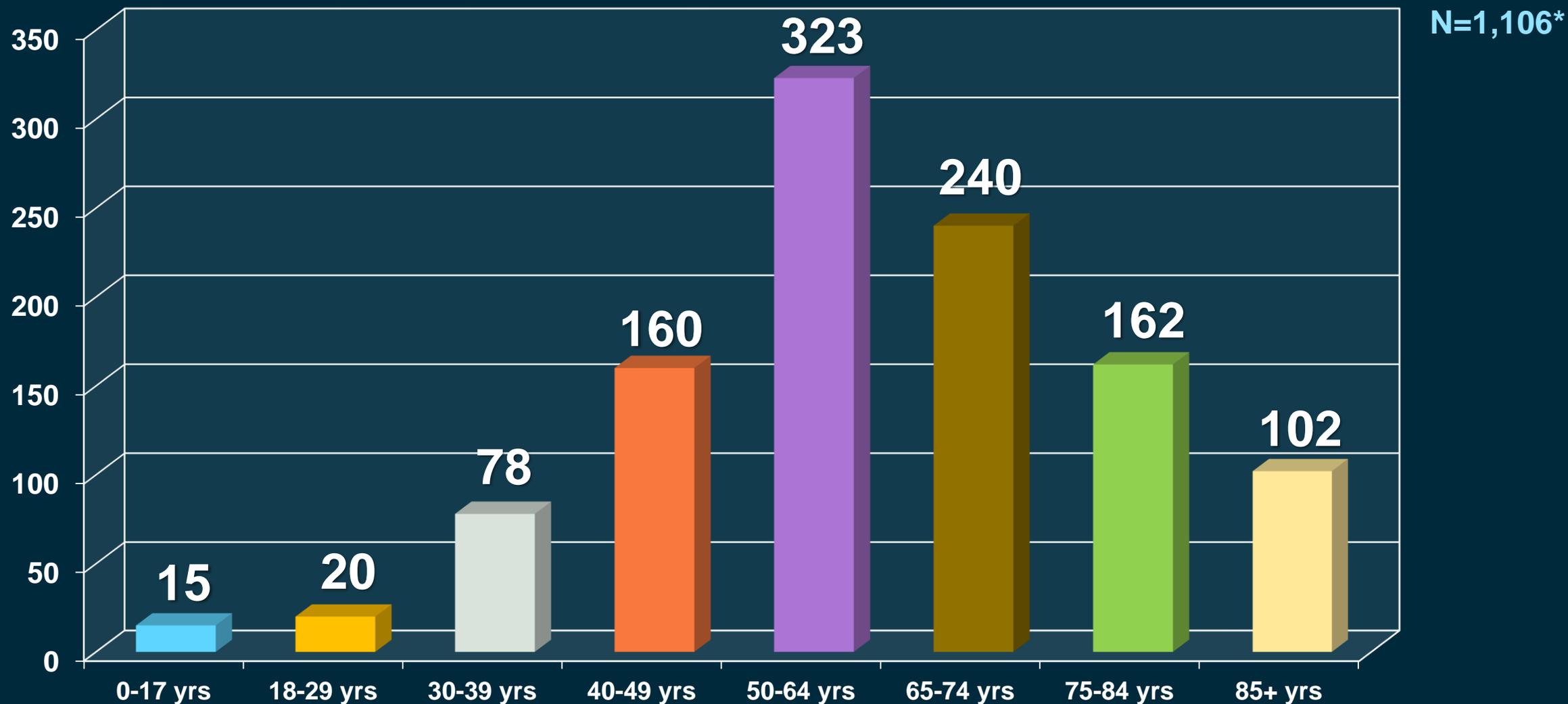
## Race/Ethnicity



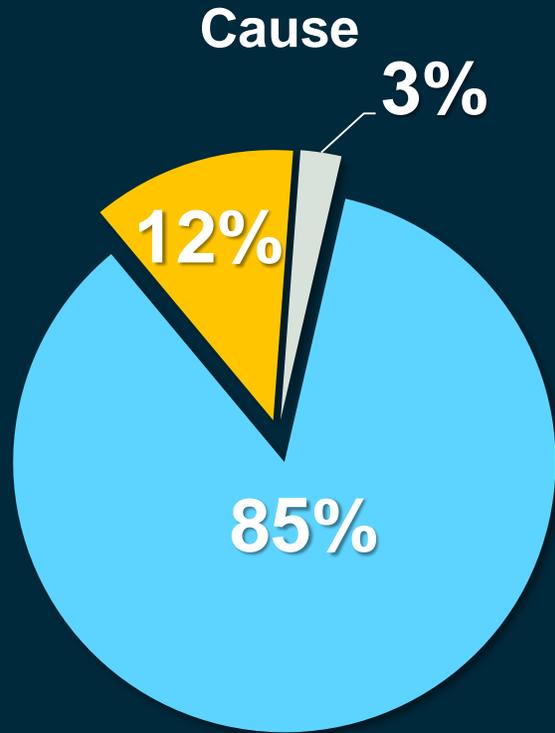
■ Black: 297   ■ Hispanic: 425  
■ White: 342   ■ Asian: 42

N=1,106\*

# Age Distribution for COVID-19 Cases

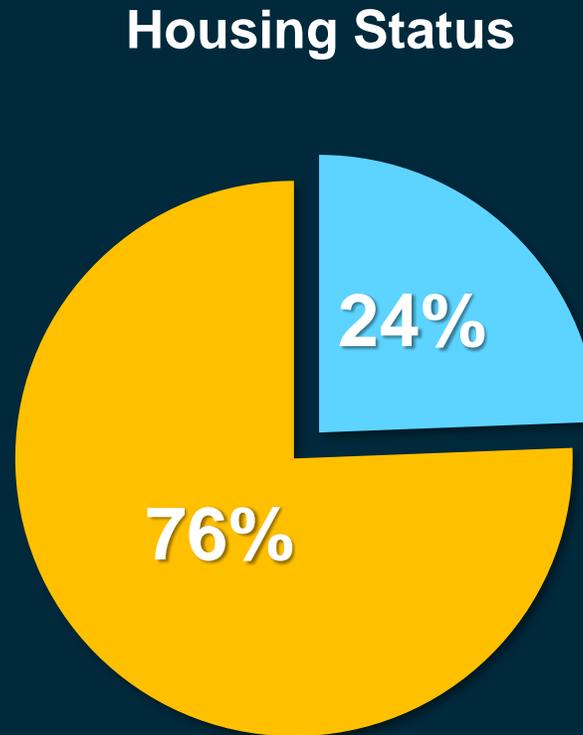


# 2021 February Winter Storm – Deaths Due to Freezing Weather



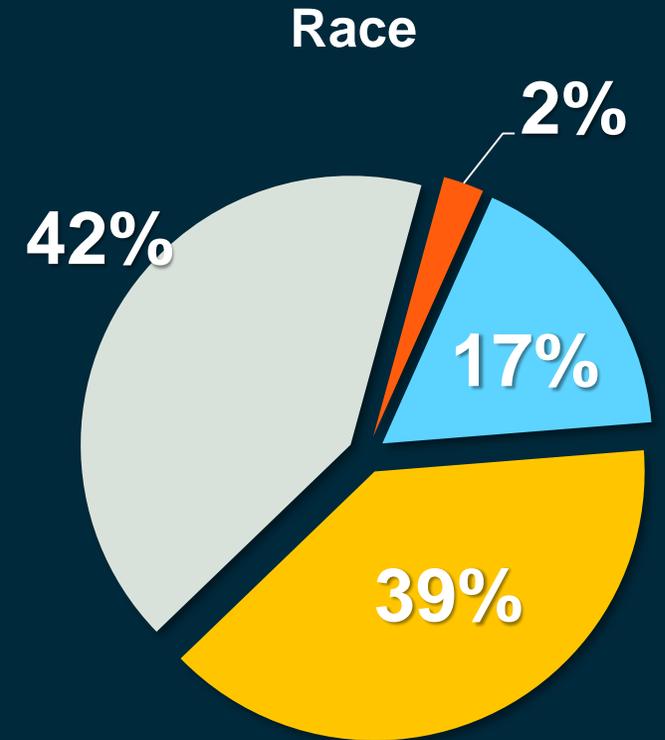
N=41

- Hypothermia: 35
- Carbon Monoxide Toxicity: 5
- \*Blunt Trauma: 1



N=41

- Homeless: 10
- Fixed Residence: 31



N=41

- Hispanic: 7
- Black: 16
- White: 17
- Asian: 1

# ML Cases Received by Manner in 2021 vs Pre-COVID

Manner of Death	Pre-COVID 5 yr. Average	2021	Difference	% Change
	N	N		
Suicide	511	581	70	14%
Homicide	465	720	255	55%
Accidental	1,607	2,029	422	26%
Natural	1,921	2,409	488	25%
Undetermined	151	207	56	37%
<b>Total</b>	<b>4,655</b>	<b>5,946</b>	<b>1,291</b>	<b>28%</b>

# ML Cases Received by Manner/Cause in 2021 vs Pre-COVID

Manner of Death	Pre-COVID 5 yr. Average	2021	Difference	% Change
	N	N		
Suicide; Firearm	287	347	60	21%
Suicide; Hanging	124	127	3	2%
Homicide; Firearm	370	608	238	64%
Accidental; Drug Toxicity	582	1,129	547	94%
Accidental; MVC	524	558	34	6%
Natural*; Cardiac Diseases	1,521	1,903	382	25%
Natural*; Obesity	326	642	316	97%
Natural*; Diabetes	328	540	212	65%
Natural*; Chronic Ethanolism	239	421	182	76%
Natural*; COVID-19	-	308	80**	35%**
<b>Total</b>	<b>4,301</b>	<b>6,583</b>	<b>1,974</b>	<b>37%</b>

\* Natural death data does not reflect discrete cases because causes may be combined within a case.

\*\* Difference in COVID-19 for 2021 is calculated by subtracting out ML COVID-19 cases in 2020 (228).

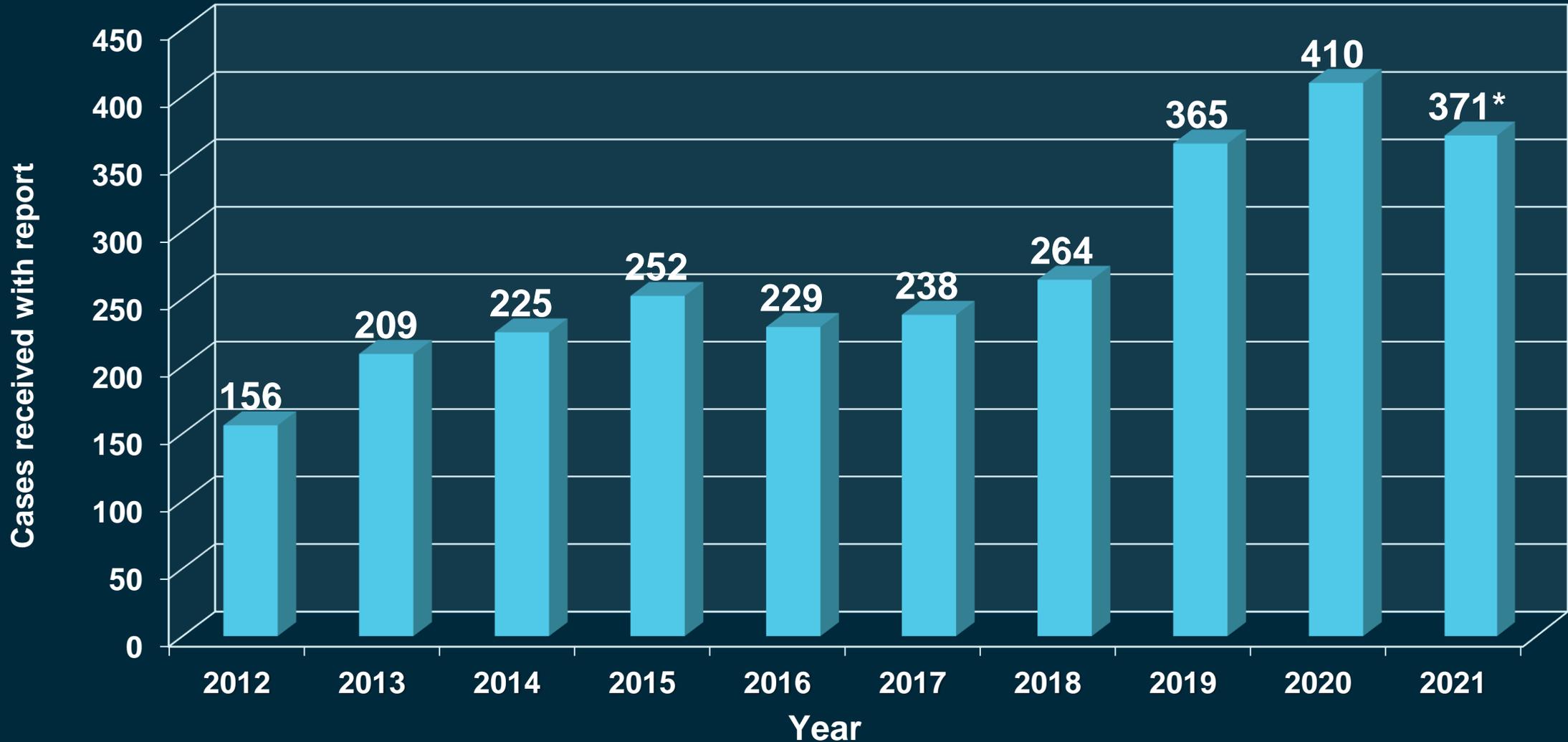
# Organ and Tissue Donation Summary

- **HCIFS maintains agreements with:**
  - LifeGift
  - Lions Eye Bank of Texas at Baylor College of Medicine
  - Biograft Transplant Services
  
- **269 ML cases were released in 2021 for organ and/or tissue donation**

# Forensic Anthropology

- Staffed by **three** doctoral-level forensic anthropologists, all diplomates of the American Board of Forensic Anthropology
- **2021 casework:**
  - **371** total cases received with written reports provided
  - **260** trauma cases analyzed
  - **11** death scenes with skeletal recovery
  - **31** cases of remains determined to be non-human

# Forensic Anthropology Caseload Trend

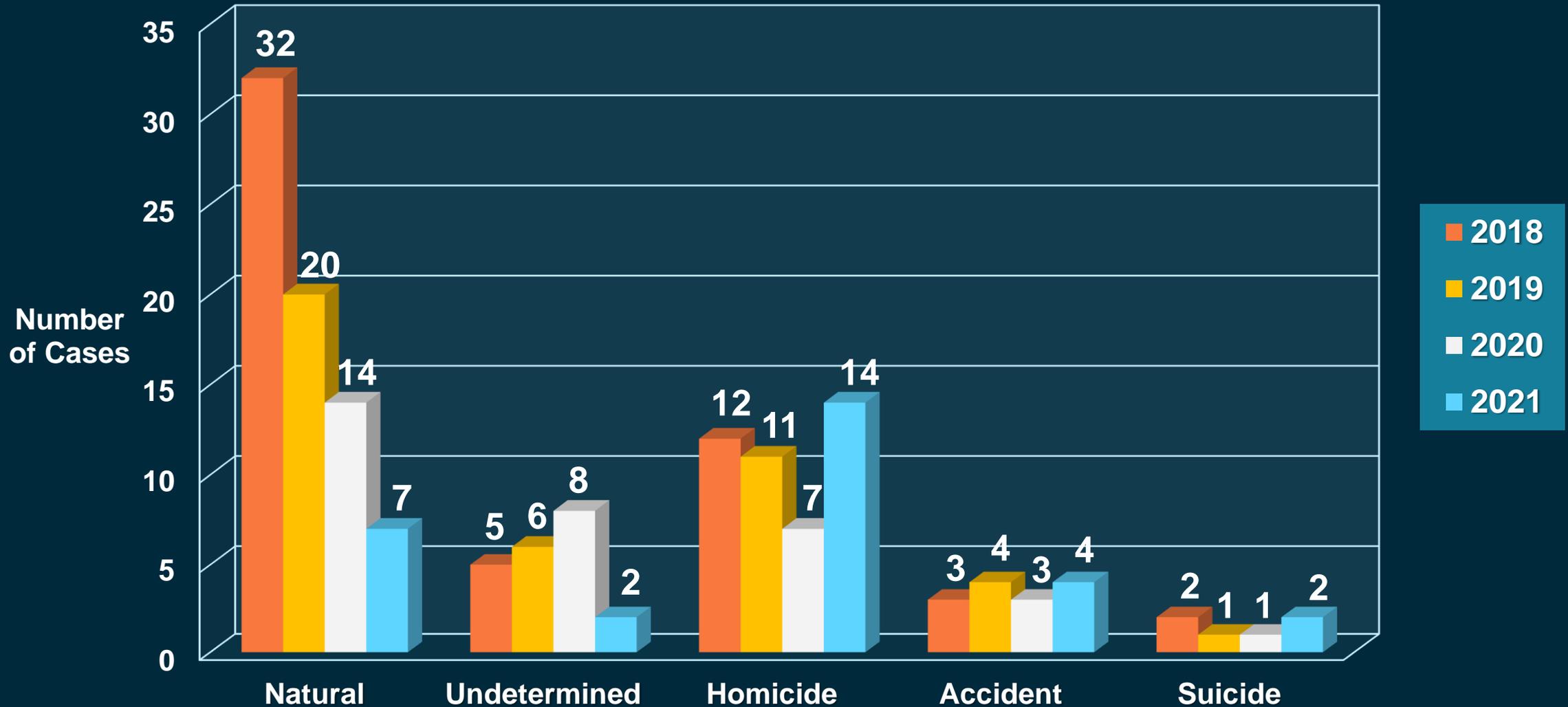


*\*This is a 10% decrease from 2020 and a 2% increase from 2019.*

# Forensic Entomology

- **Staffed by a board-certified, doctoral-level forensic entomologist**
  - Reports are peer-reviewed by external doctoral-level entomologists from three major academic institutions
- **2021 Casework:**
  - 29 cases
  - 6 scene collections
  - 20 autopsy collections
  - 1 scene and autopsy collection

# Forensic Entomology Cases by Manner of Death



# Quality Management Division

## A separate division of HCIFS

Ensures that services provided by the Institute are reliable and of high quality



# Responsibilities

---

- Maintains a **documented quality management system** that meets all accreditation and county requirements
- Facilitates **quality improvements** within each division of HCIFS
- Monitors the **continued use of best practices** and ensures the reliability of records released for discovery

# 2021 Accomplishments

- **328** standard operating procedures reviewed
- **220** proficiency tests administered
- **614** court orders processed
- **11** internal audits conducted
- **71** internal training sessions provided

# Crime Laboratory Services

Provides analytical testing on  
evidence submitted by local agencies  
in Harris and surrounding counties



# Statistical Summary

- **Cases received: 26,631**
  - Up **17%** from 2020
- **Cases completed: 27,946**
  - Up **22%** from 2020
- **Total number of submitting agencies: 84**
- **69% of laboratory personnel have a professional certification**
  - American Board of Criminalistics: **52** analysts
  - American Board of Forensic Toxicology: **13** analysts
  - Association of Firearm and Tool Mark Examiners: **5** examiners

# Crime Laboratory Services

## **DRUG CHEMISTRY**

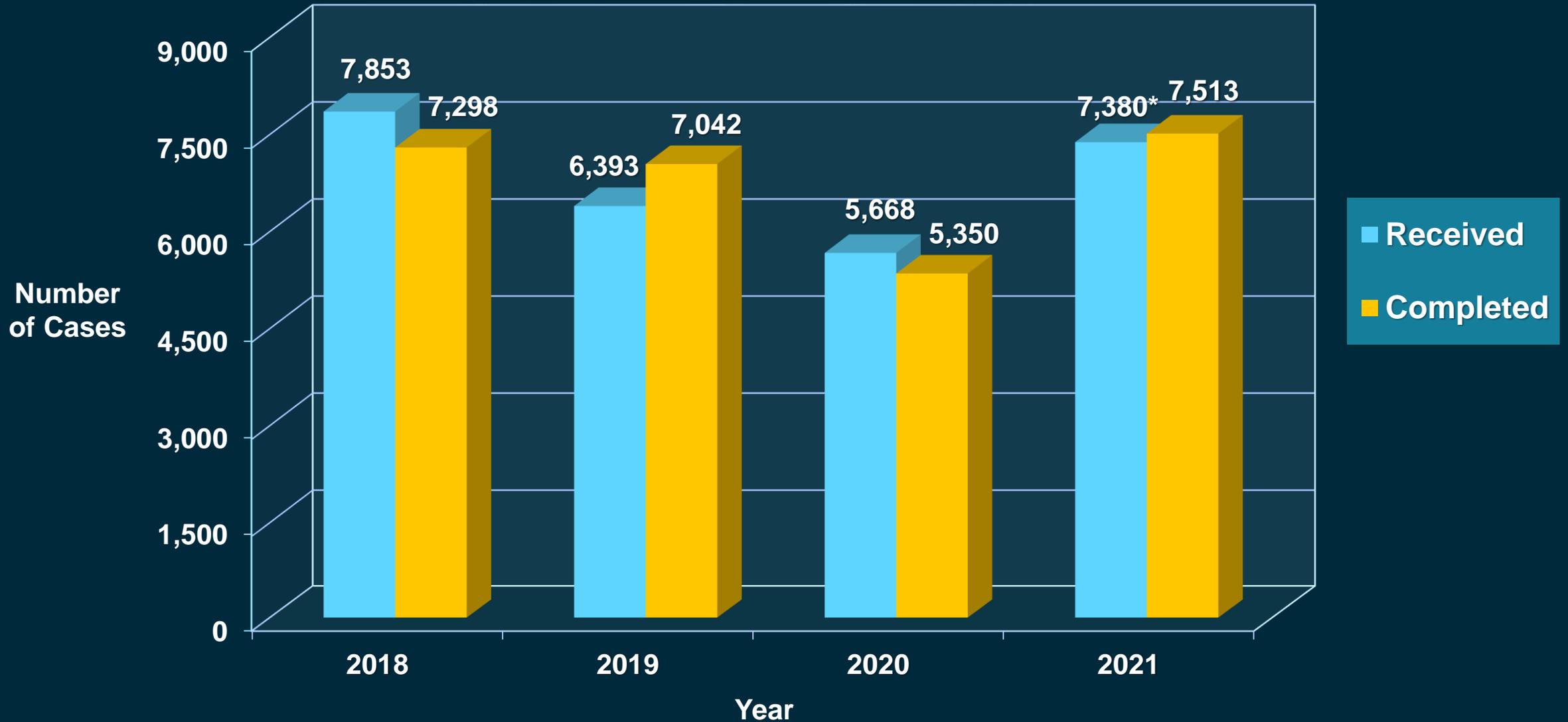
Analyzes suspected drug evidence  
seized by law enforcement agencies



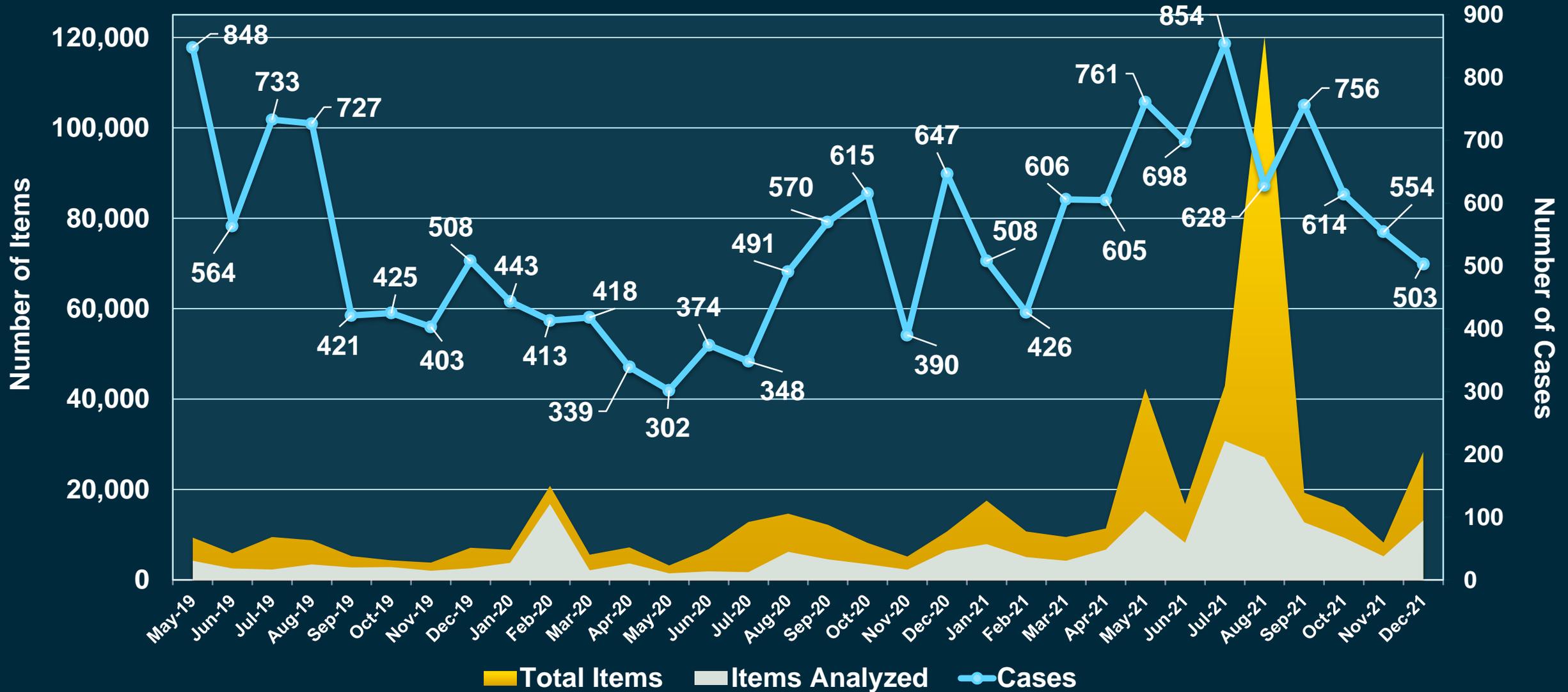
# Drug Chemistry Laboratory

- In accordance with Texas state statutes, identifies **confiscated, illegal, and dangerous drugs**, including:
  - Plant material
  - Powders, tablets, liquids
  - Drug paraphernalia
- The laboratory also develops and implements methods to **identify new designer drugs** including:
  - Synthetic cannabinoids
  - Opioid derivatives

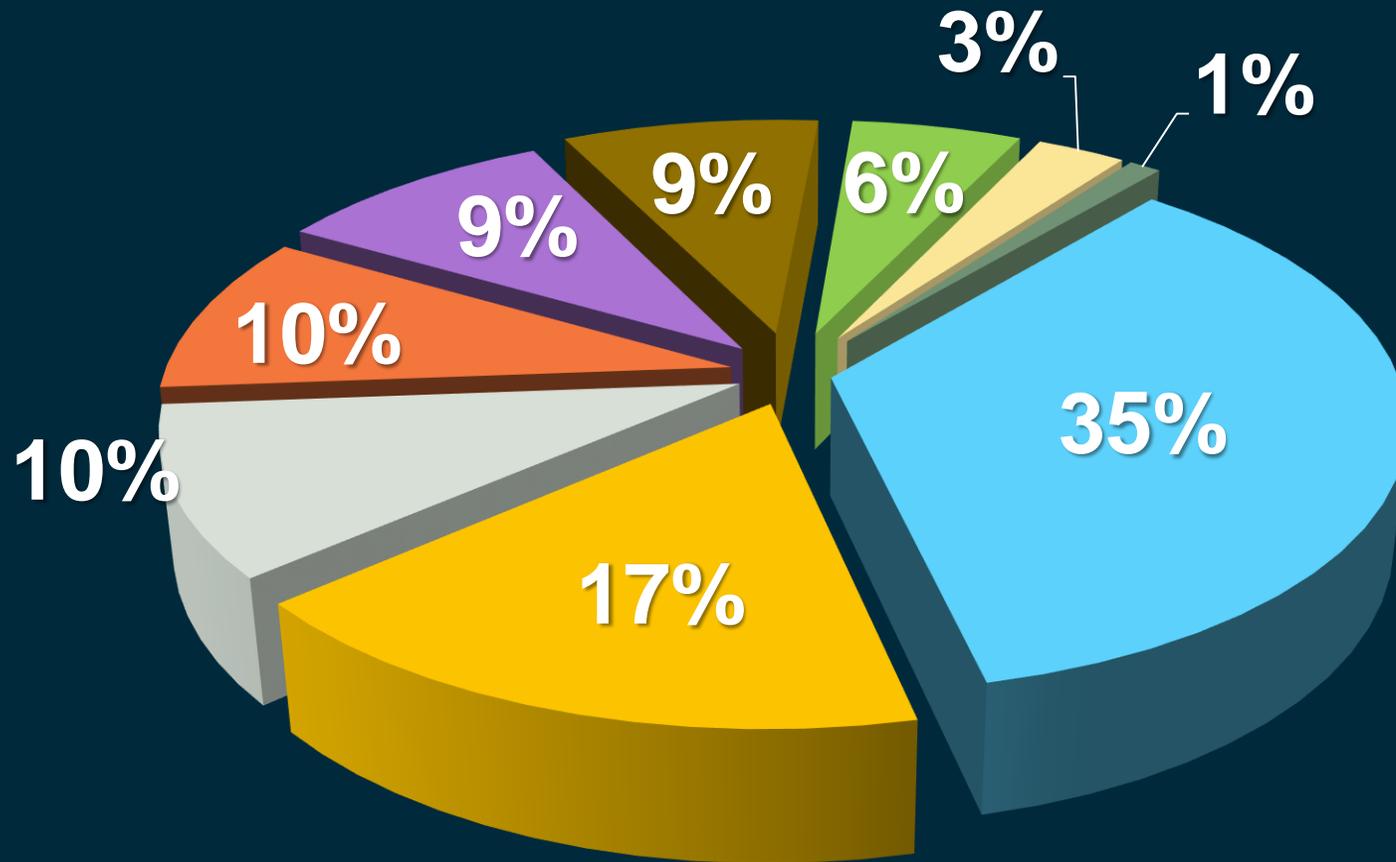
# Drug Cases Received and Completed



# Trend in Drug Cases | Total Items | Items Analyzed



# Positive Drug Test Results



N=16,727\* total confirmed results

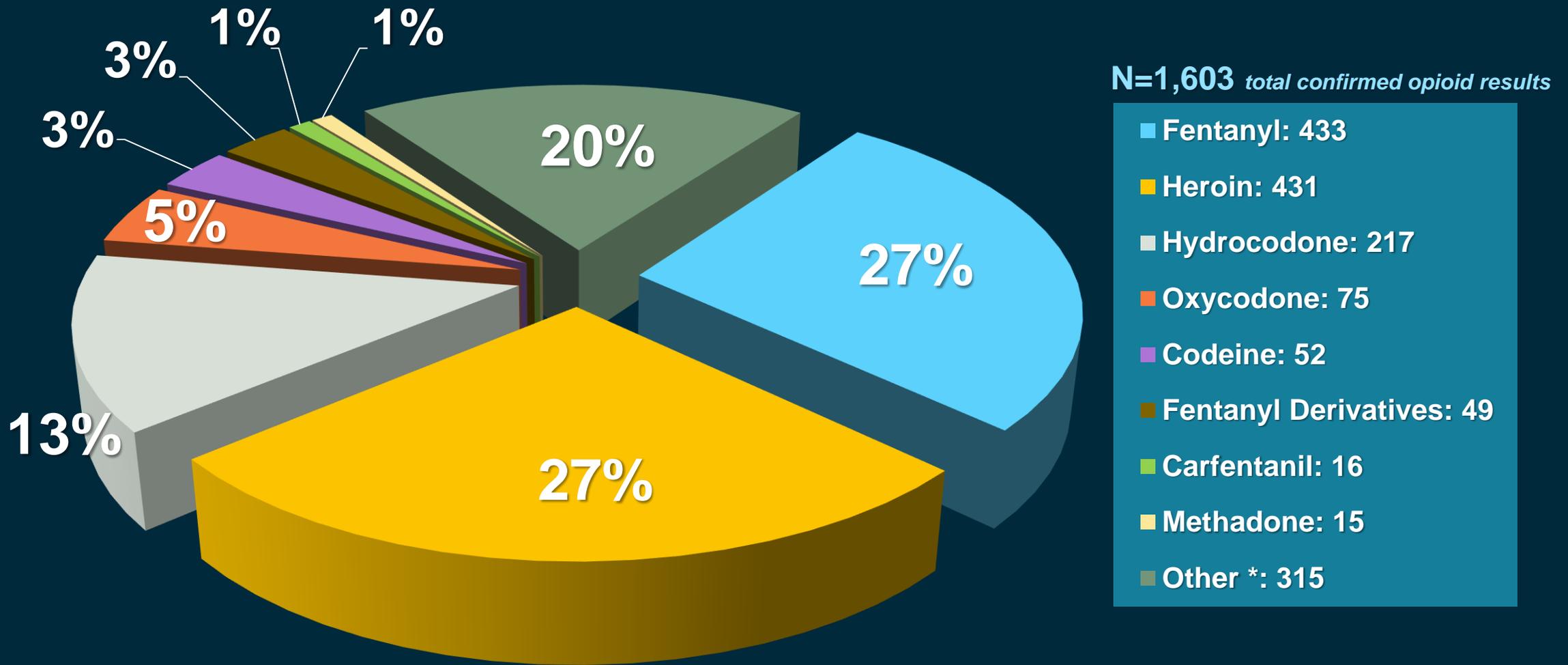
- Methamphetamine: 5,906
- Non-Controlled Substances\*\*: 2,855
- Prescription Drugs: 1,703
- Opioids: 1,603
- Cocaine: 1,560
- Marihuana: 1,438
- Designer Drugs: 953
- THC: 497
- Other Controlled Substances\*\*\*: 180

\* This reflects a 38% increase from 2020.

\*\* Non-controlled substances include caffeine, acetaminophen, oils, waxes, and edible THC.

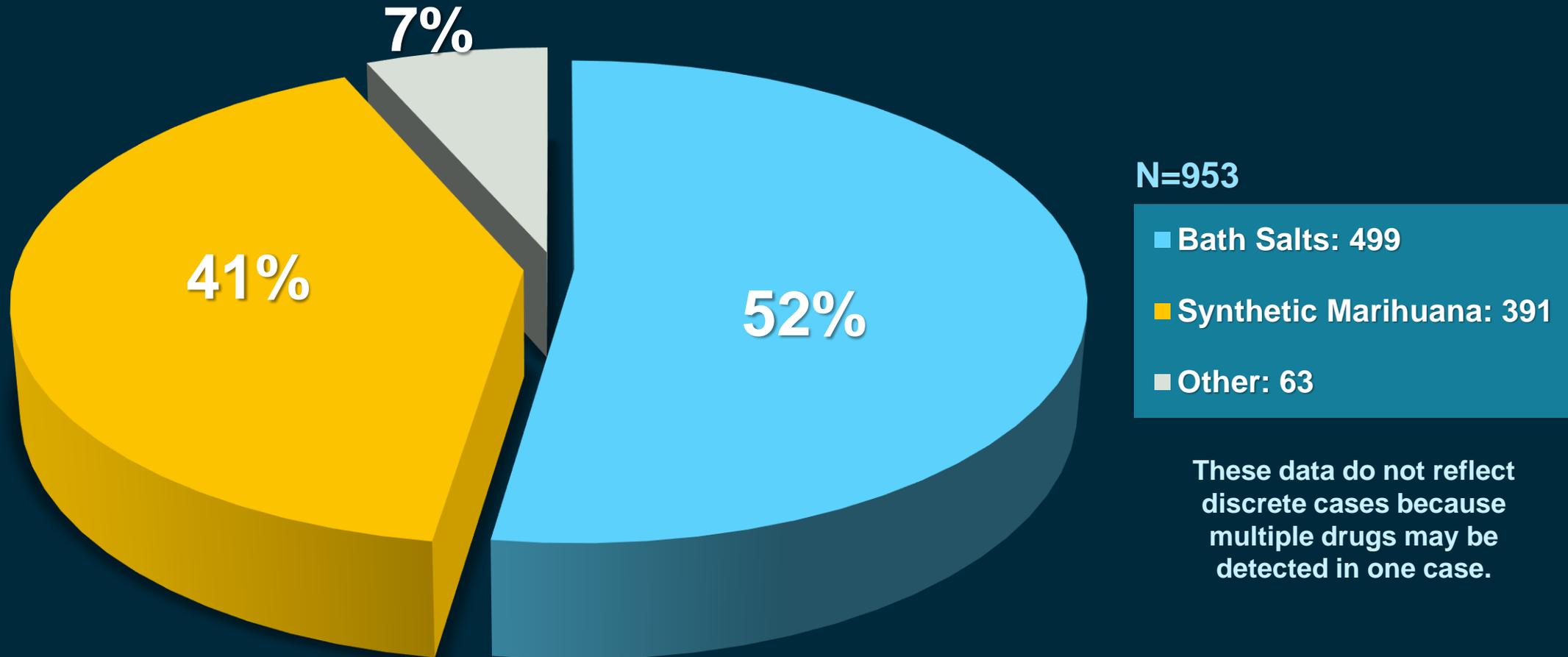
\*\*\* Other controlled substances include anti-seizure medicines and anti-depressants.

# Opioid Test Results



\*Other includes: Morphine (20), Hydromorphone (3), 4-ANPP (267), and other uncommon opioids

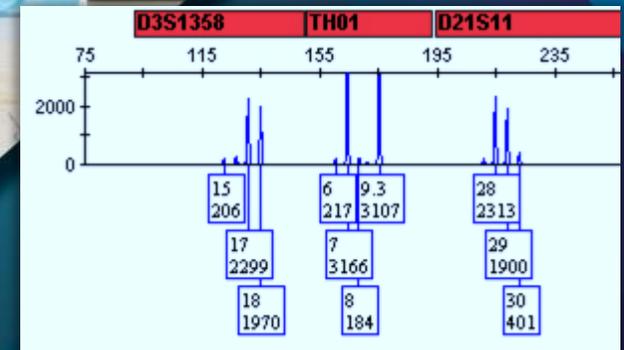
# Designer Drug Test Results



# Crime Laboratory Services

## FORENSIC GENETICS

Analyzes biological fluids and tissues such as blood, semen, muscle, and bone for DNA

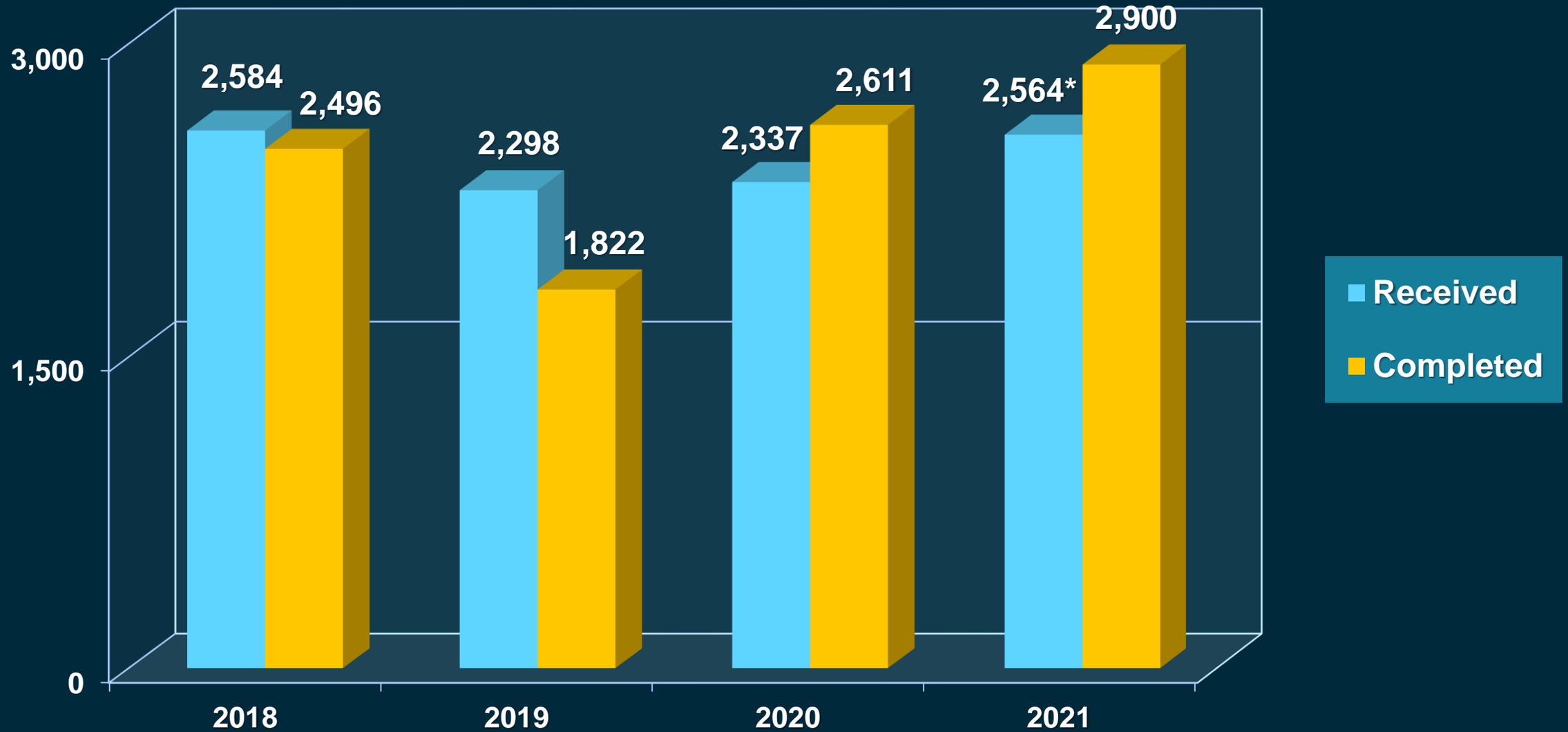


# Forensic Genetics Laboratory

## *Conducts DNA testing primarily for:*

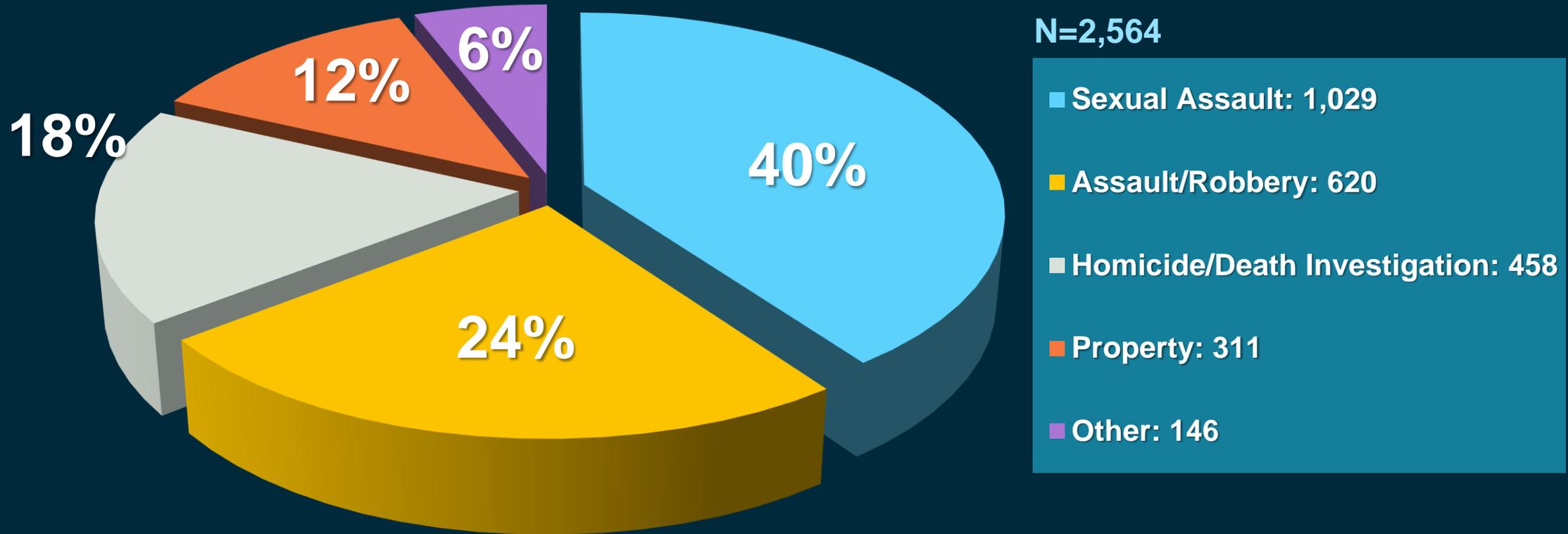
- Law enforcement agencies
- HCIFS medical examiners to assist in positively identifying decedents
- Cases submitted for **DNA** testing include crimes against persons such as sexual assault, homicide, and robbery; as well as property crimes such as burglary and theft
- Crimes against persons are given **first priority** for testing

# DNA Cases Received and Completed

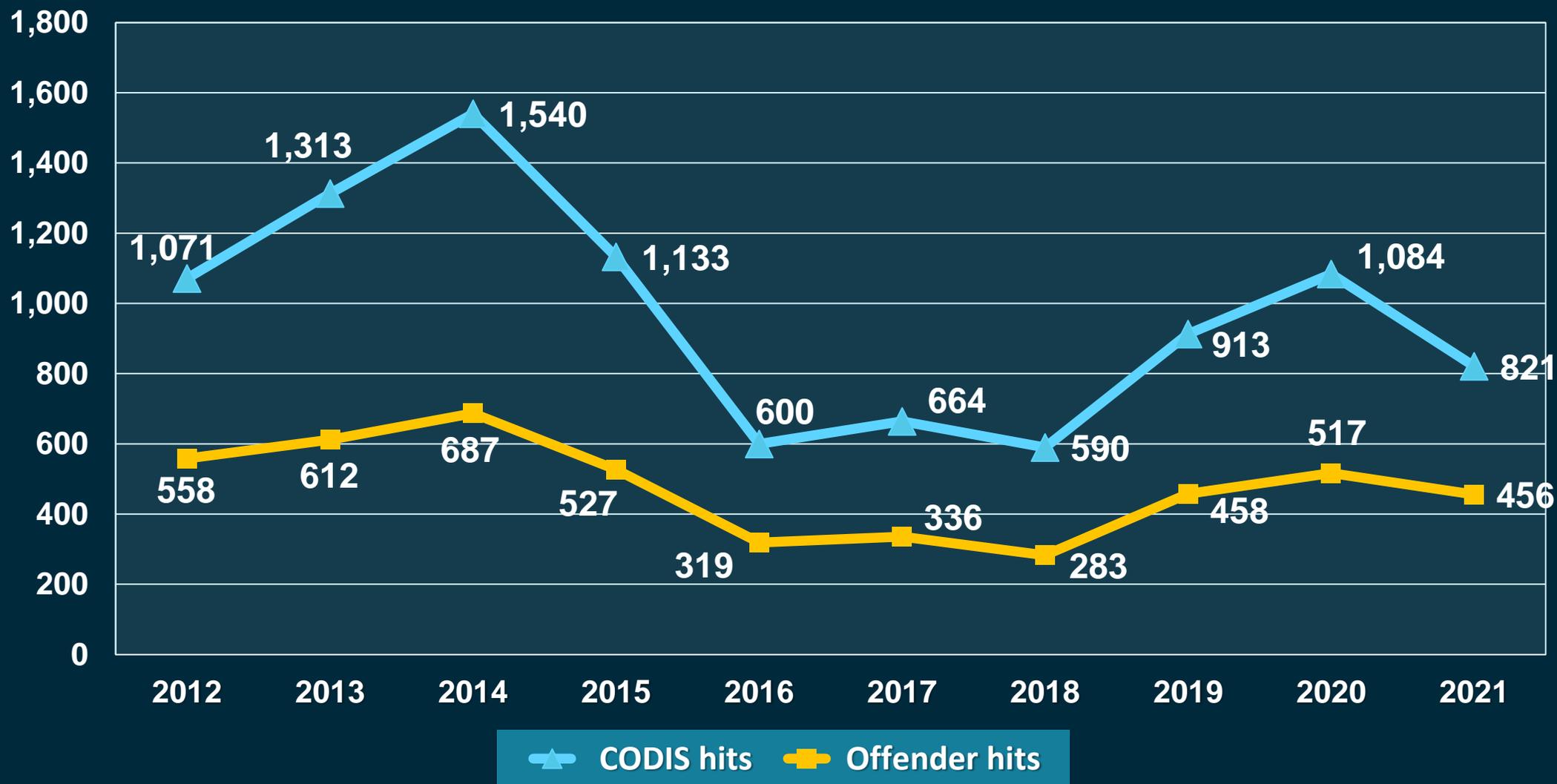


*\*This reflects a 10% increase from 2020 in cases received.*

# DNA Case Submissions by Type



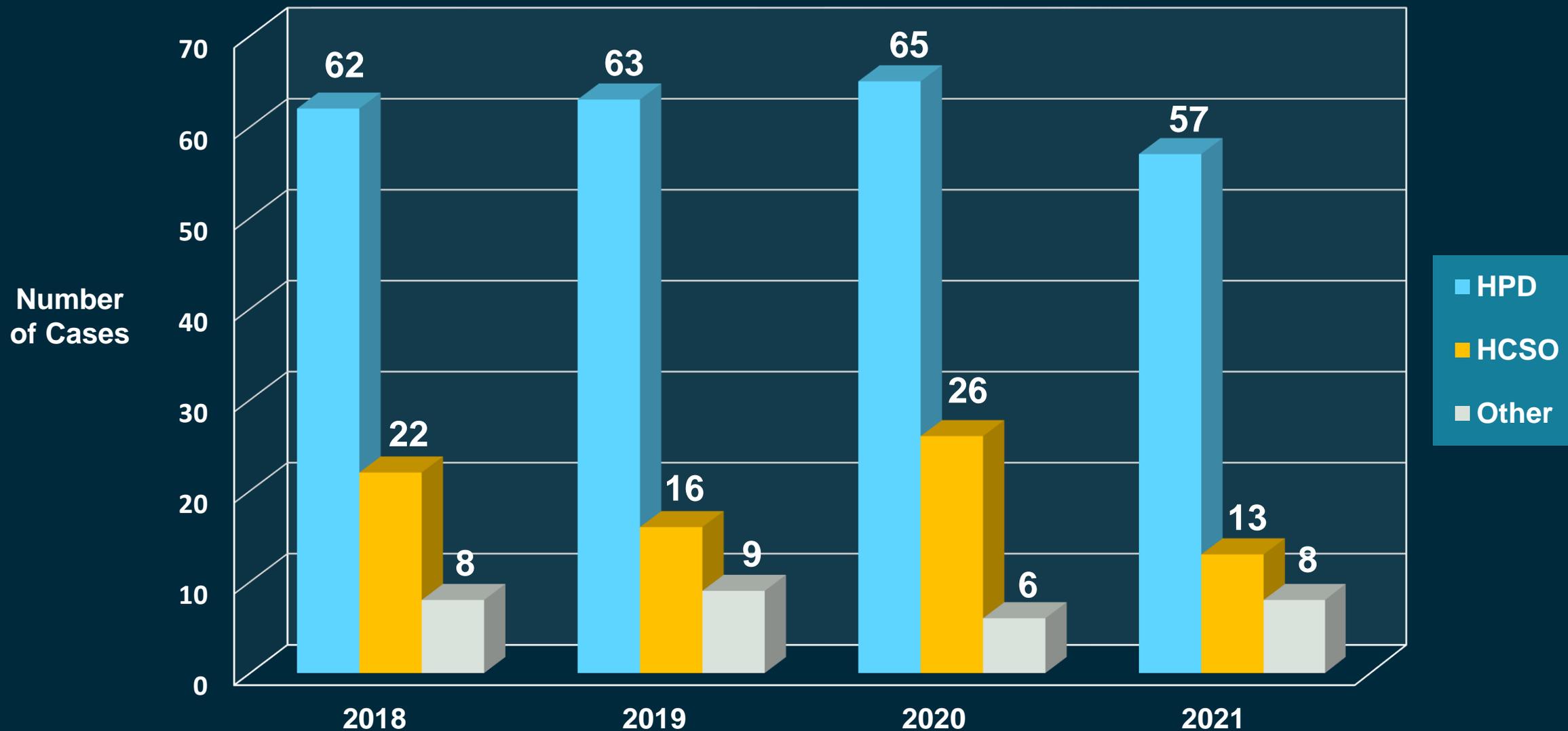
# CODIS Hits (Combined DNA Index System)



# Trace DNA Evidence Collection Team

- Specialized DNA analysts who attend select death scenes to **collect DNA and trace evidence** from bodies that have been:
  - Dumped
  - Bound
  - Thought to have been in close contact with an unknown perpetrator
- The team had a number of **successes obtaining DNA** different from that of the victim.
- This information assists investigators in **solving crimes**.

# Trace DNA Collection by Agency



# Crime Laboratory Services

## **FORENSIC TOXICOLOGY**

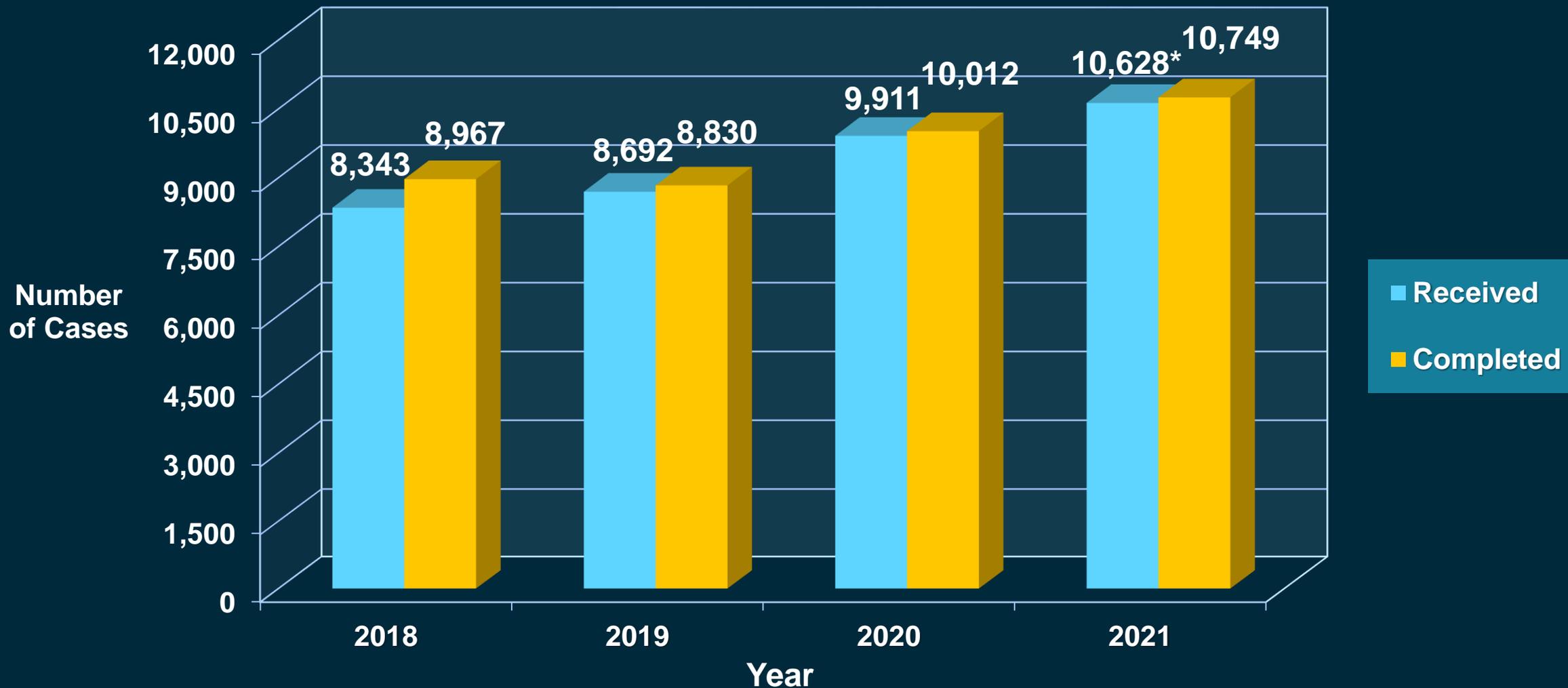
Provides analytical services in medicolegal death investigations, driving while intoxicated, and drug-facilitated sexual assault investigations



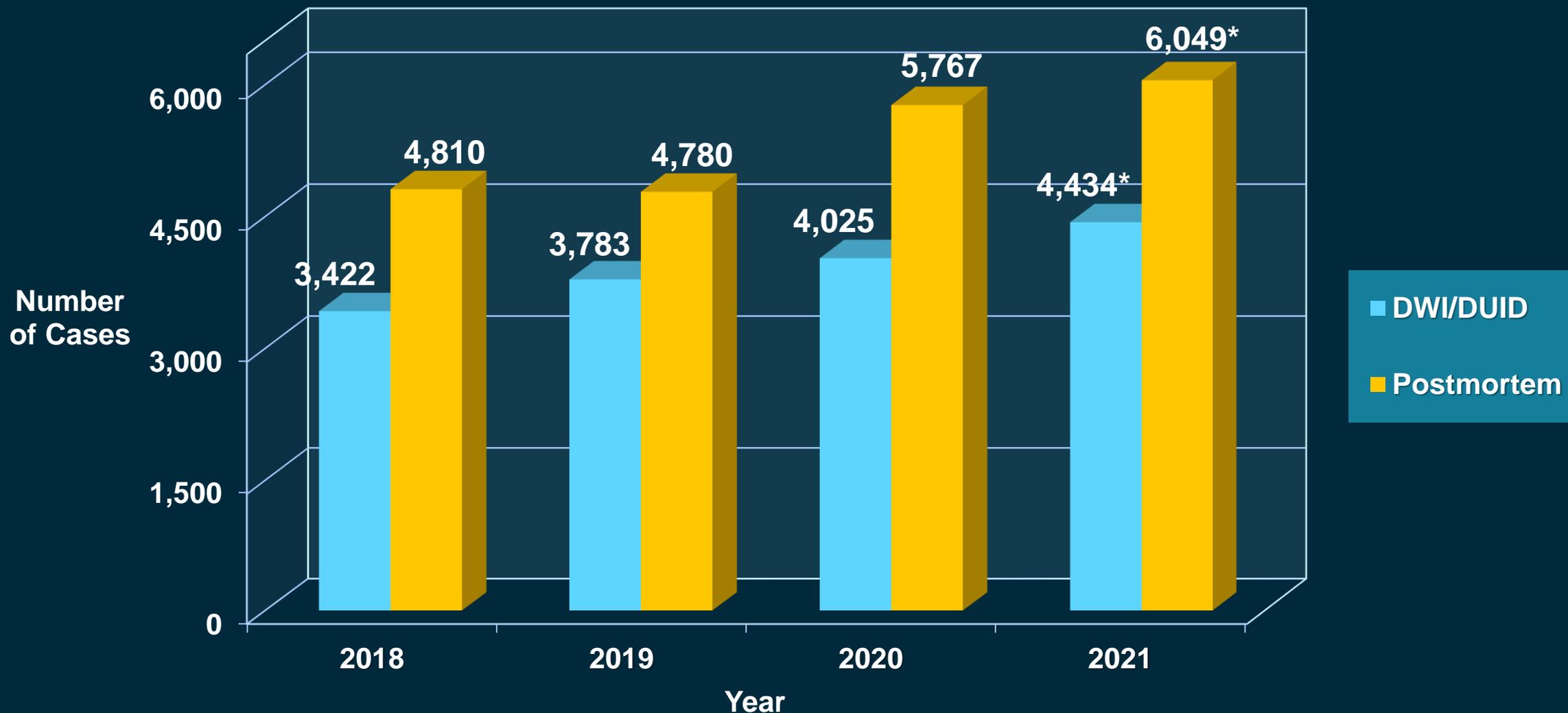
# Forensic Toxicology Laboratory

- Analyzes **biological evidence** submitted by the HCIFS Medical Examiner Service and law enforcement agencies in Harris County for:
  - Death investigations
  - Driving while intoxicated (DWI) and driving under the influence (DUI) cases
  - Drug-facilitated sexual assaults
- The only forensic toxicology laboratory in Texas **dually accredited** by the ANSI National Accreditation Board and the American Board of Forensic Toxicology

# Toxicology Cases Received and Completed

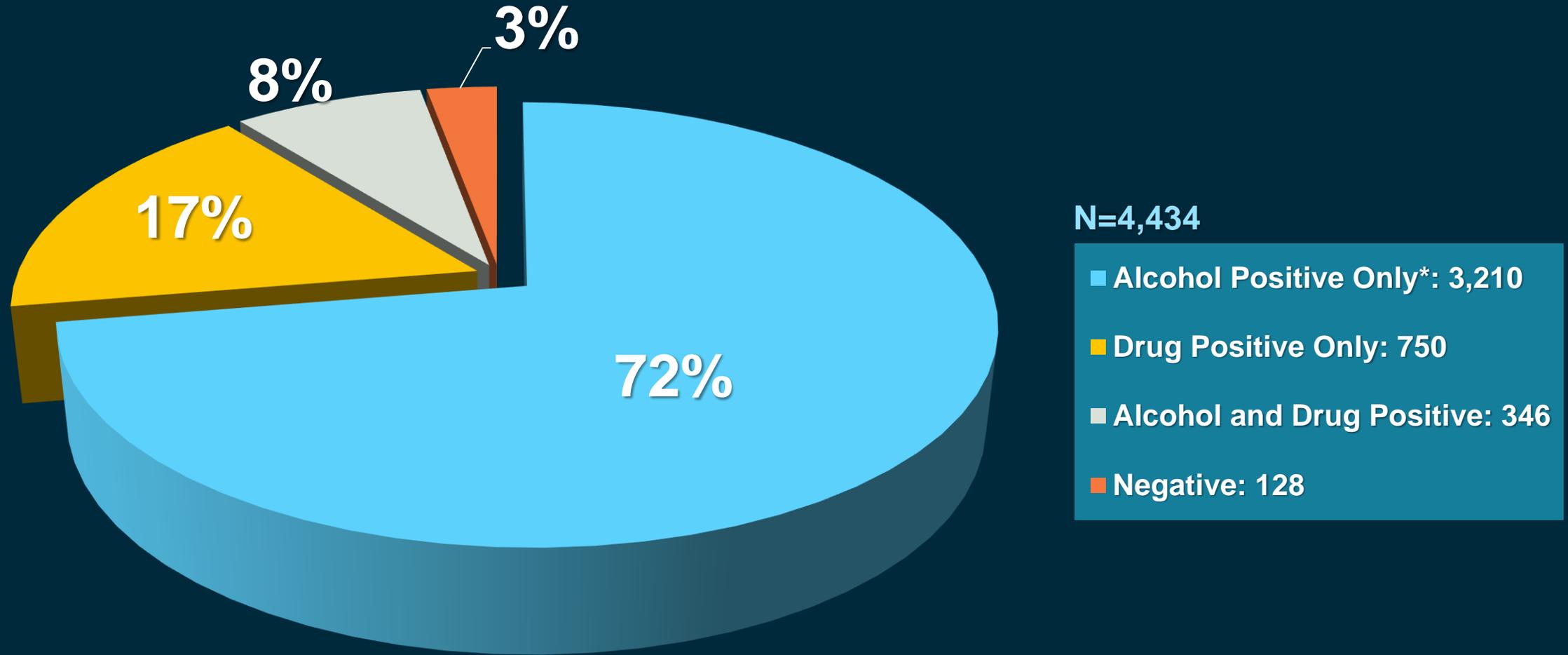


# Toxicology Cases Received by Type



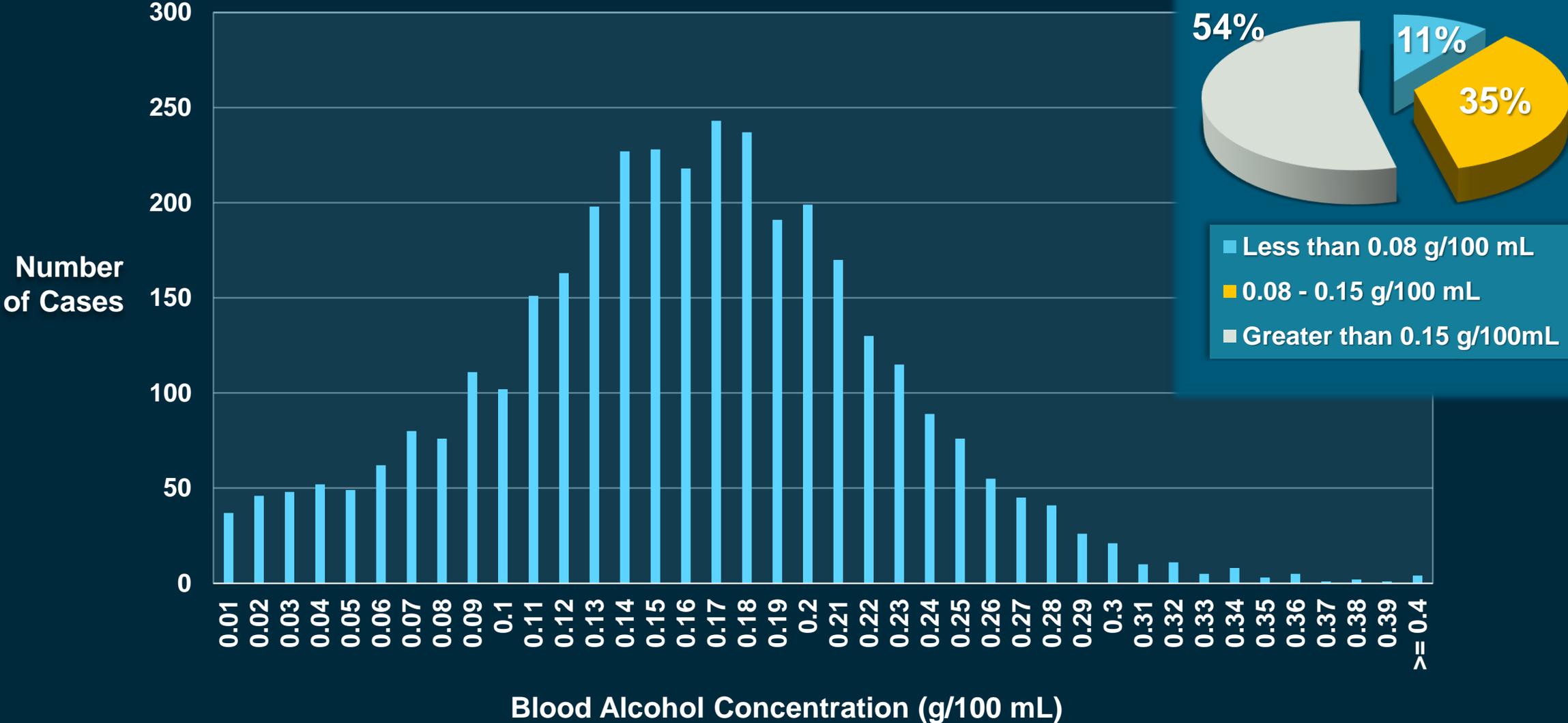
*\*Compared to 2020, this is a 10% increase in cases received for DWI/DUID and a 5% increase in cases received for postmortem cases.*

# DWI Case Results

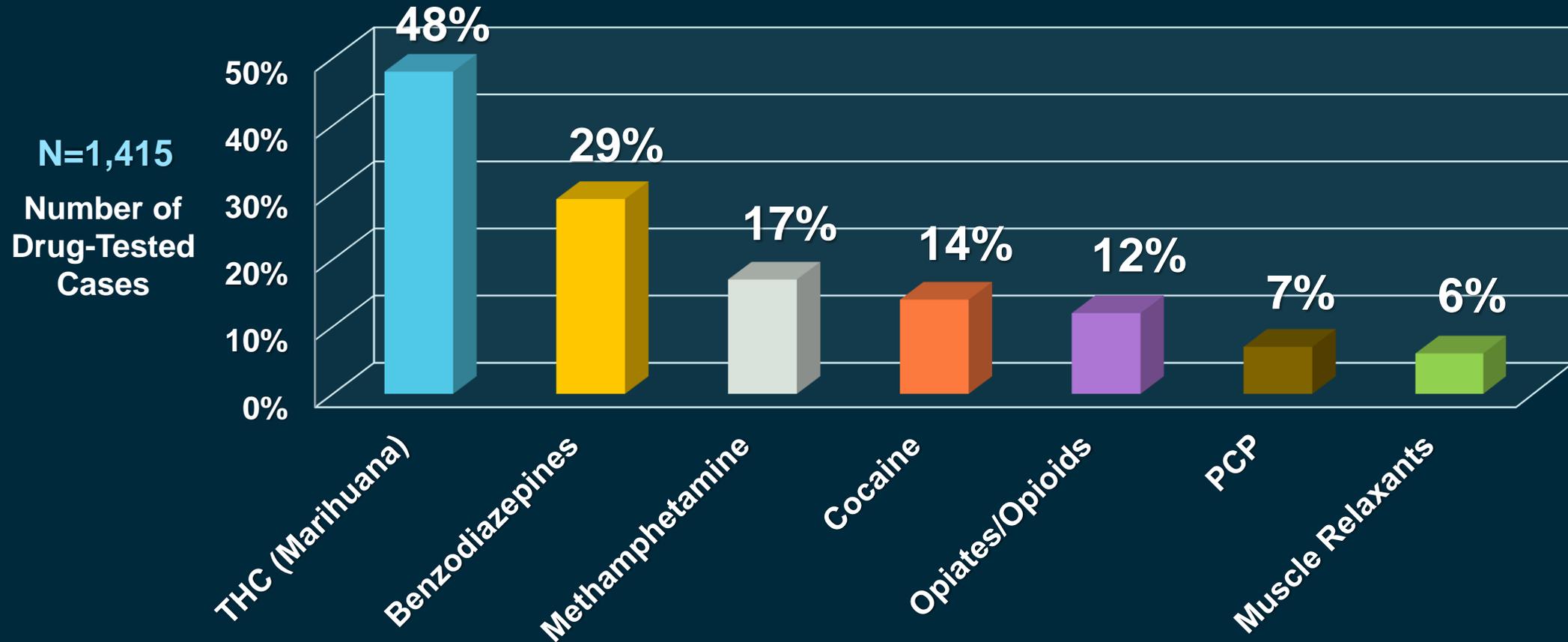


\*Alcohol Positive Only is a case with the presence of ethanol but no drug analysis was performed. For cases that do not involve a fatality, drugs are tested only if the alcohol concentration is <0.10g/100mL.

# DWI Blood Alcohol Concentrations



# Drug Prevalence in DWI Cases



True prevalence may be underrepresented as one case could have multiple drugs from a single drug class, e.g., opiates and benzodiazepines.

# Crime Laboratory Services

## PHYSICAL EVIDENCE

### Firearms Identification

Evaluates fired cartridge casings and bullets recovered from crime scenes and firearms involved in violent, gun-related incidents

### Trace Evidence

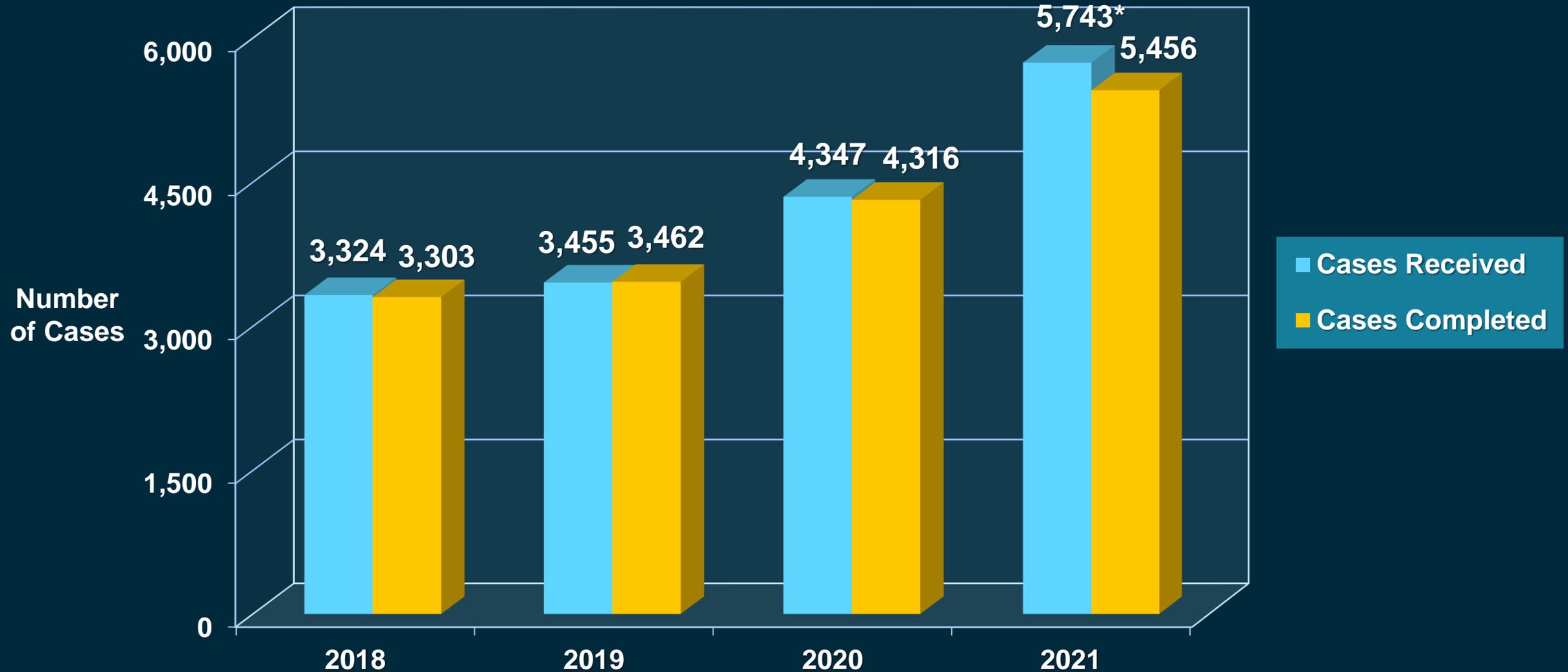
Analyzes in the forensic sub-disciplines of gunshot residue and fire debris



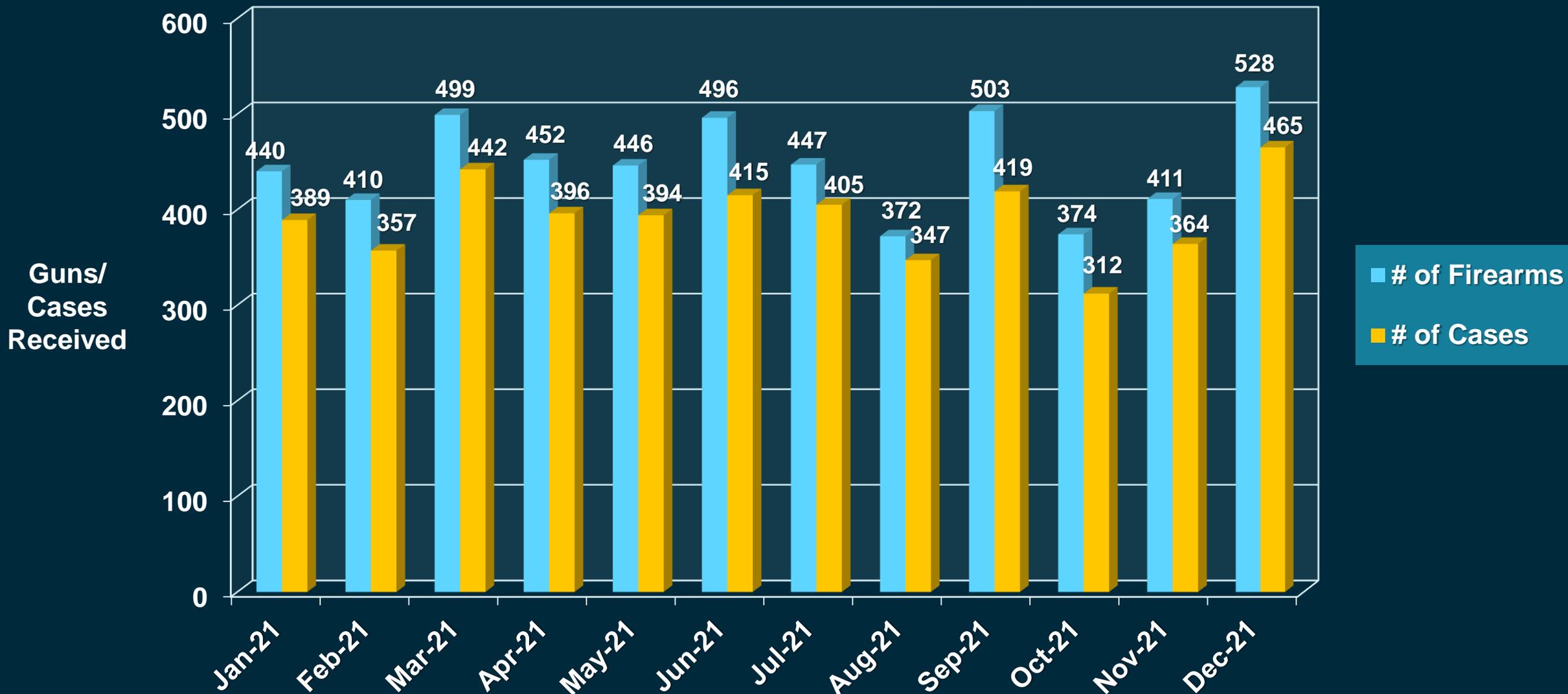
# Firearms Identification Laboratory

- Conducts examinations of evidence related to investigations of **gun-related offenses**
- Cases received are comprised of **weapons, bullets, and cartridge casings**
- Serves as a **regional facility** for the National Integrated Ballistics Information Network (NIBIN) database

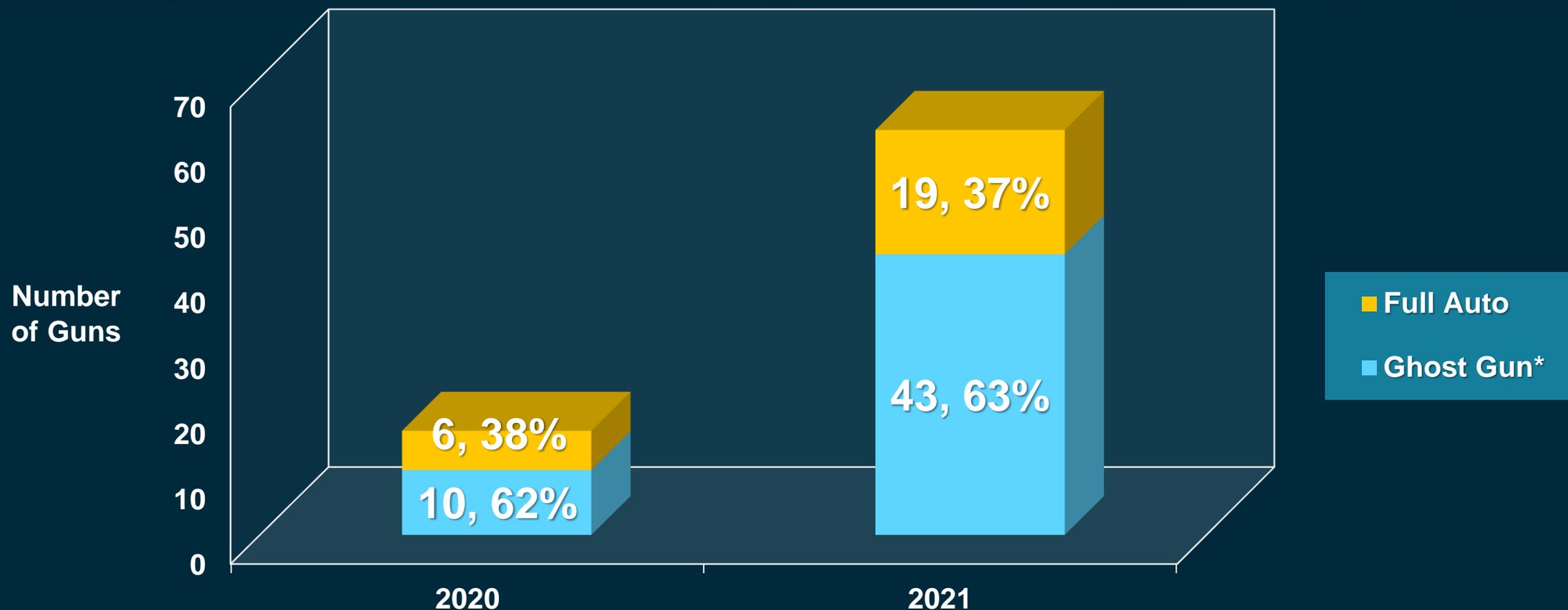
# Firearms Identification Casework



# Firearms IBIS (Test-Fire Only) Case Submissions



# Submissions for Uncommon Firearms Types



*\*Ghost guns are unserialized, untraceable firearms that can be legally built from home. An 80% completed firearm receiver can be purchased online and comes with instructions on how to finish the assembly. All other firearm parts can be purchased legally online and assembled. The finished product will be a fully functioning firearm that has no serial number and cannot be traced by the ATF.*

# Trace Evidence

Provides analytical support to the HCIFS Medical Examiner Services and law enforcement in two areas:

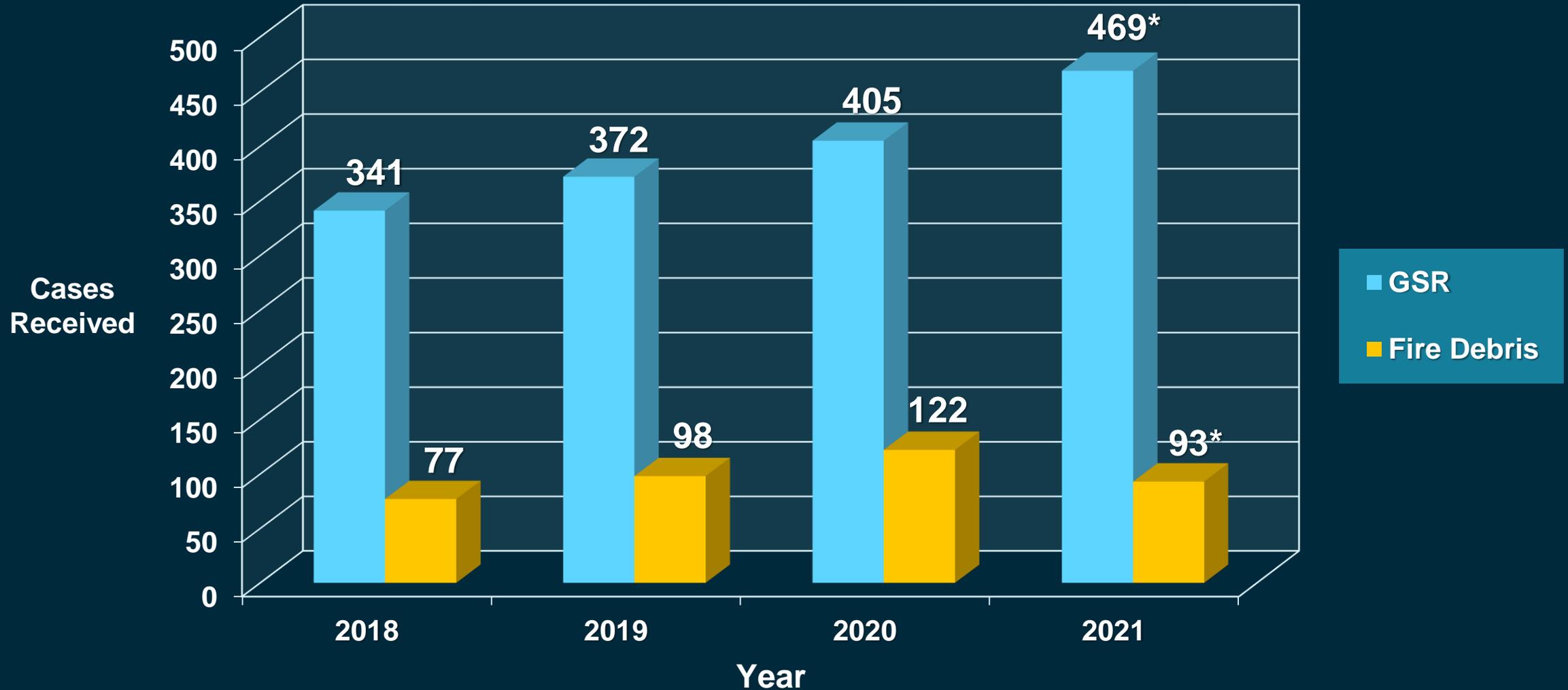
- **Fire Debris Analysis**

- Examines evidence from fires to assist investigators in determining the presence of ignitable liquid residues

- **Gunshot Residue (GSR) Analysis**

- Assists in determining whether a person or object has an association with the discharge of a firearm

# Trace Evidence Casework



*\*Compared to 2020, this is a 7% increase in overall cases received (16% increase in GSR and a 24% decrease in fire debris).*

# Published Scientific Work

Published articles in  
peer-reviewed journals



# Publications by HCIFS Doctors and Scientists\*

	Title	Authors	Publication
1	Potential impacts of 3D modeling and 3D printing in firearm toolmark examinations	Li SY, <b>Turner J.</b> , Golightly S., Zelbst P., Yu J.	<i>Journal of Forensic Sciences</i> 2021; 66:2201– 2207
2	Long-term Stability of Fentanyl Analogs in Blood	<b>Palmquist K.B.</b> , Swortwood M.J.	<i>Journal of Analytical Toxicology</i> 2021; 45(8): 870-877; doi: 10.1093/jat/bkab051
3	Quantification of Fentanyl Analogs in Oral Fluid using LC-QTOF-MS	<b>Palmquist K.B.</b> , Swortwood M.J.	<i>Journal of Forensic Sciences</i> 2021; 66(5): 1871-1878; doi: 10.1111/1556-4029.14813
4	Phenibut, a GABA <sub>B</sub> Agonist, Detected in a Fatality	<b>Arndt C., Gray T.R.</b>	<i>Journal of Analytical Toxicology</i> , 2021; bkab099
5	Adult-onset CNS myelin sulfatide deficiency is sufficient to cause Alzheimer's disease-like neuroinflammation and cognitive impairment	Qiu S., Palavicini J.P., Wang J., <b>Gonzalez N.S.</b> , He S., Dustin E., Zou C., Ding L., Bhattacharjee A., Van Skike C.E., Galvan V., Dupree J.L., Han X.	<i>Molecular Neurodegeneration</i> , 2021 Sep 15;16(1):64. doi: 10.1186/s13024-021-00488-7. PMID: 34526055; PMCID: PMC8442347
6	The First Step in an Investigation of Quantitative Ultrasound as a Technique for Evaluating Infant Bone Strength	<b>Soto Martinez M.E.</b> , Love J.C., Crowder C.M., <b>Wiersema J.M.</b> , <b>Pinto D.C.</b> , Derrick S.M., <b>Gao S.</b> , <b>Fleischman J.M.</b> , Greeley C., Donaruma-Kwoh M., Bachim A.	<i>Journal of Forensic Sciences</i> , 2021 66(2):456-469. doi:10.1111/1556-4029.14605
7	The concurrence of multiple sclerosis and glioblastoma	Alkabie, Samir, Castrodad-Molina, R., <b>Heck K.</b> , Mandel, J., Hutton, G.	<i>Multiple Sclerosis and Related Disorders</i> . 50. 102877. 10.1016/j.msard.2021.102877
8	SARS-CoV-2 Infects Human Engineered Heart Tissues and Models COVID-19 Myocarditis	Bailey, A., Dmytrenko, O., Greenberg, L., Bredemeyer, A., Ma, P. Liu, J., Penna, V., Winkler, E., Sviben, S., Brooks, E., Nair, A. <b>Heck, K.</b> , Rali, A., Simpson, L., Saririan, M., Hobohm, D., Stump, W., Fitzpatrick, J., Xie, X., Lavine, K.	<i>JACC: Basic to Translational Science</i> . 6. 10.1016/j.jacbts.2021.01.002.
9	S-100-negative, GNA11 mutation-positive intramedullary meningeal melanocytoma of the thoracic spine: A radiographic challenge and histologic anomaly	Flores, A., Gadot, R., Noorbhai, I., Hall, H., <b>Heck, K.</b> , Raper, D. M.S., Xu, D., Karas, P., Mandel, J.J., Ropper, A.E.	<i>Surgical Neurology International</i> , 12, [A9]
10	Inflammatory Bowel Disease Presenting With Concurrent COVID-19 Multisystem Inflammatory Syndrome	Sweeny K.F., Zhang Y.J., Crume B., Martz C.A., <b>Blessing M.M.</b> , Kahn S.A.	<i>Pediatrics</i> . 2021 Apr;147(4):e2020027763. doi: 10.1542/peds.2020-027763. Epub 2021 Jan 7. PMID: 33414238; PMCID: PMC8015148.
11	A Case Series of Acute Hemorrhagic Leukoencephalitis	<b>Podduturi V.</b> , <b>Blessing M.M.</b> , Joseph D.M., <b>Ross J.L.</b> , Sandberg G.D.	<i>Am J Forensic Med Pathol</i> . 2021 Sep 1;42(3):263-266. doi: 10.1097/PAF.0000000000000642. PMID: 33394682.

# Publications by HCIFS Doctors and Scientists\* (cont'd)

	Title	Authors	Publication
12	Fatal Hemoperitoneum Due to Isolated Splenic Peliosis	<u>Podduturi V.</u> , <u>Blessing M.M.</u>	<i>Am J Forensic Med Pathol.</i> 2021 Mar 1;42(1):85-87. doi: 10.1097/PAF.0000000000000596. PMID: 32740102
13	A call for complex systems and syndemic theory in firearm violence research	Lemke, M.K., <u>Wolf, D.A.</u> , <u>Drake, S.A.</u>	<i>American Journal of Preventive Medicine (2021)</i> In press
14	Identifying gaps and improving investigation of fatal elder abuse and/or neglect	<u>Drake, S.A.</u> , Akande, A., Kelly, P.A., Yang, Y., <u>Wolf, D.A.</u>	<i>Journal of Forensic Sciences (2021)</i> 66(6) 2274-2282
15	Commentary on the spectrum of cardiopulmonary pathology in COVID-19	<u>Buja, L.M.</u> , Zhao, B., McDonald, M., Ottaviani, G., <u>Wolf, D.A.</u>	<i>Cardiovascular Pathology (2021)</i> 53,[107339]
16	Fatal and non-fatal injury patterns of stranded motorists	<u>Drake, S.A.</u> , Yang, Y., <u>Gao, S.</u> , Mora, S., Garza, R., Moore, L., Todd, S.R., Wilson, C., <u>Wolf, D.A.</u>	<i>Journal of Forensic Nursing (2021)</i> DOI: 10.1097/JFN.0000000000000329.
17	Non-traumatic in-custody homicidal deaths in Harris County, Texas (2015-2019): Justification for a separate manner of death category	<u>Wolf, D.A.</u>	<i>American Journal of Forensic Medicine and Pathology (2021)</i> In press
18	A postmortem portrait of the Coronavirus Disease 2019 (COVID-19) pandemic: A large multiinstitutional autopsy survey study	Hooper, J.E., Padera, R.F., Dolhnikoff, M., Ferraz da Silva, L.F., Duarte-Neto, A., Kapp, M.E., Lacy, M.J., Mauad, T., Saldiva, P.H., Rapkiewicz, A.V., <u>Wolf, D.A.</u> , Felix, J.C., Benson, P., Monteiro, R.A.A., Shanes, E., Gawelek, K.L., Marshall, D.A., McDonald, M.M., Muller, W., Priemer, D.S., Solomon, I.H., Zak, T., Bhattacharjee, M.B., Fu, L., Gilbert, A.R., Harper, H.L., Litovsky, S. Lomasney, J., Mount, S.L., Reilly, S., Sekulic, M., Steffensen, T.S., Threlkeld, K.J., Zhao, B., Williamson, A.K.	<i>Archives of Pathology and Laboratory Medicine (2021)</i> 145:529-535. PMID: 33449998.
19	When falls become fatal – clinical care sequence	<u>Drake, S.A.</u> , Conway, S.H., Yang, Y., Cheatham, L.S., <u>Wolf, D.A.</u> , Adams, S.D., Wade, C.E., Holcomb J.B.	<i>PLoS ONE (2021)</i> 16(1): e0244862. PMID: 33406164
20	Quality assurance through standard operating procedures development and deviation: A MLDI systems response to the COVID-19 pandemic	<u>Drake, S.A.</u> , <u>Pierce, M.</u> , <u>Gumpeni, P.</u> , Giardino, E., <u>Wolf, D.A.</u>	<i>Journal of Forensic Nursing (2021)</i> 17(1) 61-64; PMID: 33017342.

# Internships and Fellowship Programs



# Internship Program

- HCIFS prepares students for future careers in forensic science in many different scientific disciplines as well as in technical, professional, and administrative capacities.
- **11** interns from the following disciplines were on site in 2021:
  - Firearms Identification
  - Forensic Investigations
  - Family Assistance
  - Forensic Entomology
  - Forensic Toxicology
  - Drug Chemistry

# Medical Examiner Fellowship Program

## *Forensic Pathology Fellowship:*

A **1-year fellowship** that is a required training program for all new pathologists seeking Forensic Pathology Board certification

Fellows focus on the data acquisition and documentation processes from medical and non-medical sources with particular emphasis placed on the correlation of scene observations (forensic investigation) with autopsy and forensic toxicological findings.

# Crime Laboratory Fellowship Programs

## *Forensic Toxicology:*

A **2-year fellowship** providing training for doctorate-level scientists seeking specialization in forensic toxicology

Upon completion of the program, fellows will be familiar with toxicology laboratory methods and interpretation. Methods include immunoassay screening, sample preparation, liquid and gas chromatography with mass spectrometry, and interpretation of toxicological findings in postmortem, DWI, and drug-facilitated sexual assault cases.



# Thank you



HARRIS COUNTY  
**INSTITUTE** SCIENCE.  
OF FORENSIC SCIENCES SERVICE.  
INTEGRITY.

◀ *HCIFS located within the TMC3 life-sciences and research campus.*

1861 Old Spanish Trail, Houston, TX 77054 | 832-927-5000 | [www.ifs.harriscounty.gov](http://www.ifs.harriscounty.gov)