2020 ANNUAL REPORT

HARRIS COUNTY
INSTITUTE OF FORENSIC SCIENCES

Shau Lin Hon/Slyworks Photography

Our Mission

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

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Medical Examiner Services

Has the statutory duty to determine cause and manner of death

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 of any person are such as to lead to suspicion that he came to his death 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 his 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**
  - **4.79+ million** estimated HC population in 2020*
  - **36,252** HC death certificates filed in 2020**
  - **36%** (13,122) of HC deaths reported to HCIFS in 2020
  - **5,595** medicolegal (ML) cases received by HCIFS for examination
  - **6,816** inquest only cases reported
  - **707** trauma inquest cases reported
  - **3,670** scenes attended by Forensic Investigators

- **6,347 deaths were certified in 2020, including:**
  - **5,595** Harris County ML cases (all brought to HCIFS for examination)
  - **707** trauma inquests
  - **45** out-of-county cases

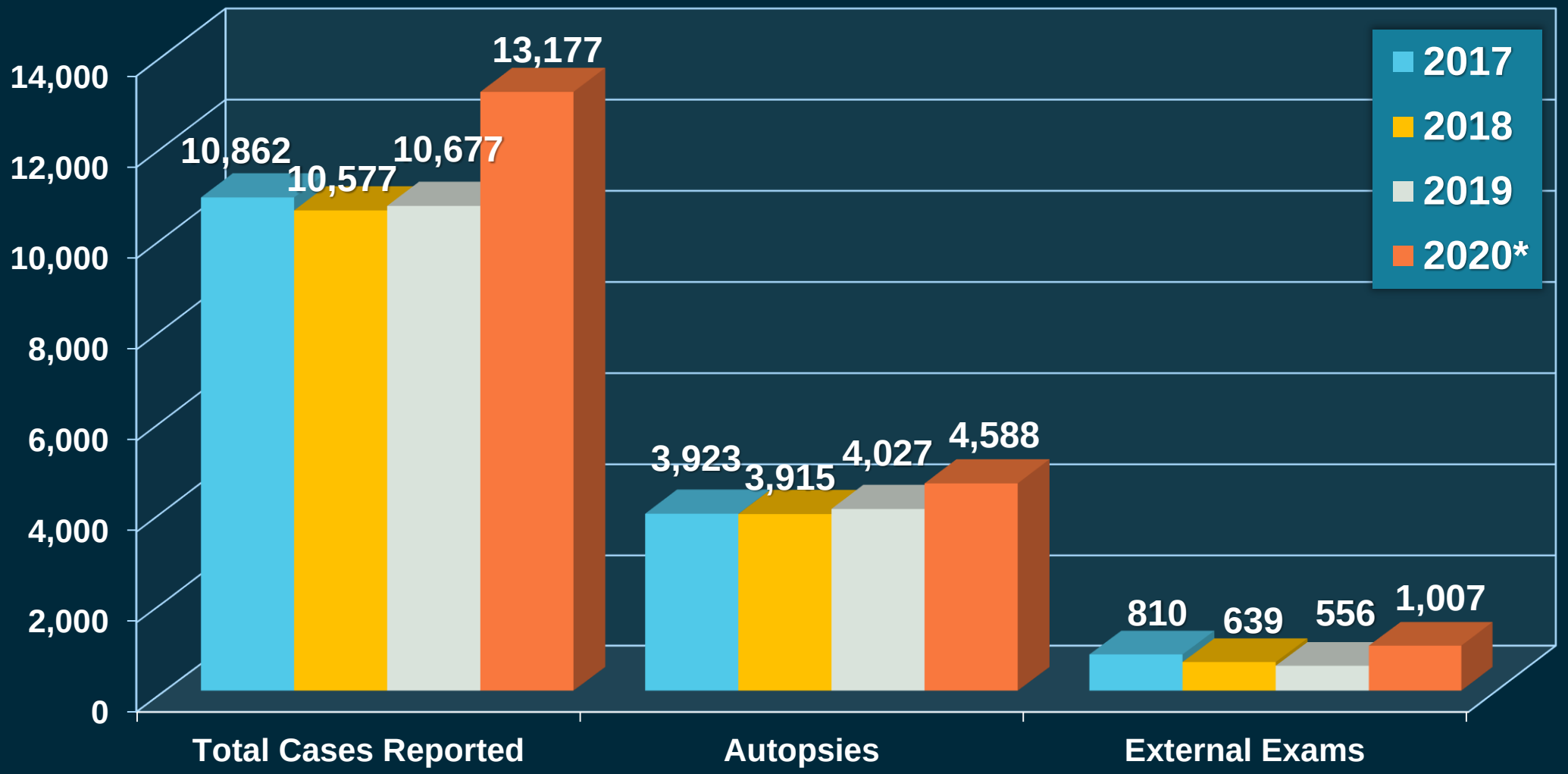
** Population estimate for 2020 obtained from the US Census Bureau*
*** Provisional Death Certificate data from the Texas Department of State Health Services*

Statistical Summary

- **82% of ML cases (4,588) received a full autopsy***
  - **18%** of ML cases (**1,007**) received an external examination only
- **411 decedents unidentified on arrival**
  - **10** decedents remained unidentified at the end of 2020**
- **330 referrals to Harris County Bereavement Services**
- **78 formal neuropathological consults and 13 child abuse consults**

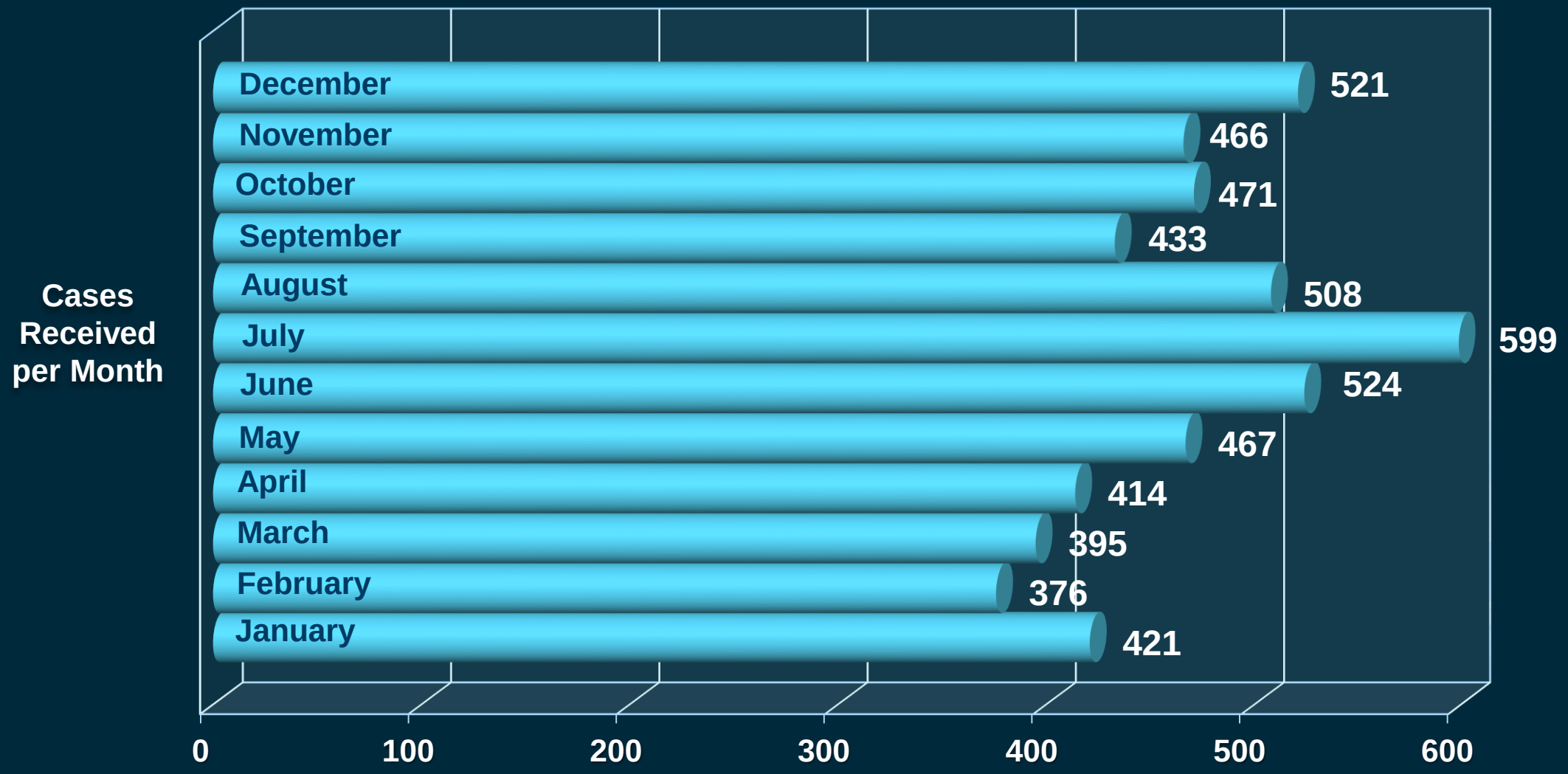
** Partial autopsies are not performed by the HCIFS*
*** 9 skeletal remains and 1 in an advanced state of decomposition*

Total Caseload (2017 - 2020)



*2020 total cases reported shows a 23% increase from 2019.The autopsy case number increase is despite a changed criteria to increase external examinations and trauma inquests.

Monthly Medicolegal Caseload 2020



Average Daily Medicolegal Caseload

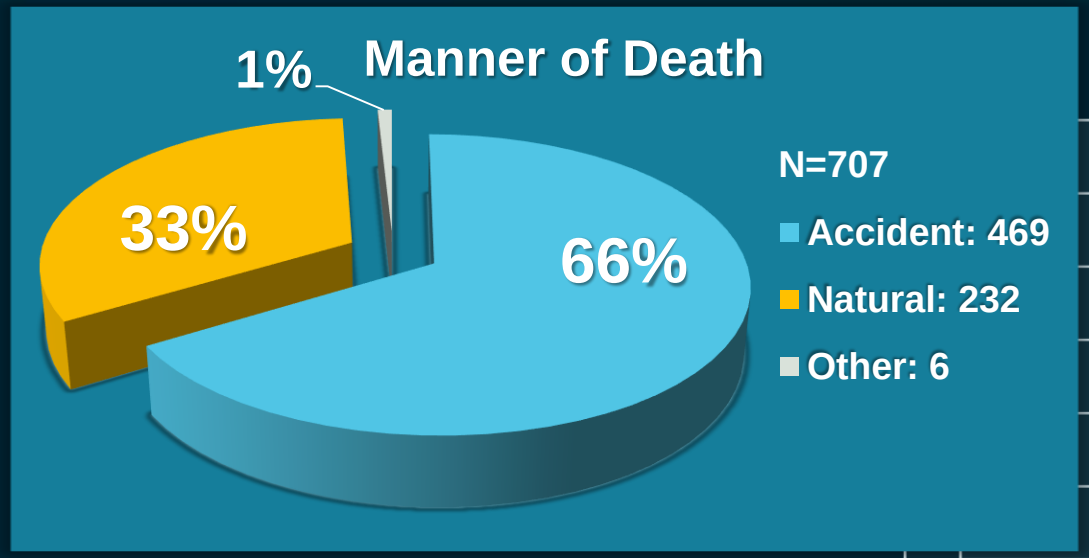
Months with HIGHEST Average Daily Caseload:

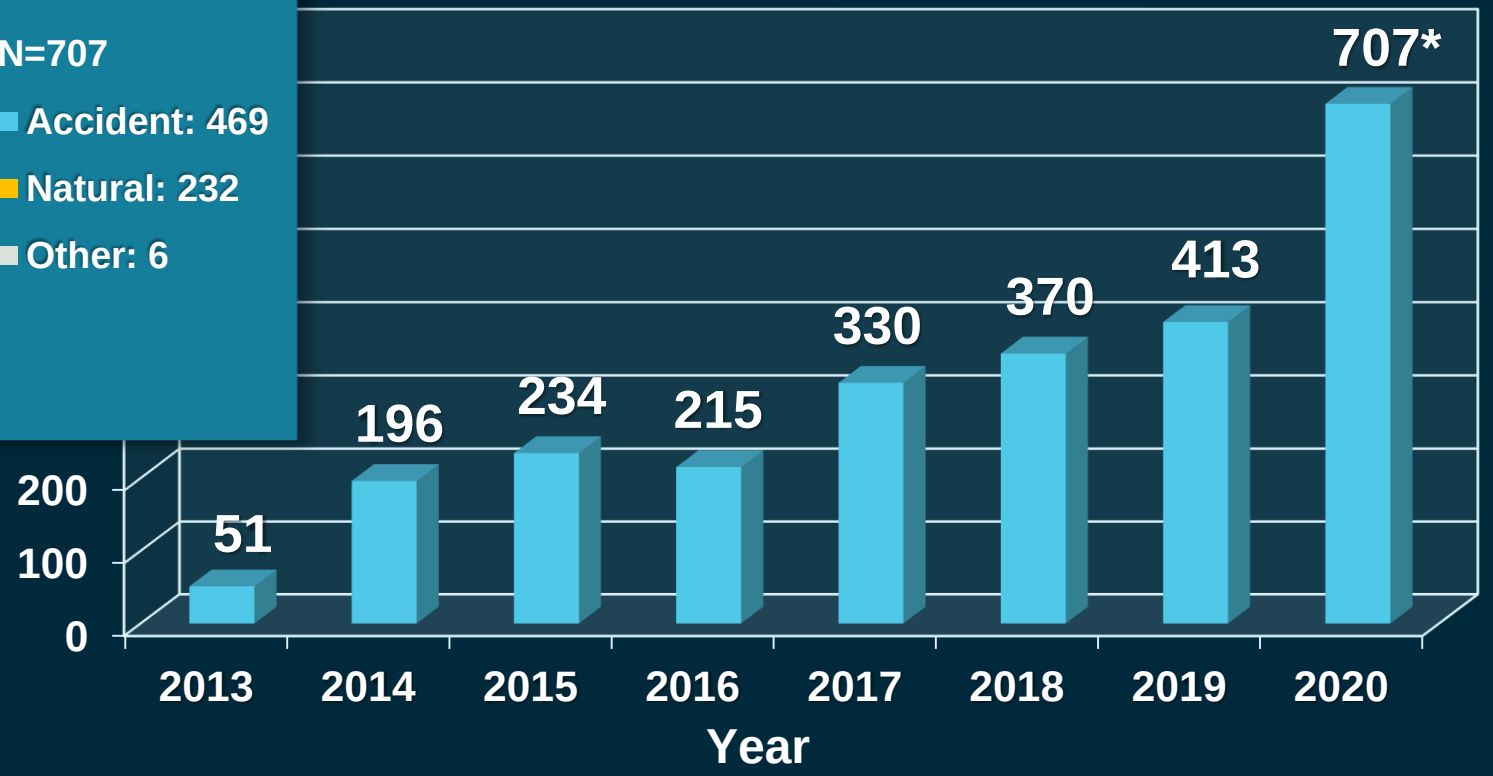
- 2020 July: 19 cases
- 2019 December: 14 cases
- 2018 January: 14 cases

Top Five Days with HIGHEST Cases Received:

2020	# of Cases	2019	# of Cases
July 15	31	October 5	23
May 6	30	November 28	23
August 28	30	August 3	22
November 9	29	August 23	22
February 3	28	November 22	22

Trauma Inquest Cases

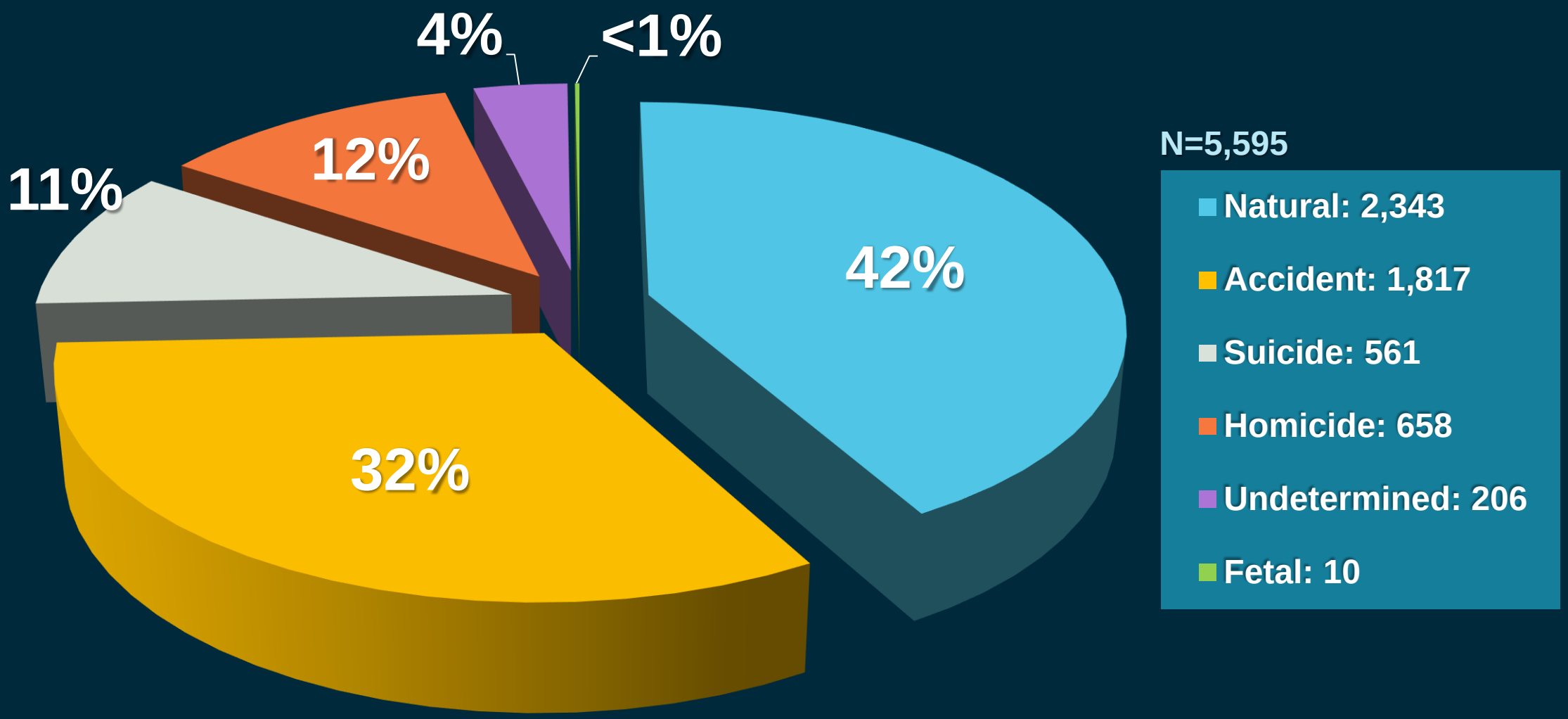




Trauma inquest is a death investigation in which the medical examiner accepts jurisdiction and completes the death certificate, but the body of the deceased is not examined by medical examiner personnel. Prior to 2014, many of the deaths that we currently handle as trauma inquests were brought in for external examination. The practice of performing a trauma inquest in these cases is a more judicious use of HCIFS personnel and streamlines family disposition of the body without compromising the accuracy of death certification.

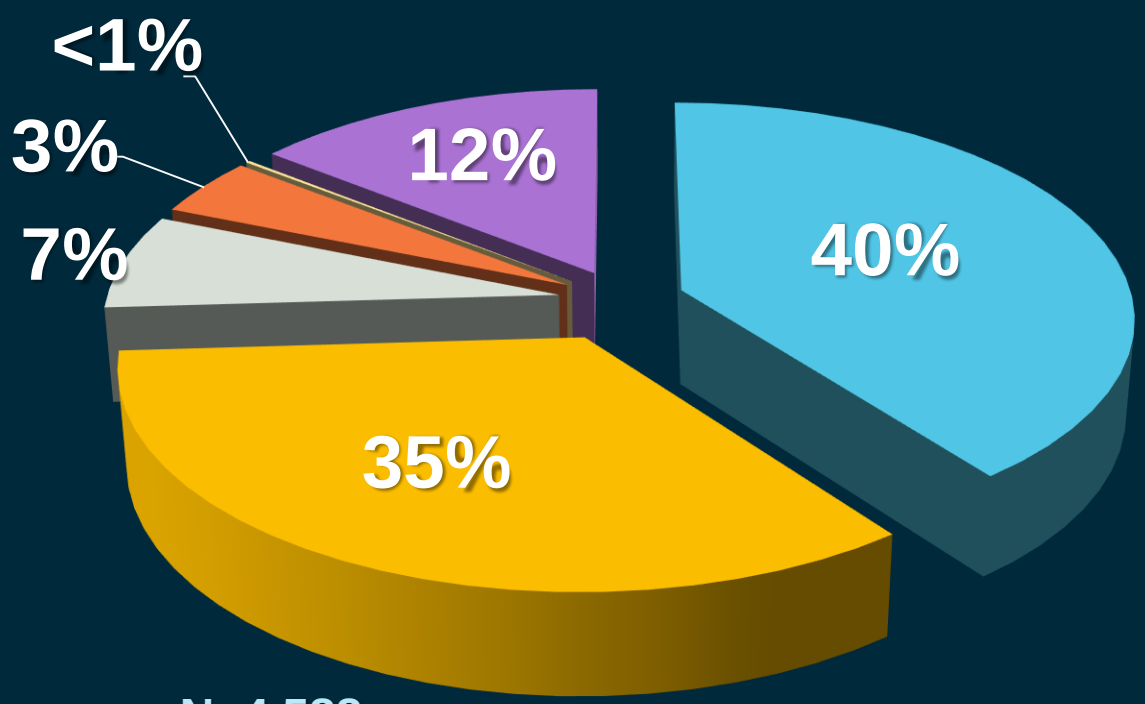
**2020 had a 72% increase from 2019; a record high for trauma inquest cases.*

Manner of Death – Autopsy and External Examinations



Manner of Death by Autopsy and External Examinations

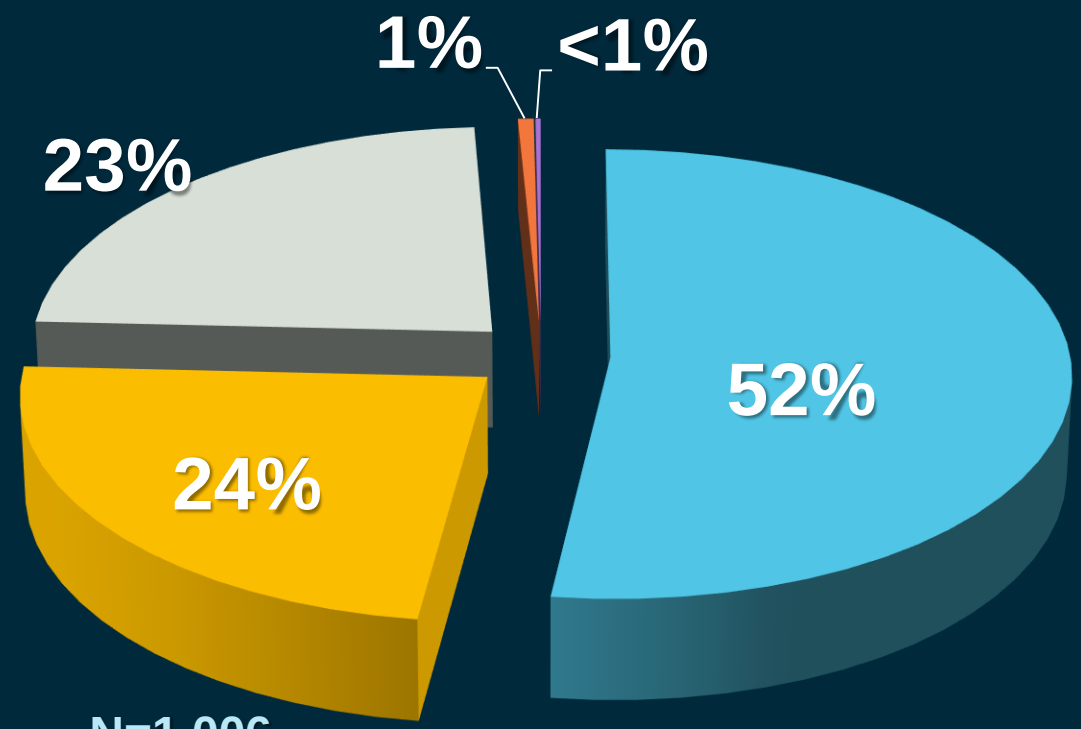
Autopsy Examinations



N=4,588

- Natural: 1,819
- Accident: 1,579
- Suicide: 325
- Undetermined: 200
- Fetal: 8
- Homicide: 657

External Examinations

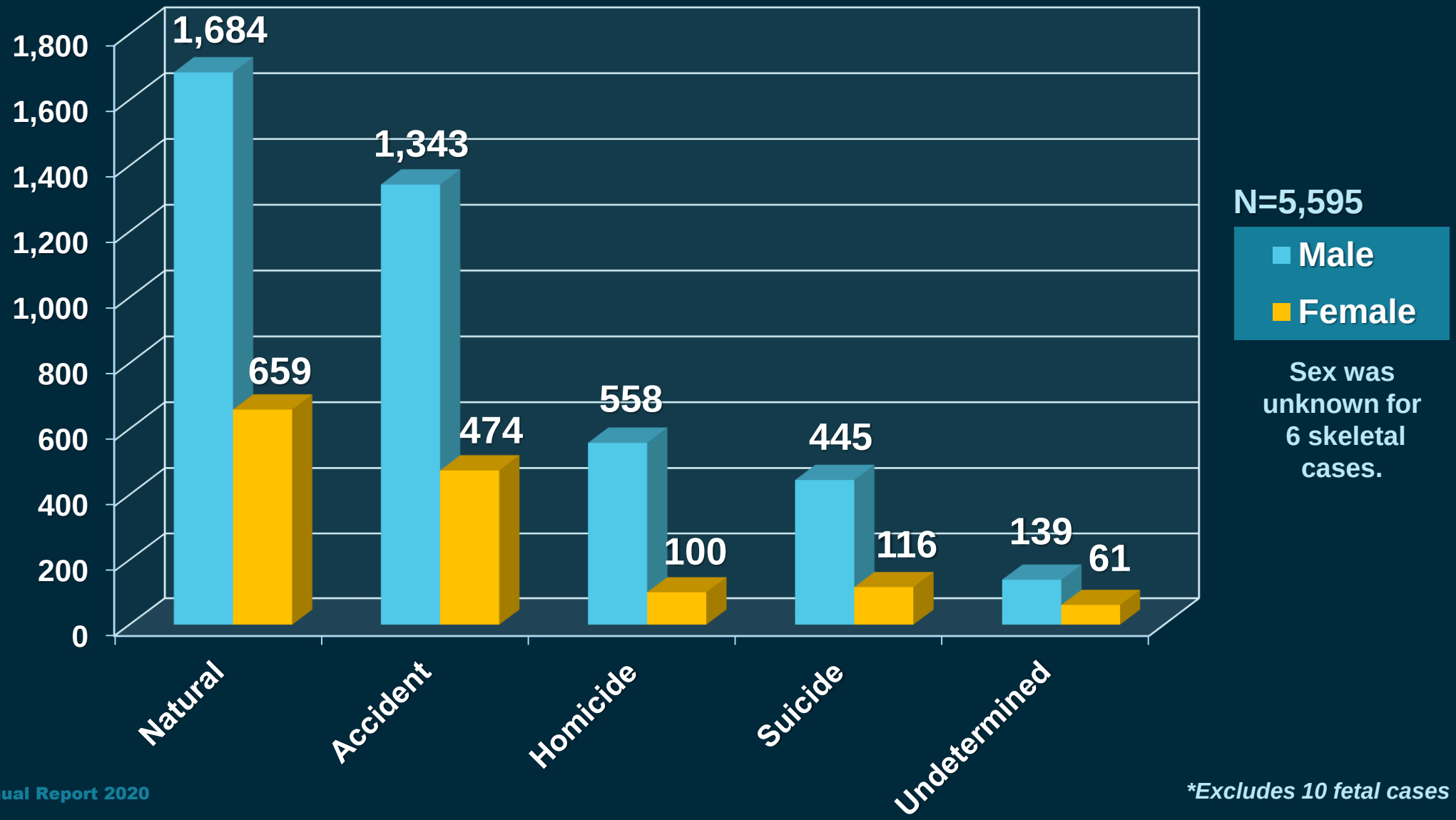


N=1,006

- Natural: 524
- Accident: 238
- Suicide: 236
- Undetermined: 6
- Fetal: 2

** One homicide case with no body recovered. The ruling is based on a positive DNA match from charred remains and circumstances of death according to law enforcement.*

Manner of Death by Sex



N=5,595

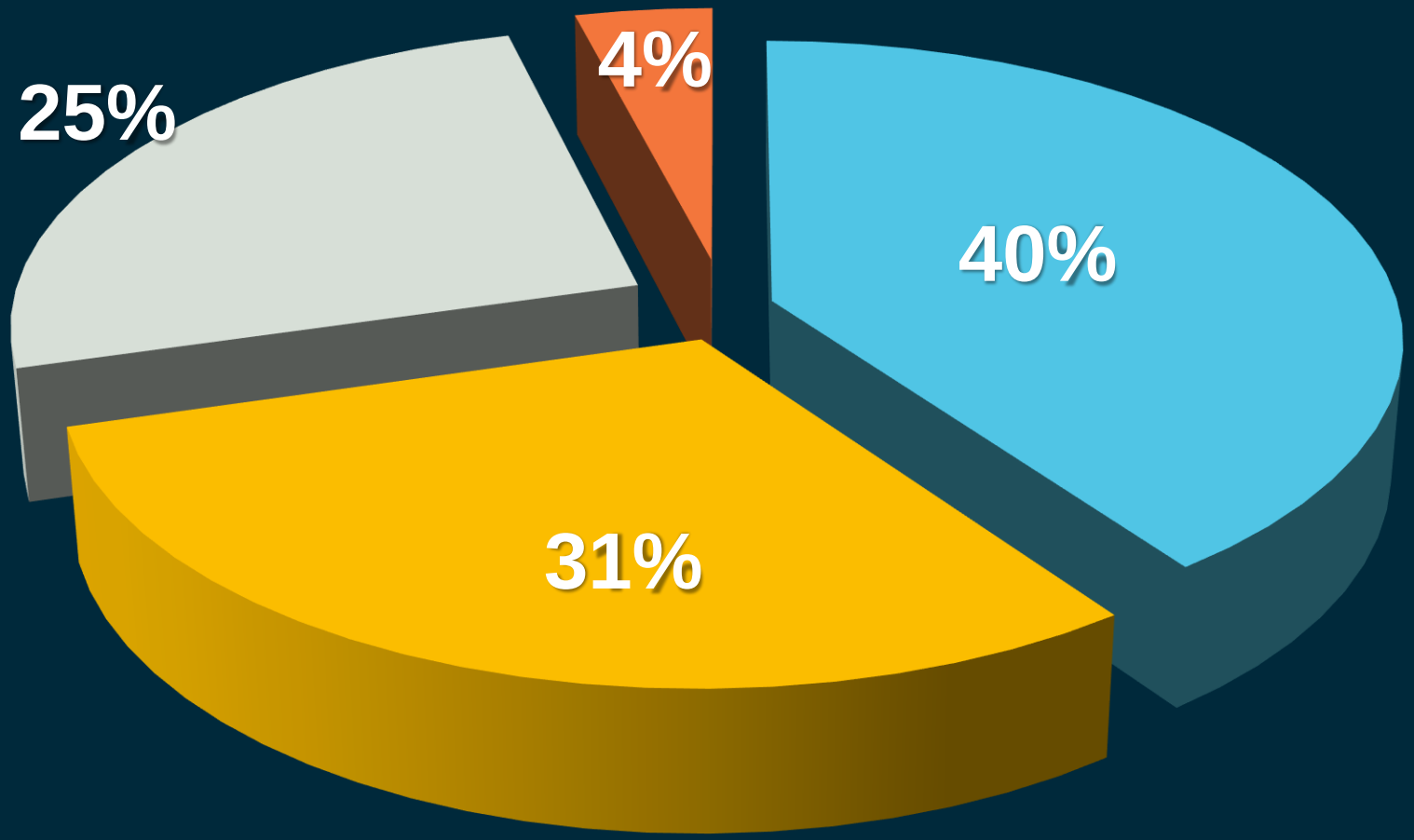
Male

Female

Sex was unknown for 6 skeletal cases.

*Excludes 10 fetal cases

Race/Ethnicity of Medicolegal Cases



N=5,595

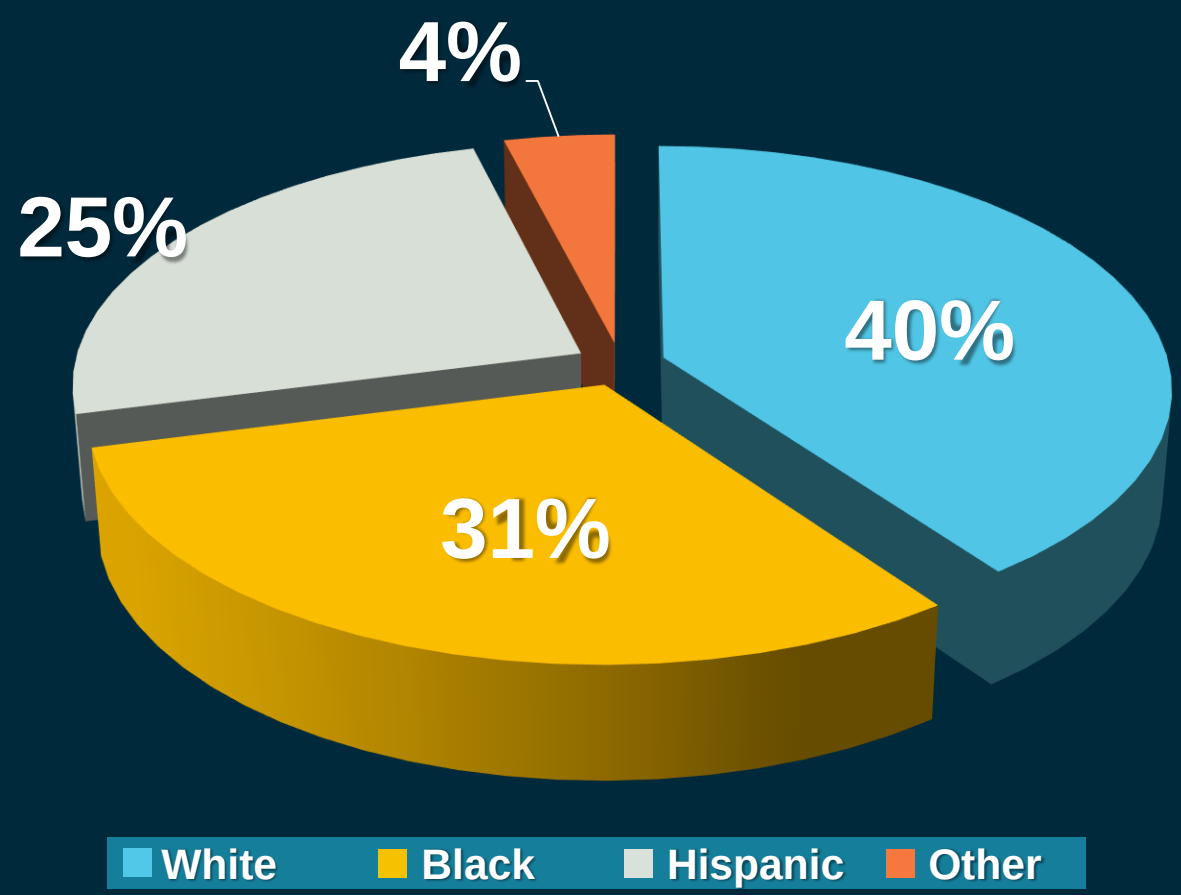
- White: 2,236
- Black: 1,700
- Hispanic: 1,419
- Other: 226*

Race/Ethnicity was unknown for 14 cases.

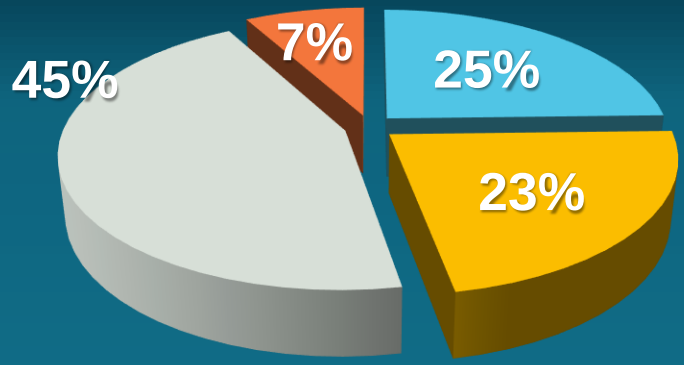
*Native American (4) and Asian (222)

Race/Ethnicity Demographics Compared to Populations

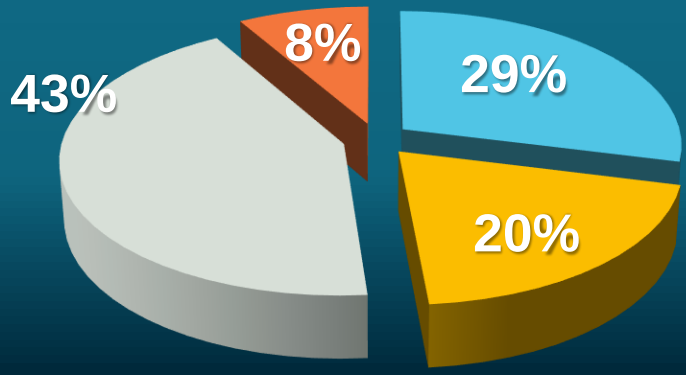
HCIFS Decedent Population*



Houston City Population**

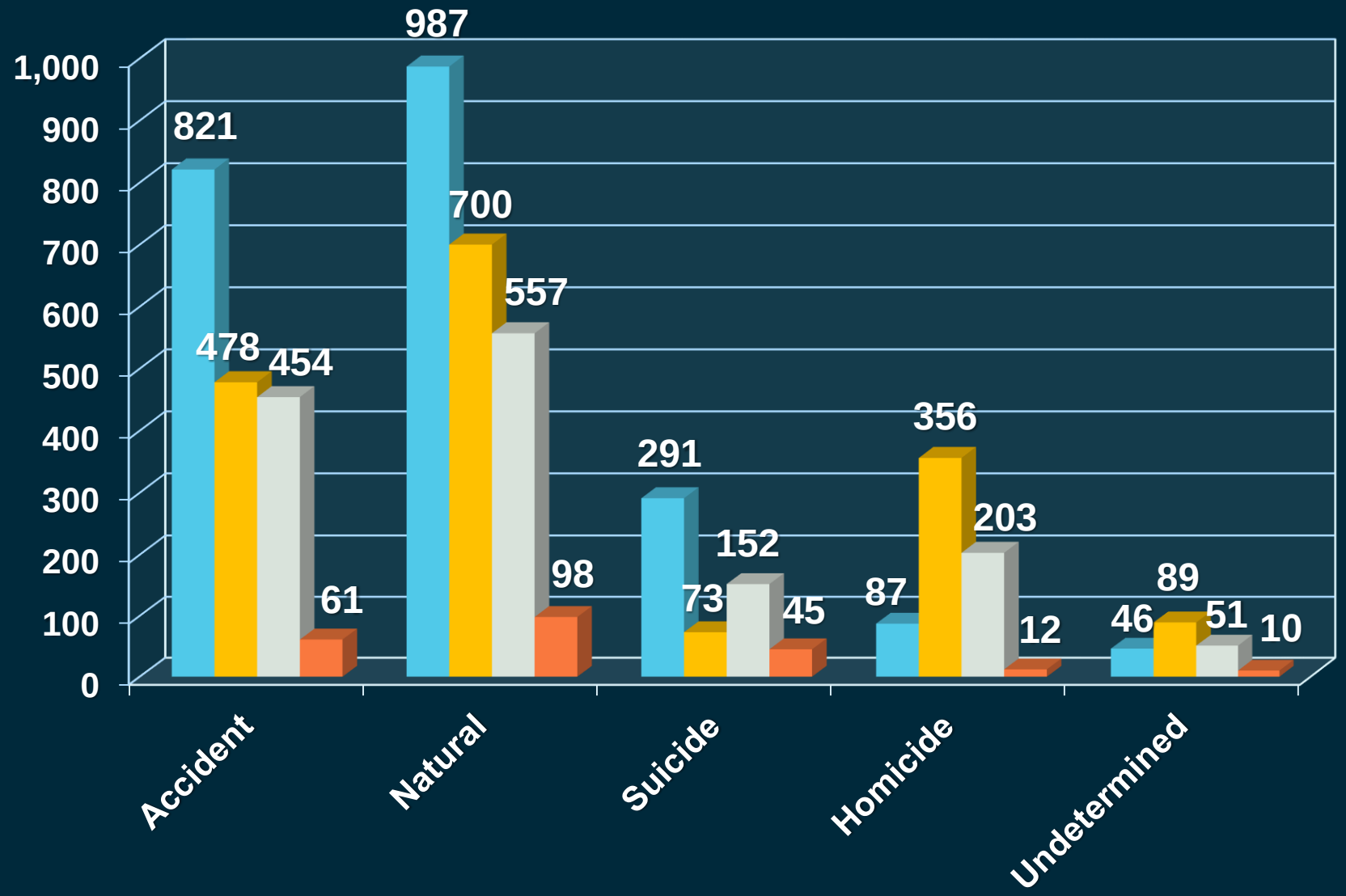


Harris County Population***



** HCIFS decedent population, N=5,595, excludes unknown race/ethnicity*
*** City of Houston population, N=2,323,660, estimated by U.S. Census Bureau*
**** Harris County population, N=4,798,048, estimated by Texas DSHS Center for Health Statistics*

Medicolegal Cases by Manner and Race/Ethnicity



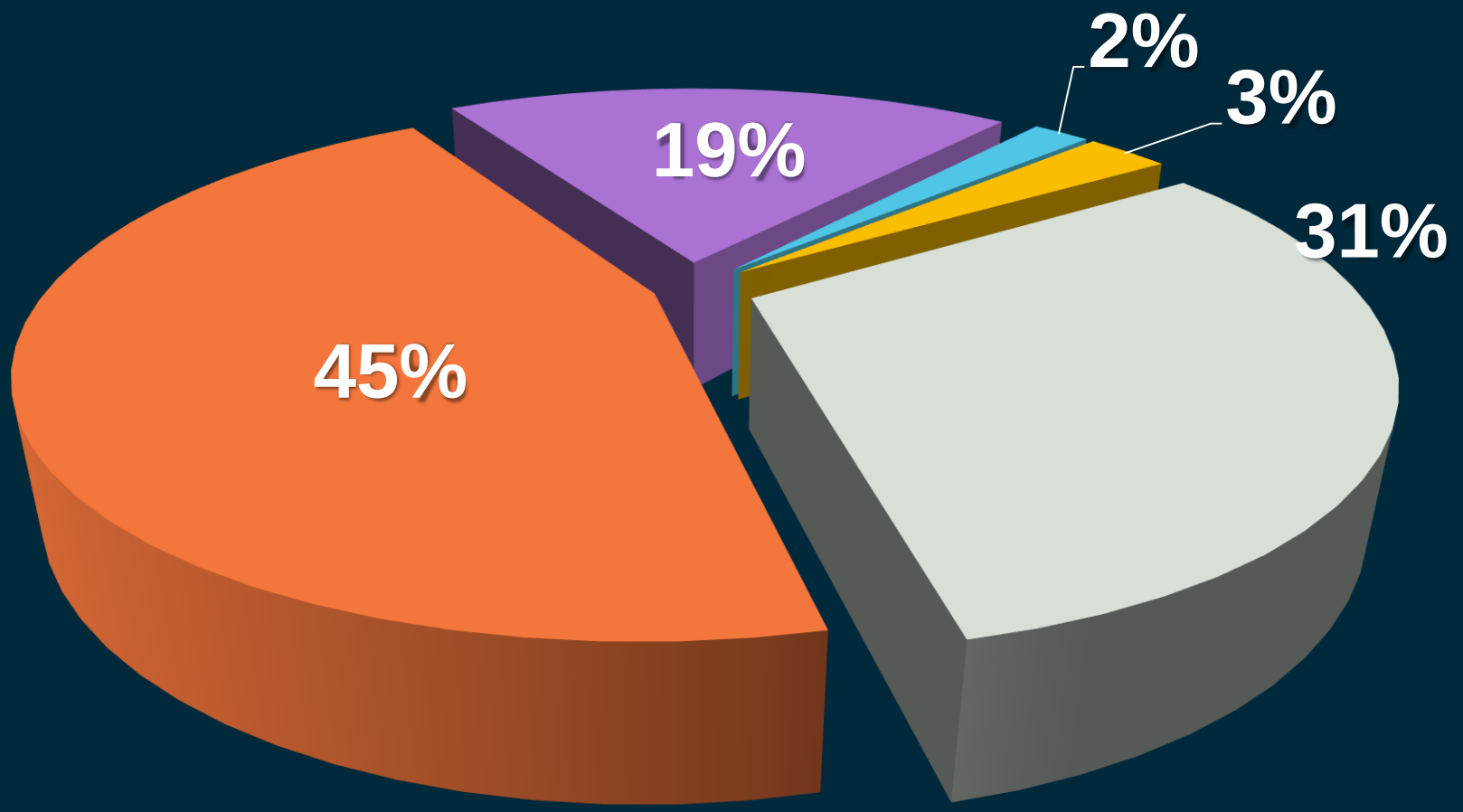
N=5,595*

- White: 2,232
- Black: 1,696
- Hispanic: 1,417
- Other: 226

14 cases were individuals of unknown race/ethnicity.

*Excludes 10 fetal cases

Medicolegal Cases by Age

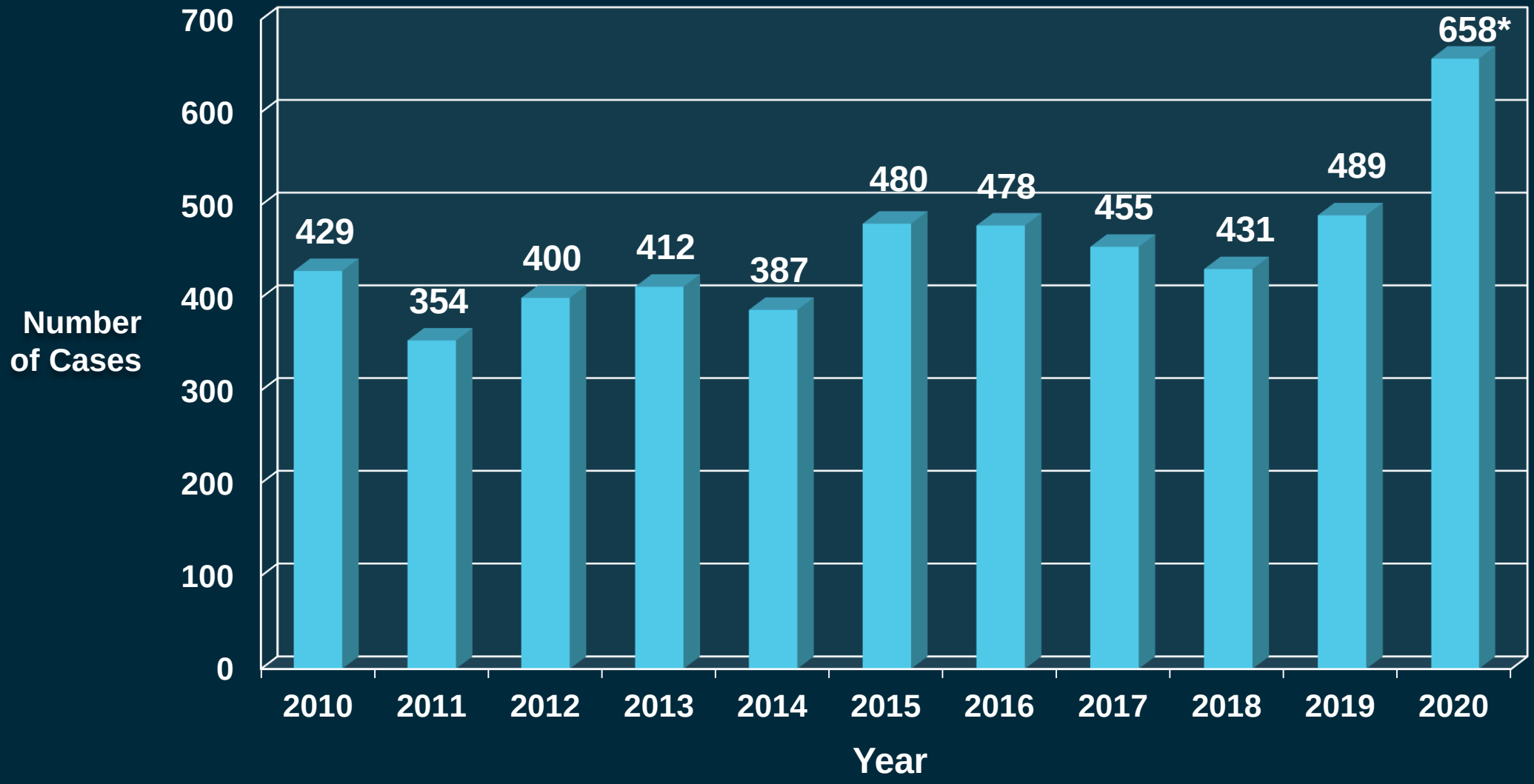


N=5,595*

- <1 Year: 107
- 1-17 Years: 154
- 18-39 Years: 1,716
- 40-64 Years: 2,507
- 65+ Years: 1,099

*12 cases with unknown age

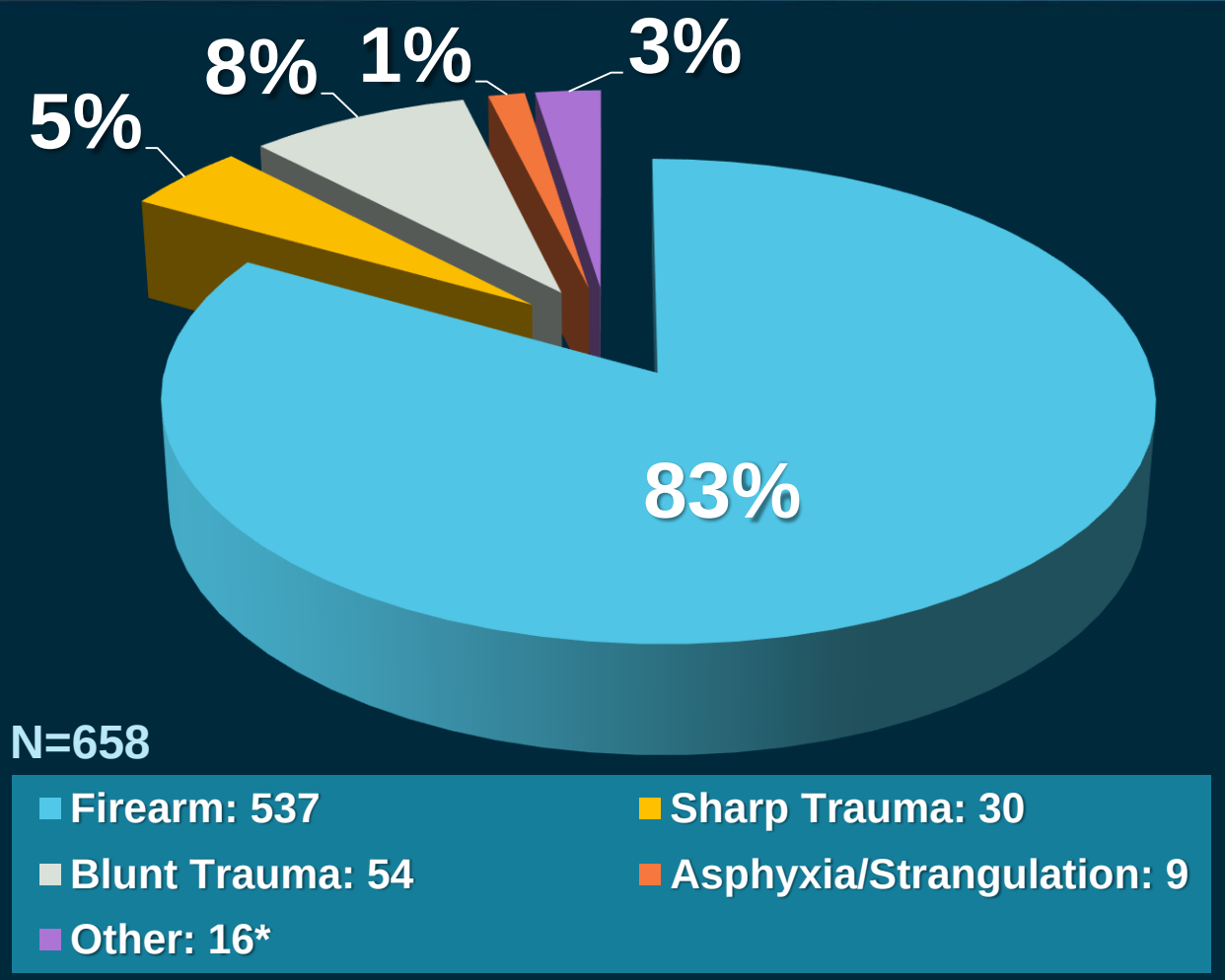
Homicide Cases



*This is a 35% increase from 2019 and a 86% increase from 2011.

Cause of Death in Homicide Cases

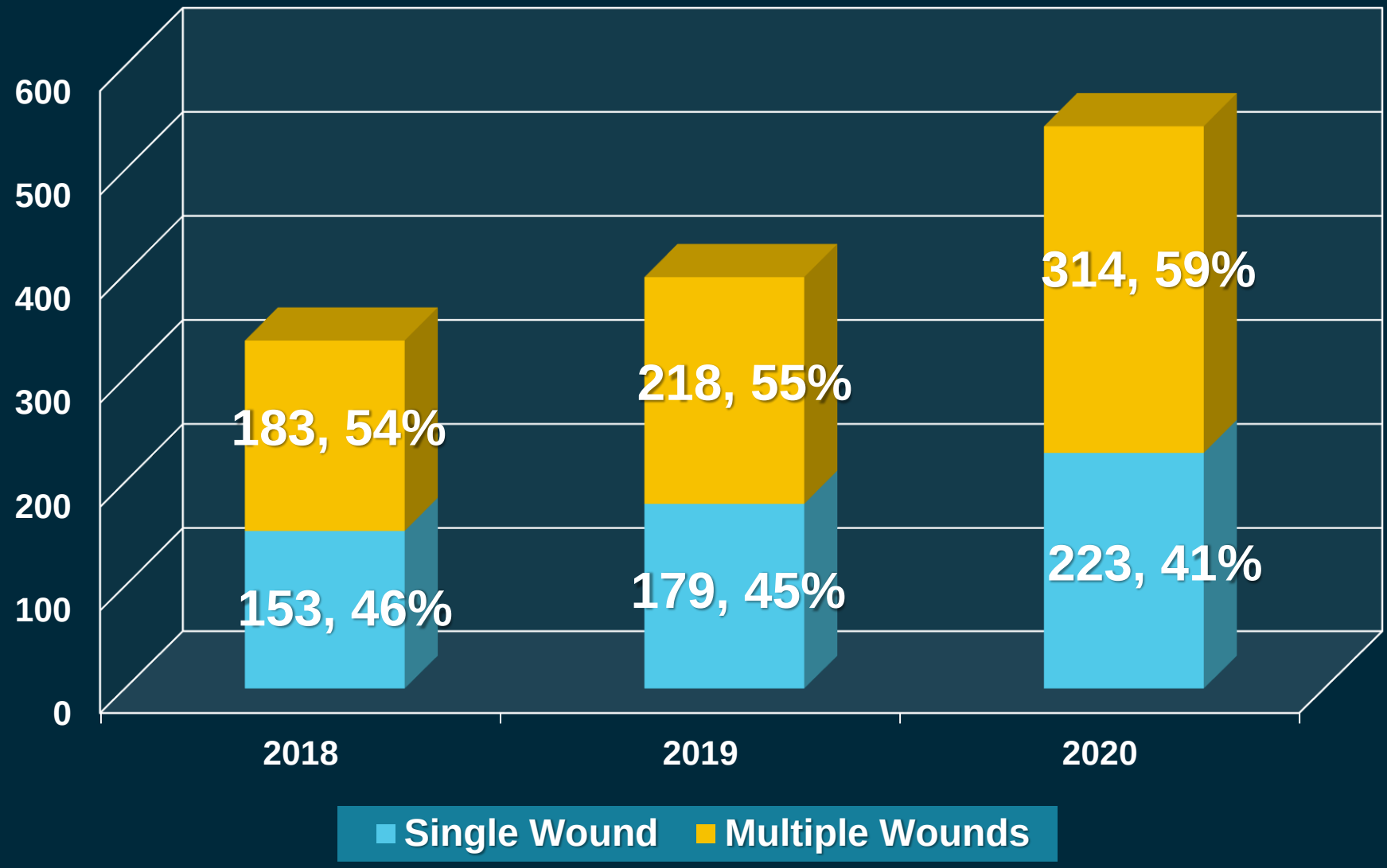
- **34** cases were linked to at least one other ML case
  (e.g., double homicide, homicide suicide, etc.)
- At least **50** homicide cases were associated with domestic violence
- **8** homicide deaths occurred "while at work"



Cases with mixed causes of death include Gunshot/sharp/blunt-force trauma (12).

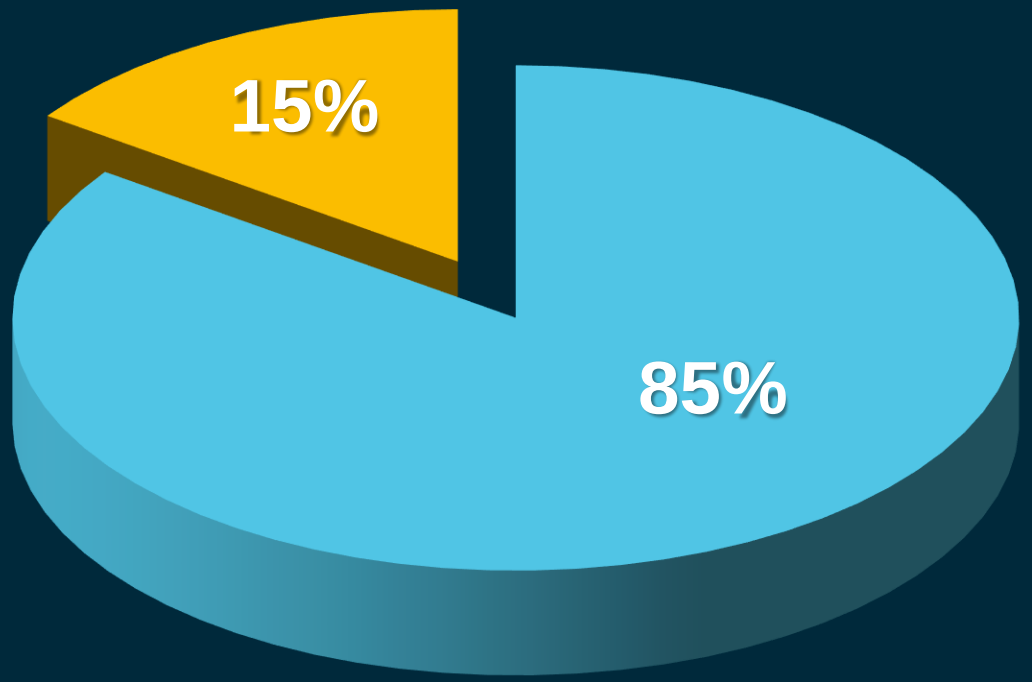
**Other causes include the use of drugs, thermal injuries, homicidal violence, and drowning.*

Homicide Deaths by Firearms



Homicide Deaths by Demographics

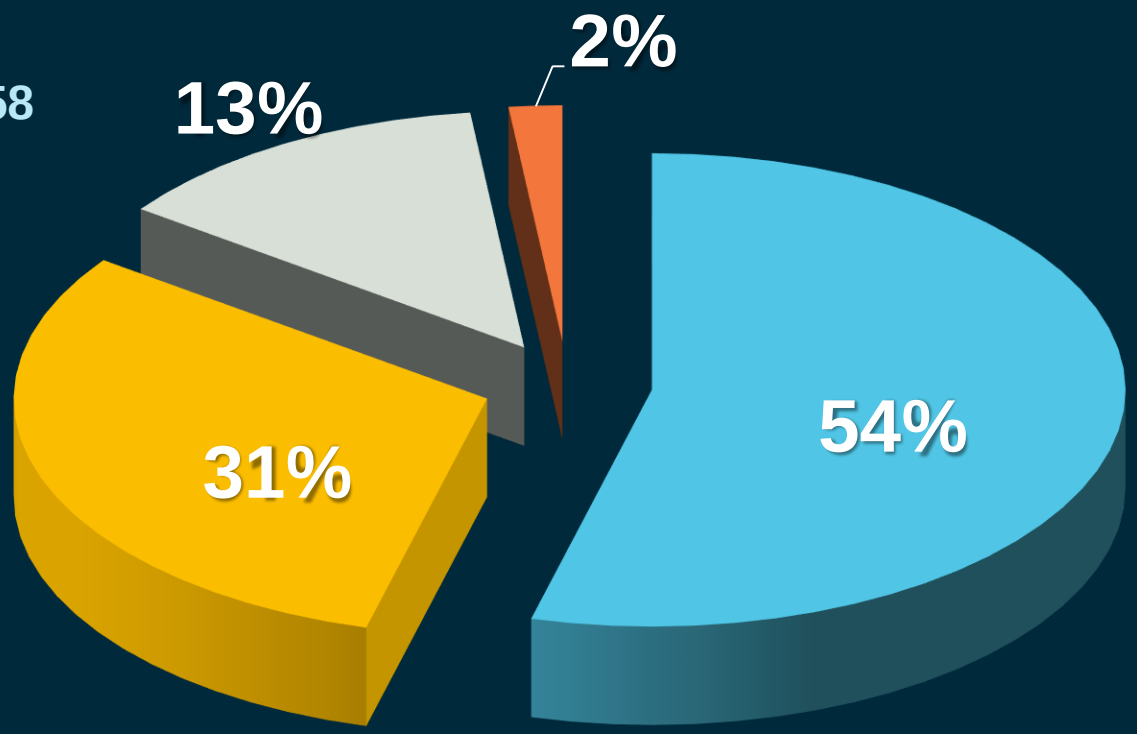
Sex



Male: 558 Female: 100

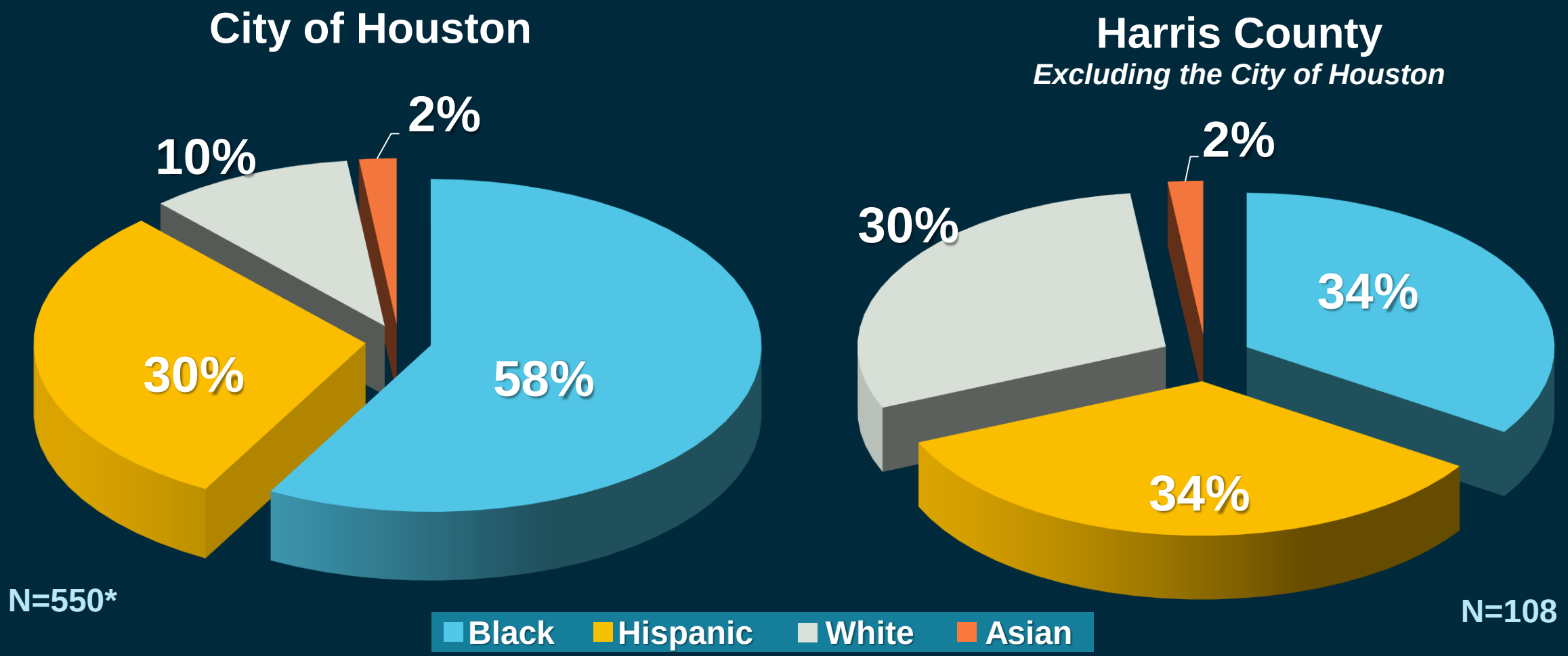
Race/Ethnicity

N=658



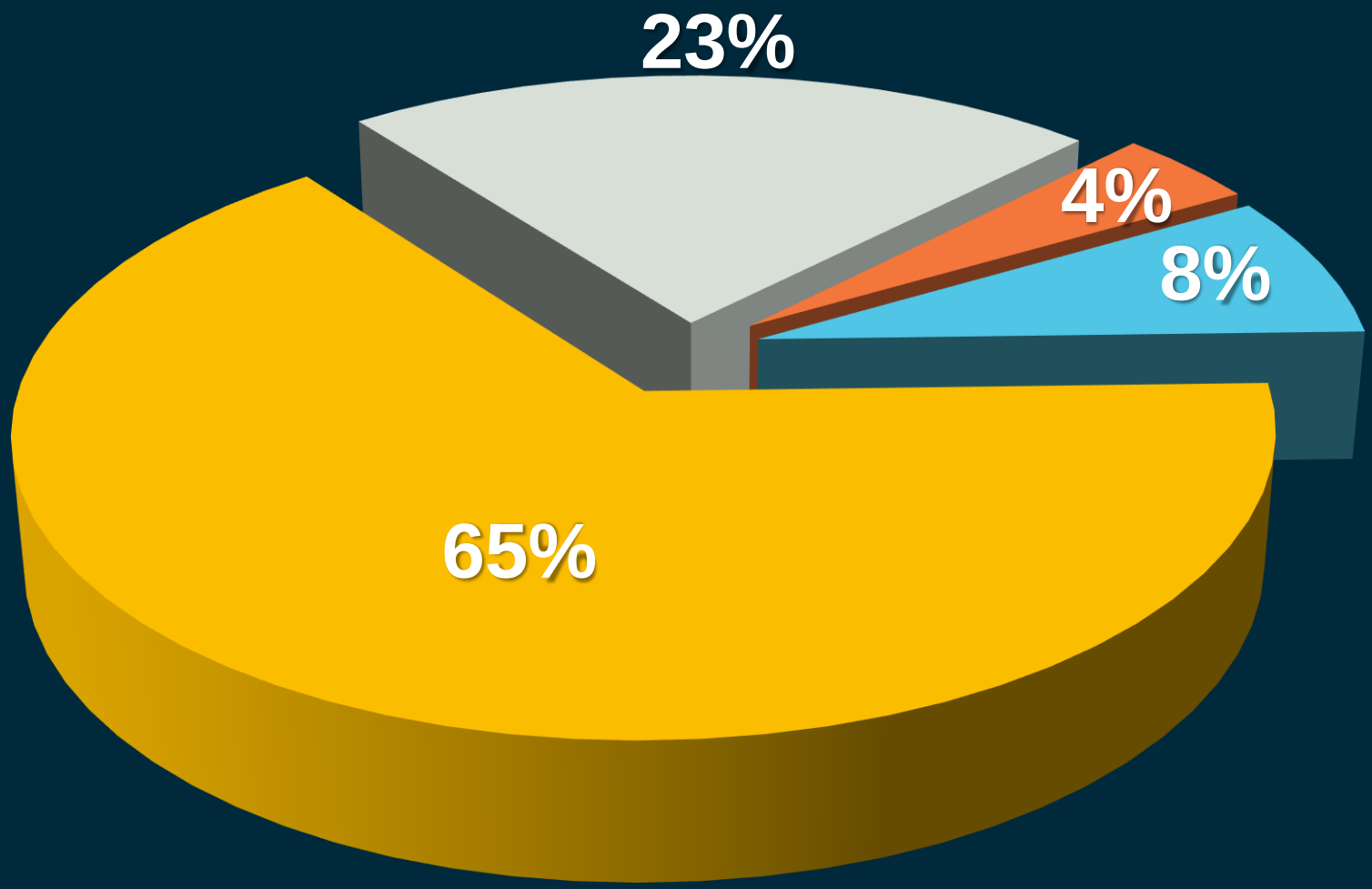
Black: 356 Hispanic: 203
White: 87 Asian: 12

Homicide Deaths by Race/Ethnicity and Location



*550 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.

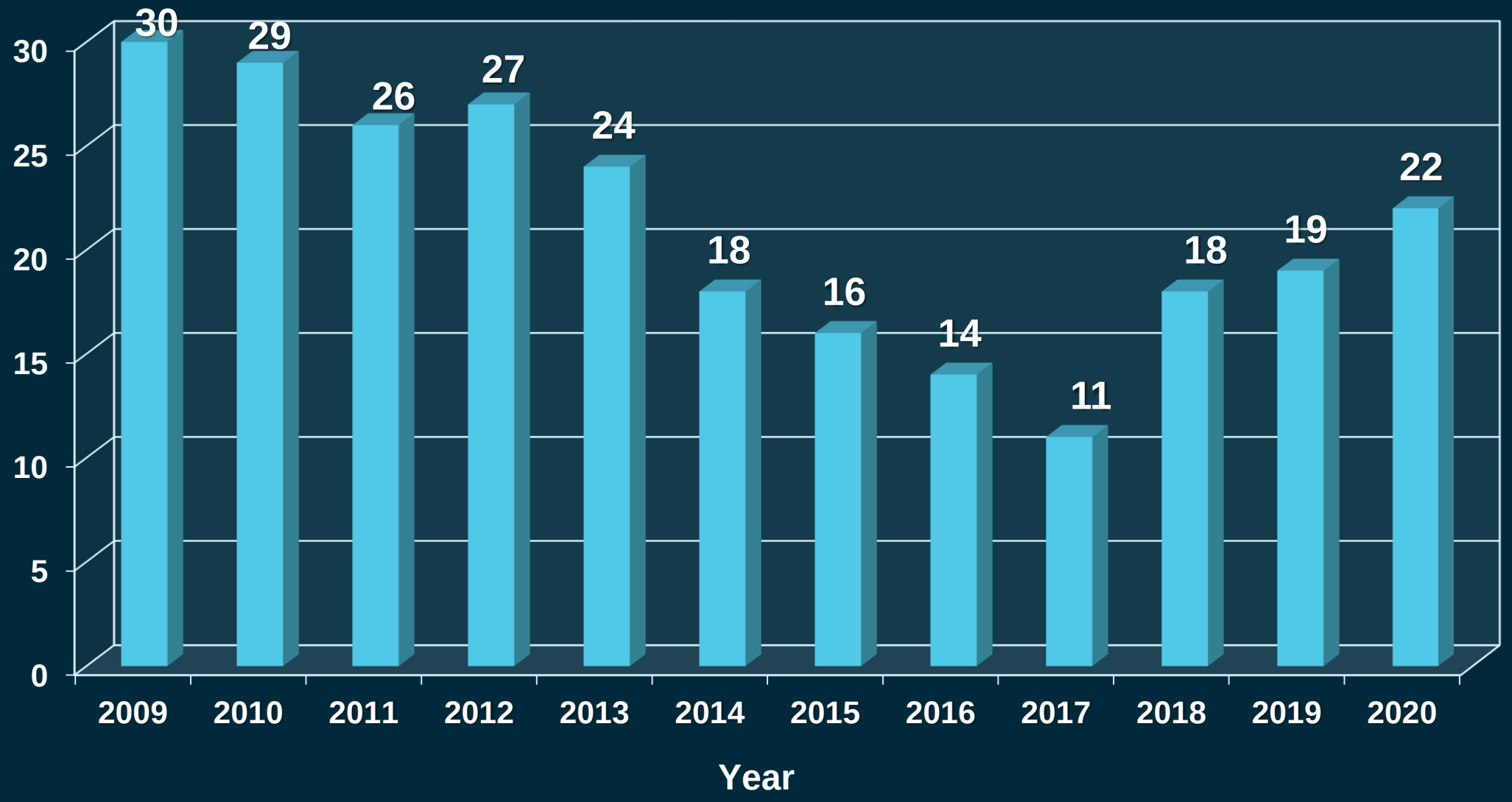
Homicide Deaths by Age



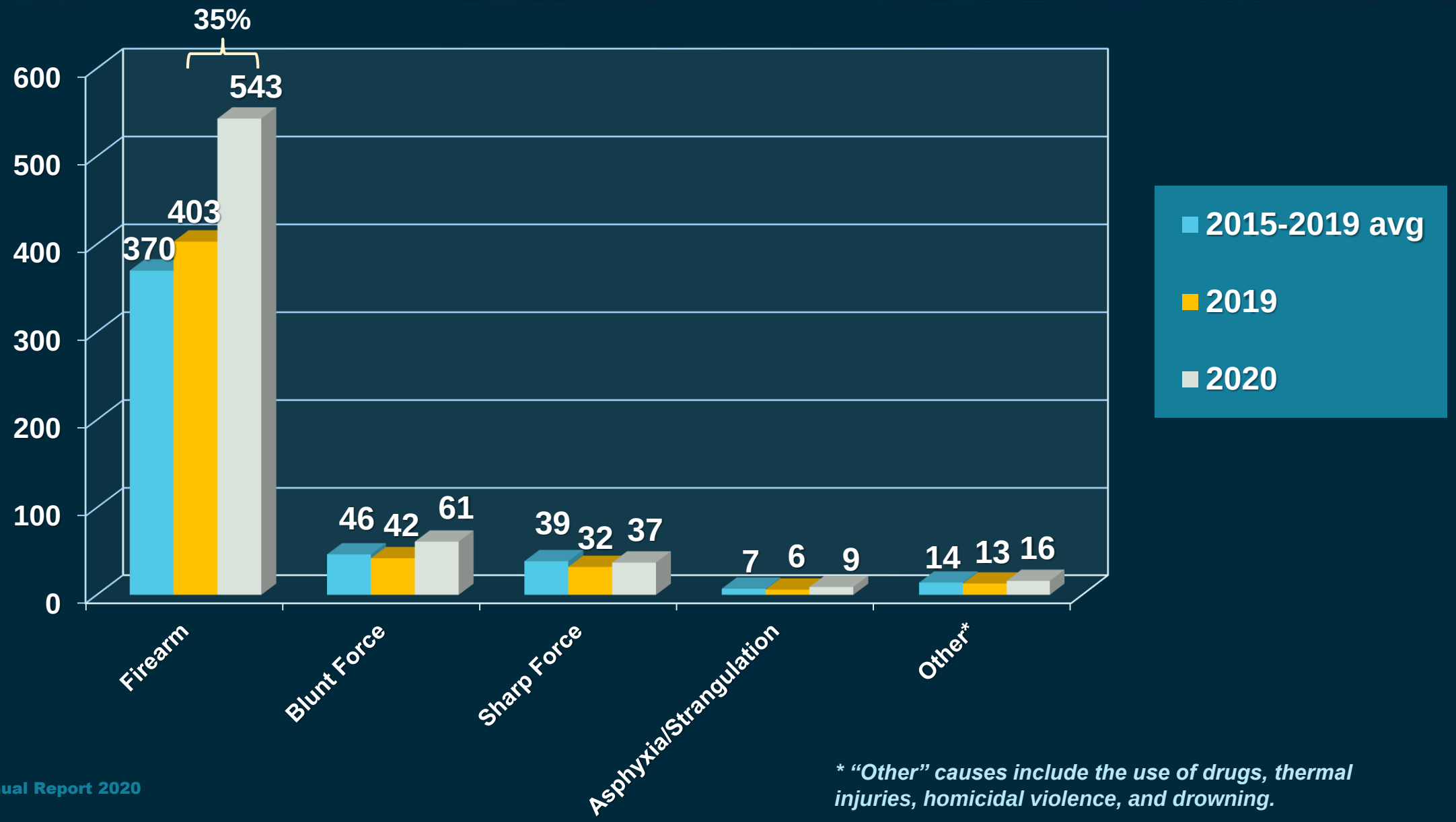
N=658

- < 18 years: 52
- 18-39 years: 428
- 40-64 years: 150
- 65+ years: 28

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

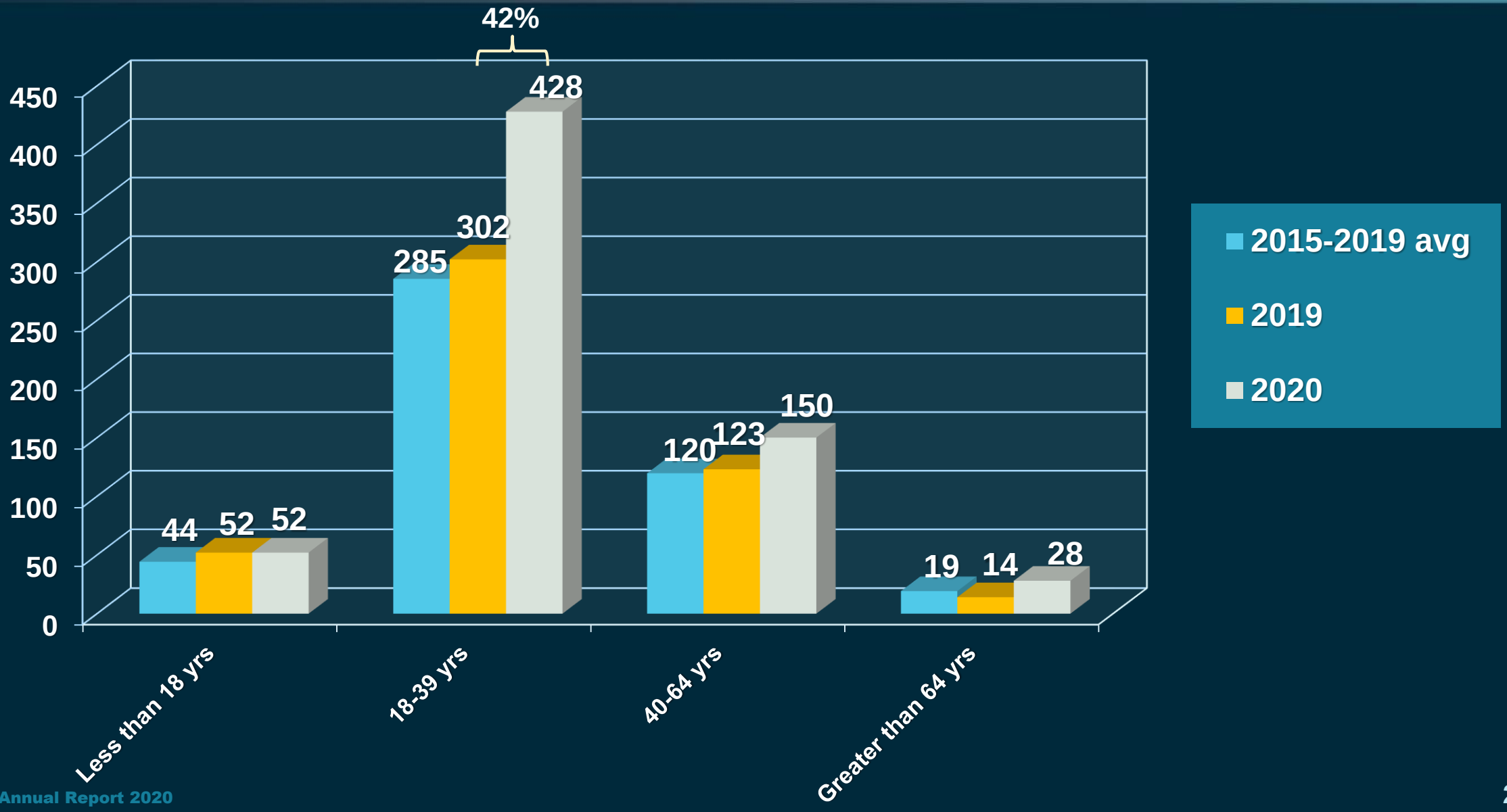


Homicide Case Comparison Between Years by Cause

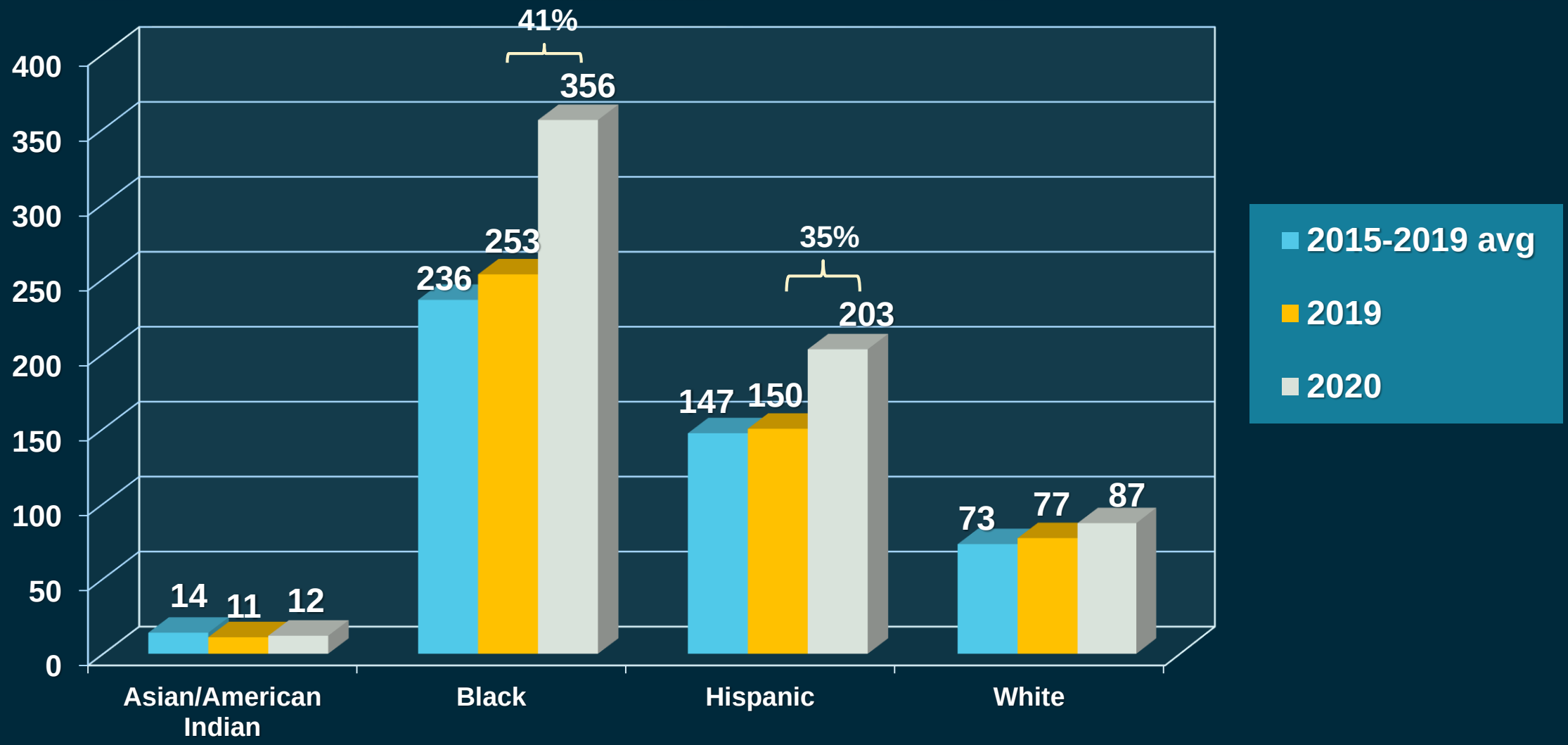


** "Other" causes include the use of drugs, thermal injuries, homicidal violence, and drowning.*

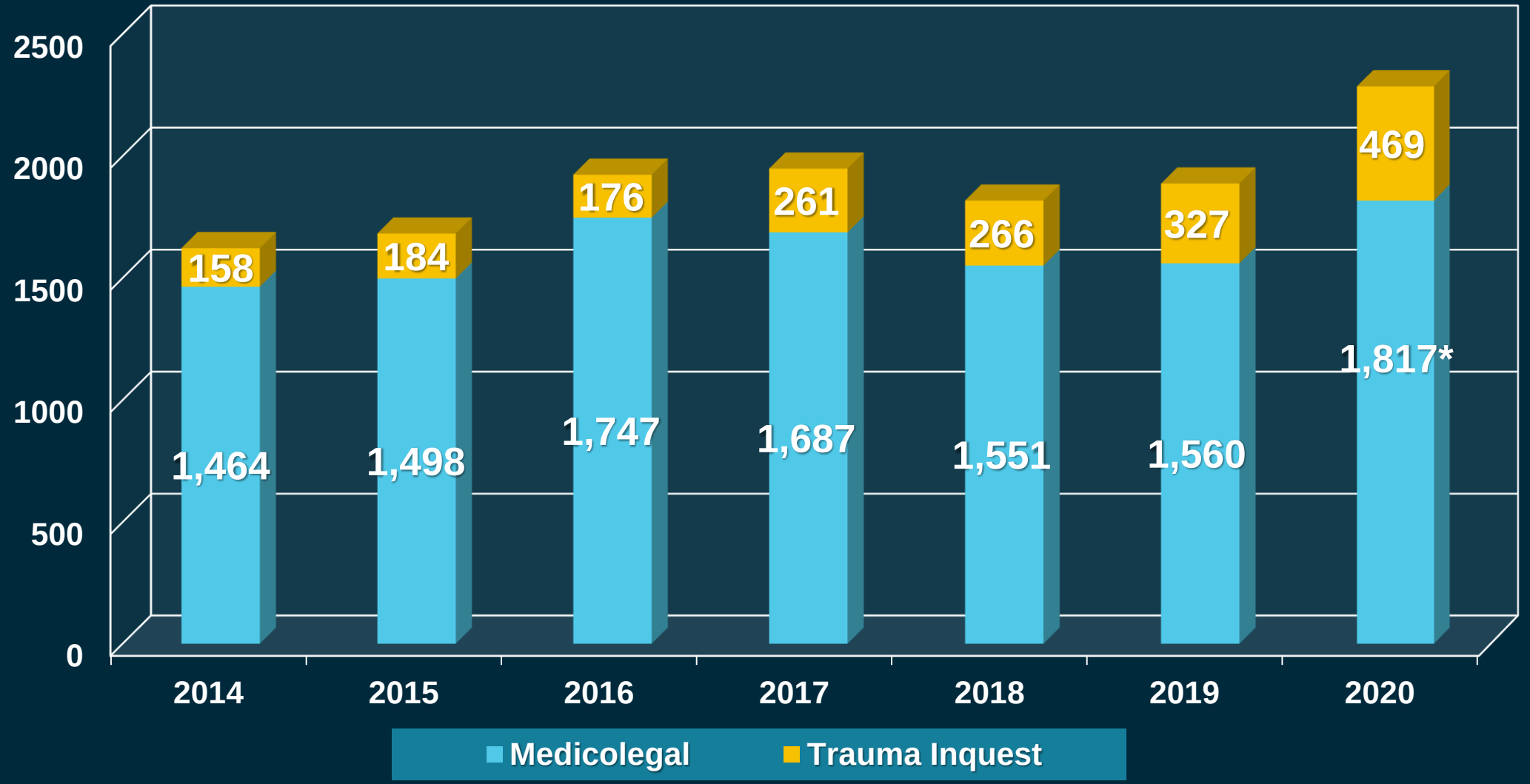
Homicide Case Comparison Between Years by Age



Homicide Case Comparison Between Years by Race



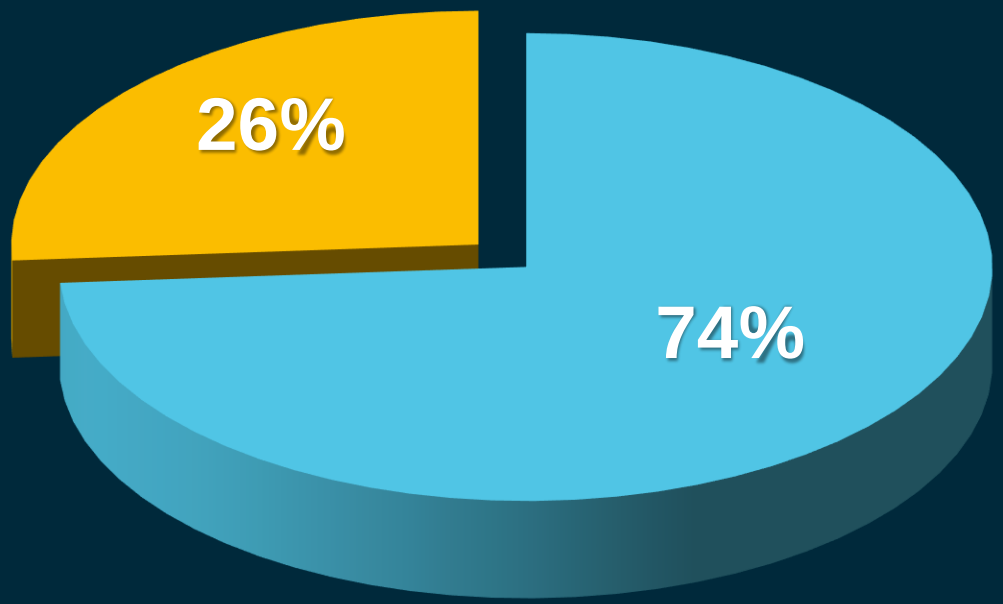
Accidental Cases



*16% increase from 2019 for medicolegal cases and a 21% increase for both medicolegal and trauma inquest cases combined

ML Accidental Deaths by Demographics

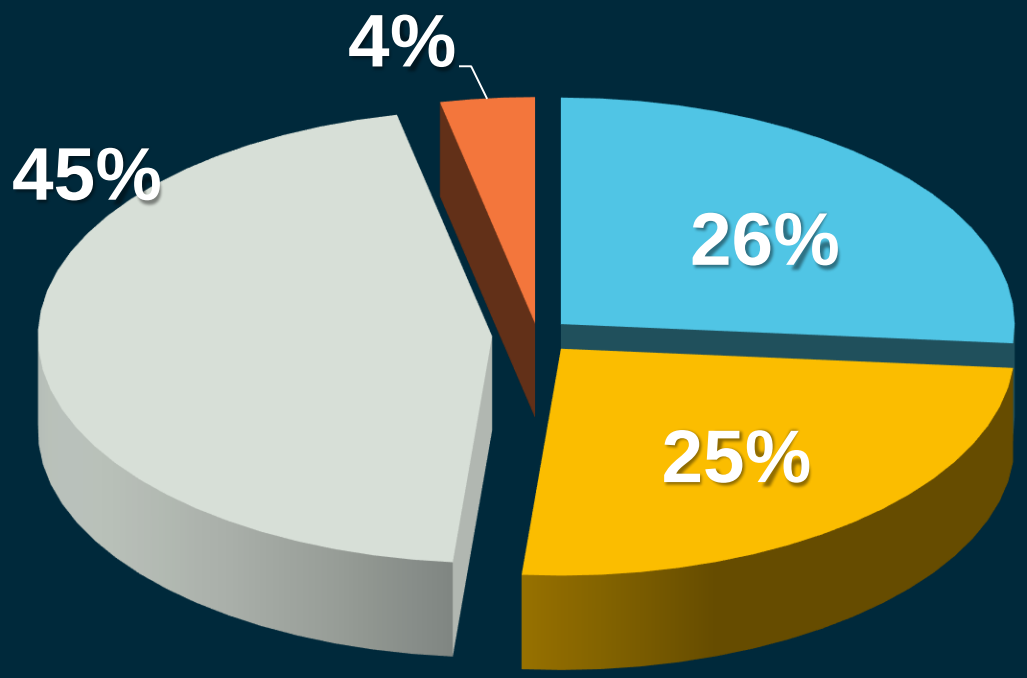
Sex



Male: 1,343 Female: 474

Race/Ethnicity

N=1,817

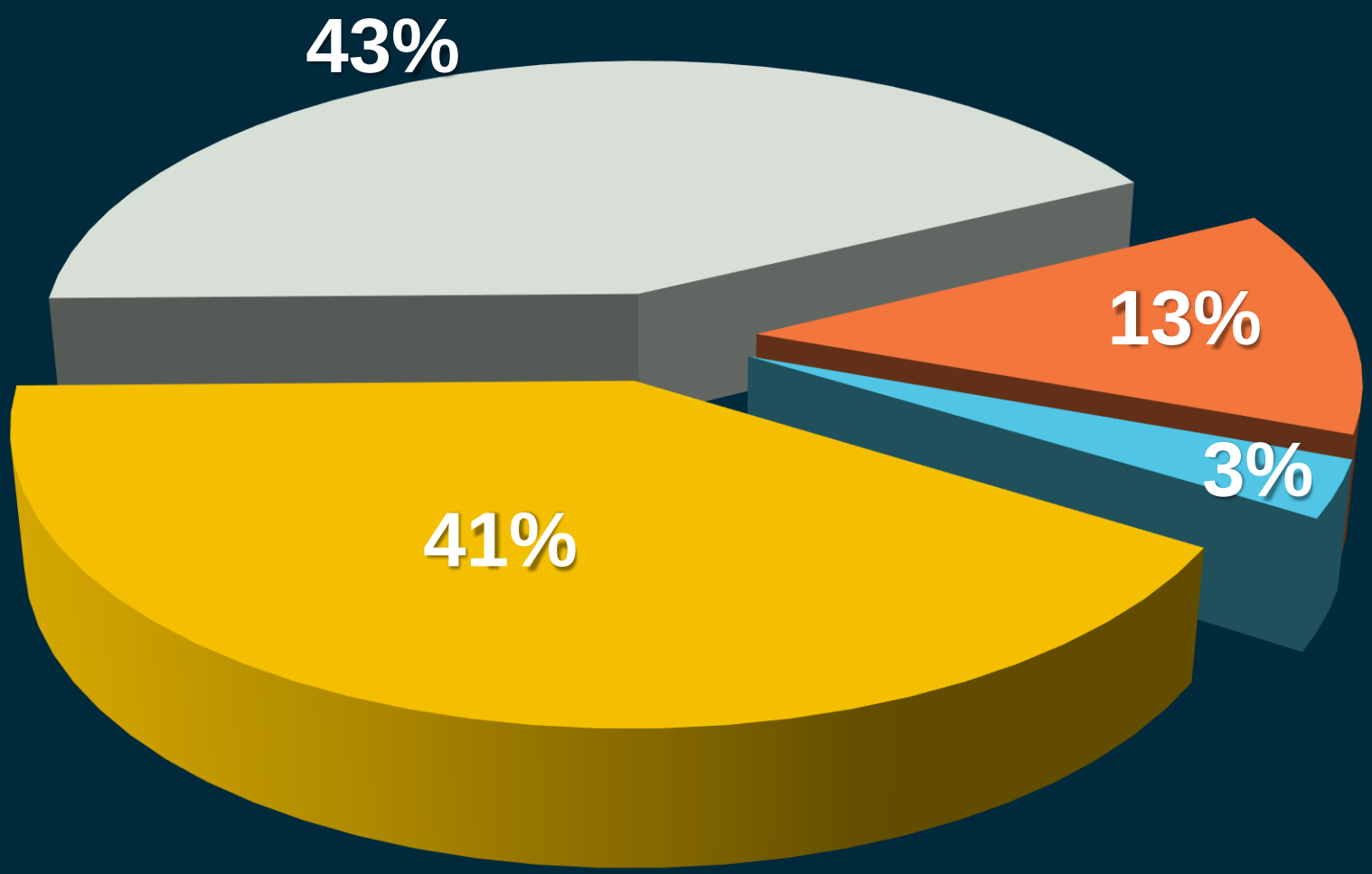


Black: 478 Hispanic: 454

White: 821 Asian: 61

*3 accidental cases with unknown Race/Ethnicity

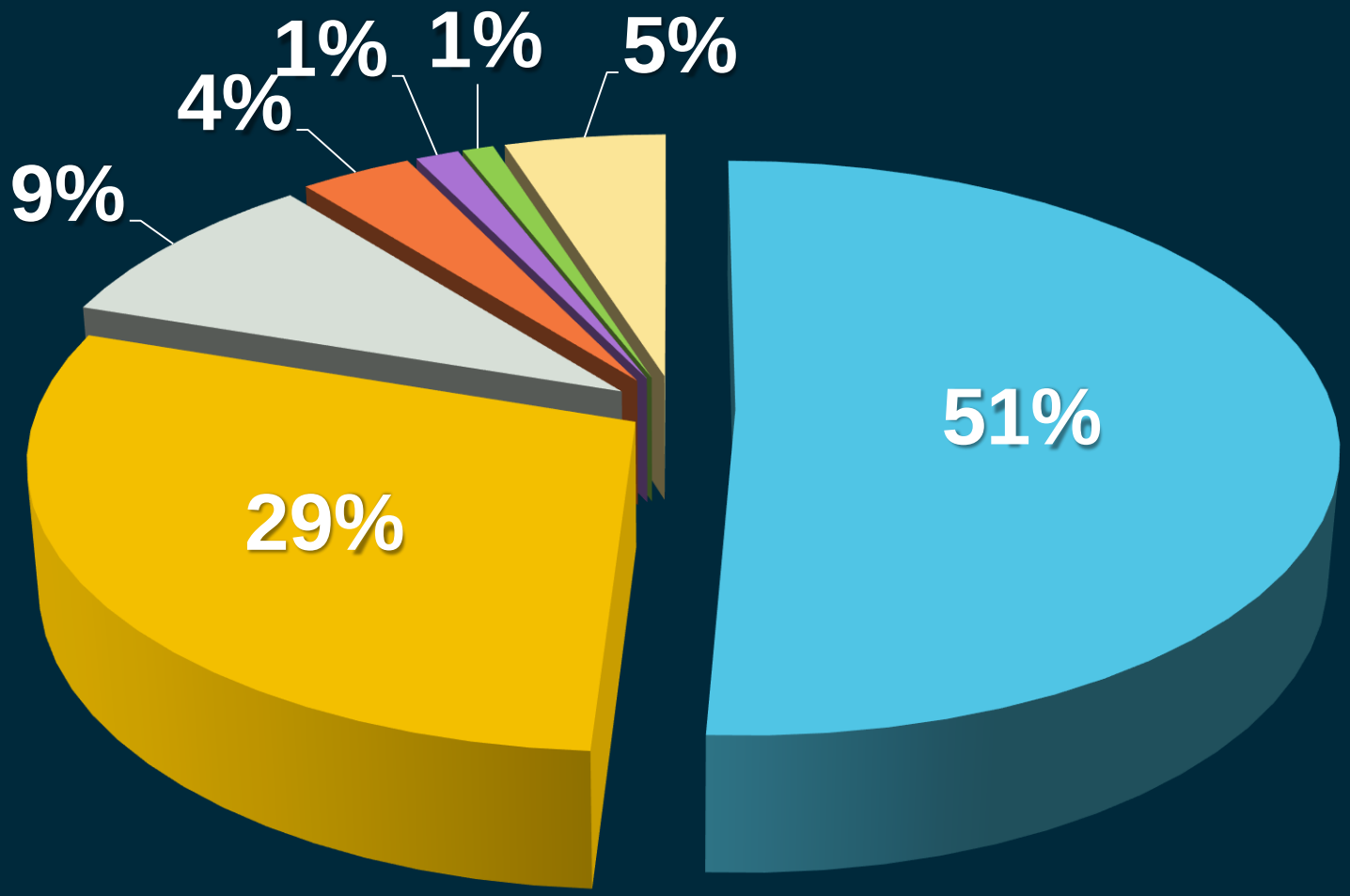
ML Accidental Deaths by Age



N=1,817

- < 18 years: 58
- 18-39 years: 745
- 40-64 years: 780
- 65+ years: 234

Most Common Causes of ML Accidental Deaths



N=1,817*

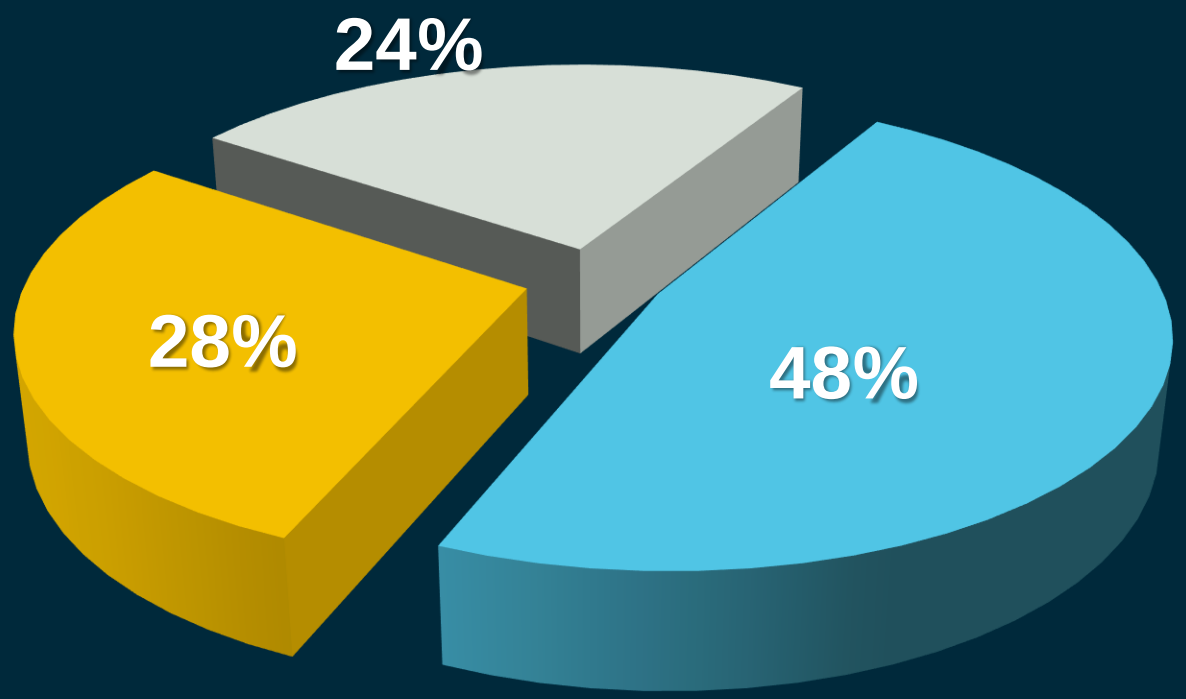
- Drug Toxicity: 942
- Motor Vehicle: 541
- Non-MVC Blunt Trauma: 169
- Drowning: 64
- Asphyxia: 25
- Fire/Thermal: 18
- Other: 92**

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

** *"Other" includes firearm injuries, sharp force injuries, hyperthermia, hypothermia, and therapeutic complications.*

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

- MVC fatalities include **33** children ages 1 month to 17 years old
- **3** children were pedestrians, 2 years to 4 years old
- **21%** of driver fatalities (**54**) were under 25 years old
- **25** stranded motorists were hit and killed



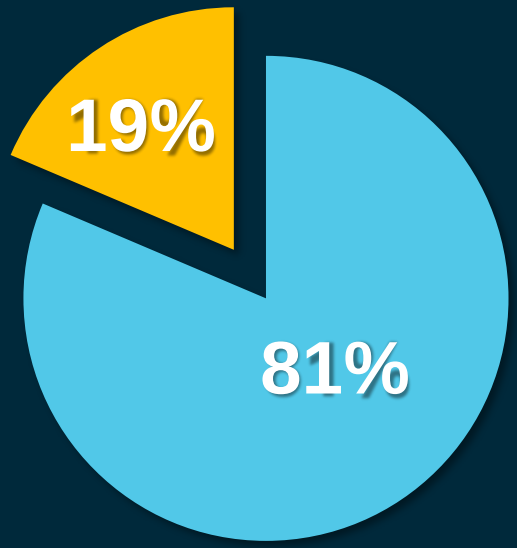
N=541

- Driver: 258
- Passenger or Unknown Position: 153
- Pedestrian: 130

MVC Sex and Age in ML Accidental Deaths

The youngest driver was 7 and the oldest was 92.

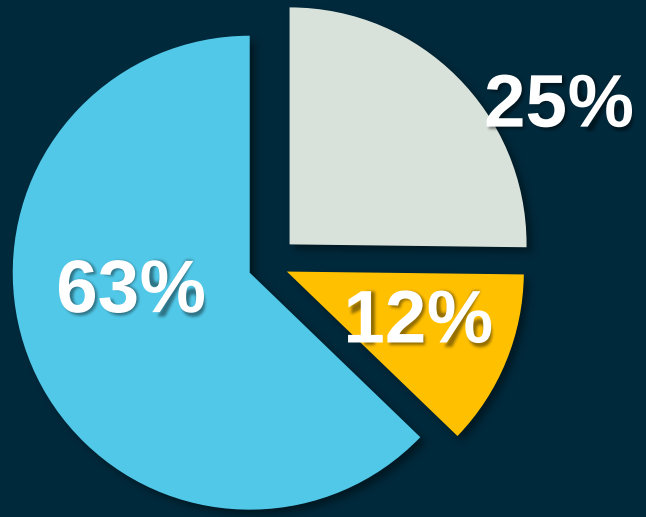
Driver's Sex



N=258

- Male: 210
- Female: 48

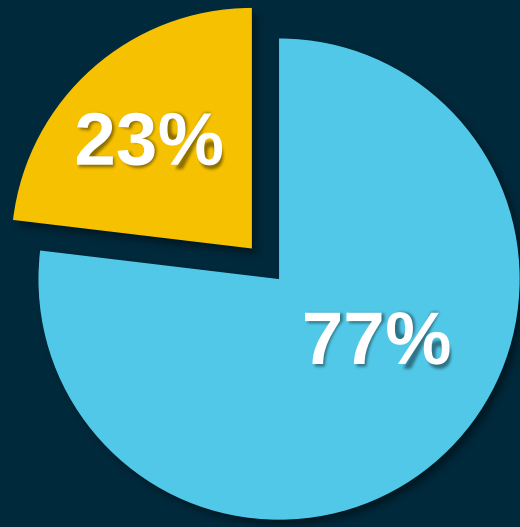
Proportion of drivers who were teens or senior citizens



N=258

- 16 to 25 years: 65
- 65+ years: 31
- Other Ages: 162

Total MVCs



N=541

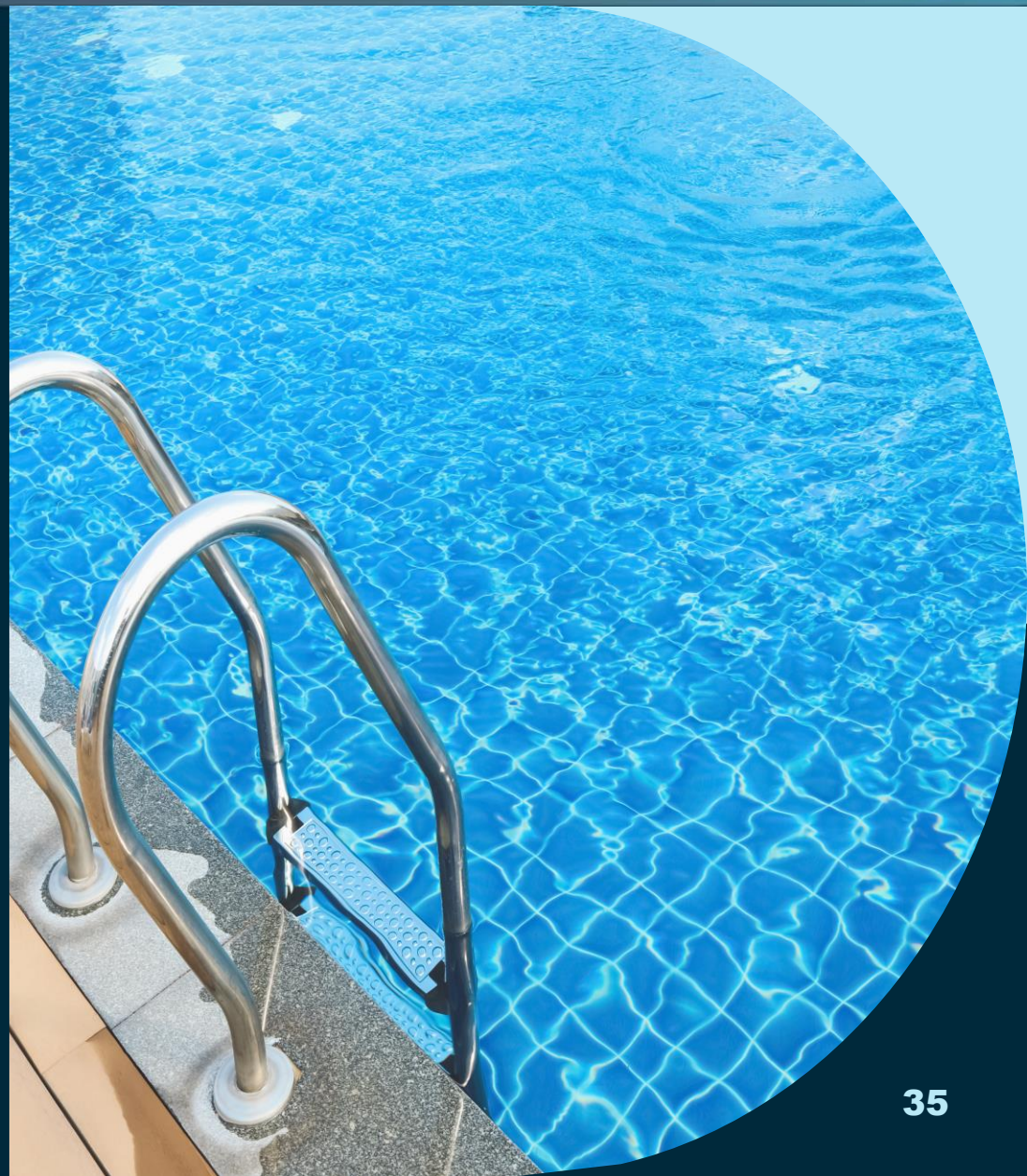
- Male: 416
- Female: 125

Medicolegal Accidental Drownings

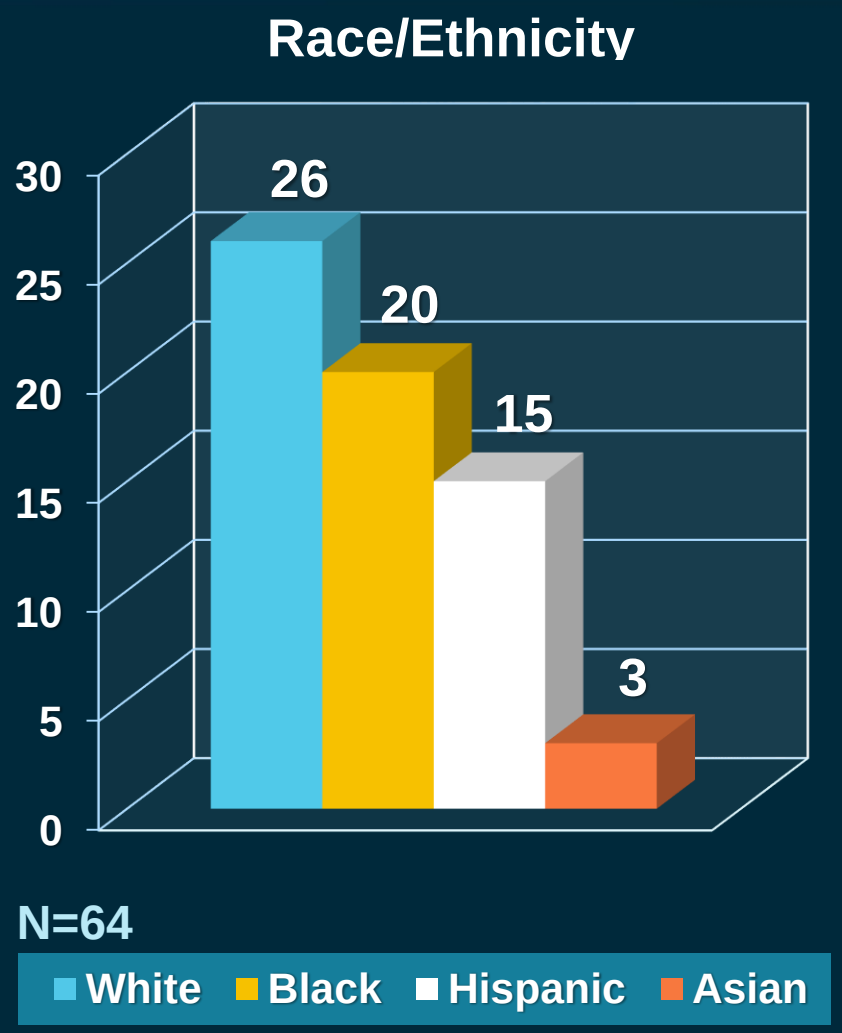
- 64 Accidental Drowning deaths in 2020

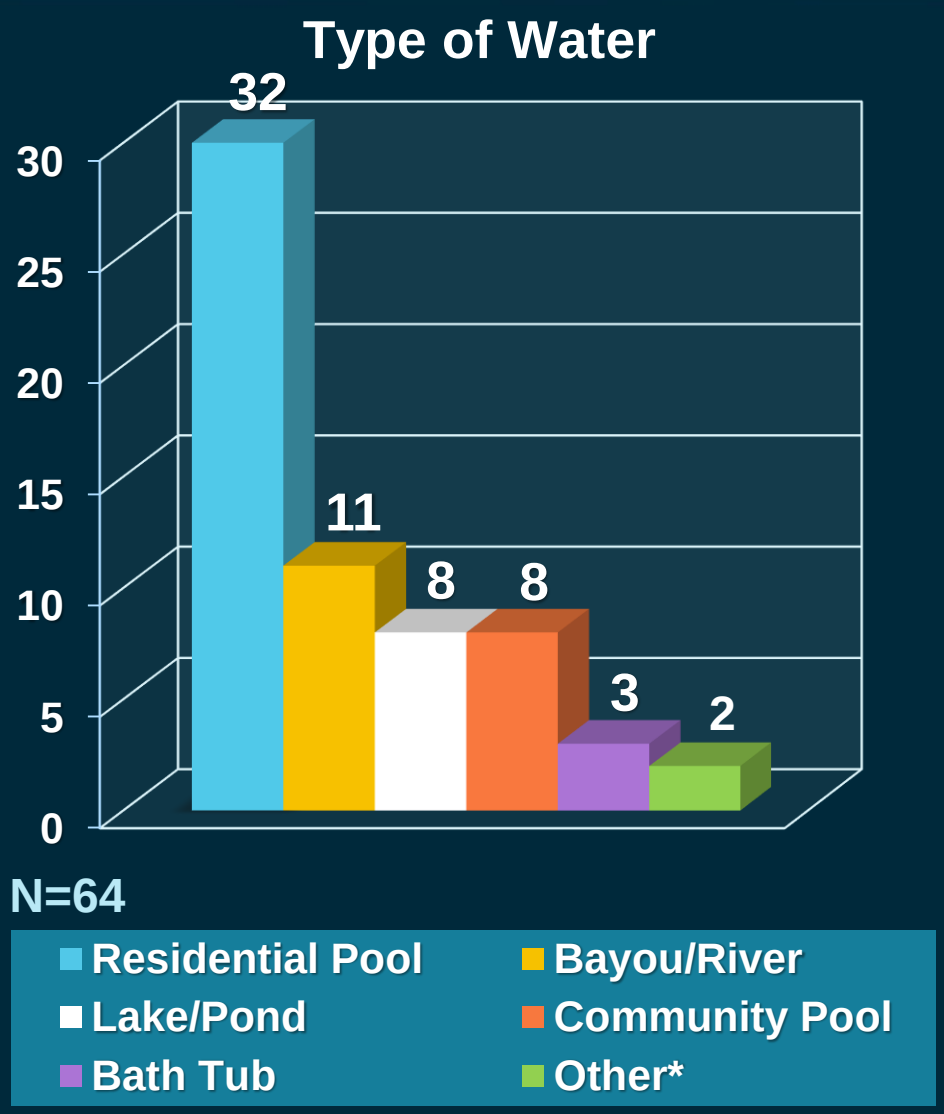
- Age range was 10 months to 86 years
  - Includes 15 children, ages 2 to 7 years

  - 43 of the drowning cases were males; 21 were females



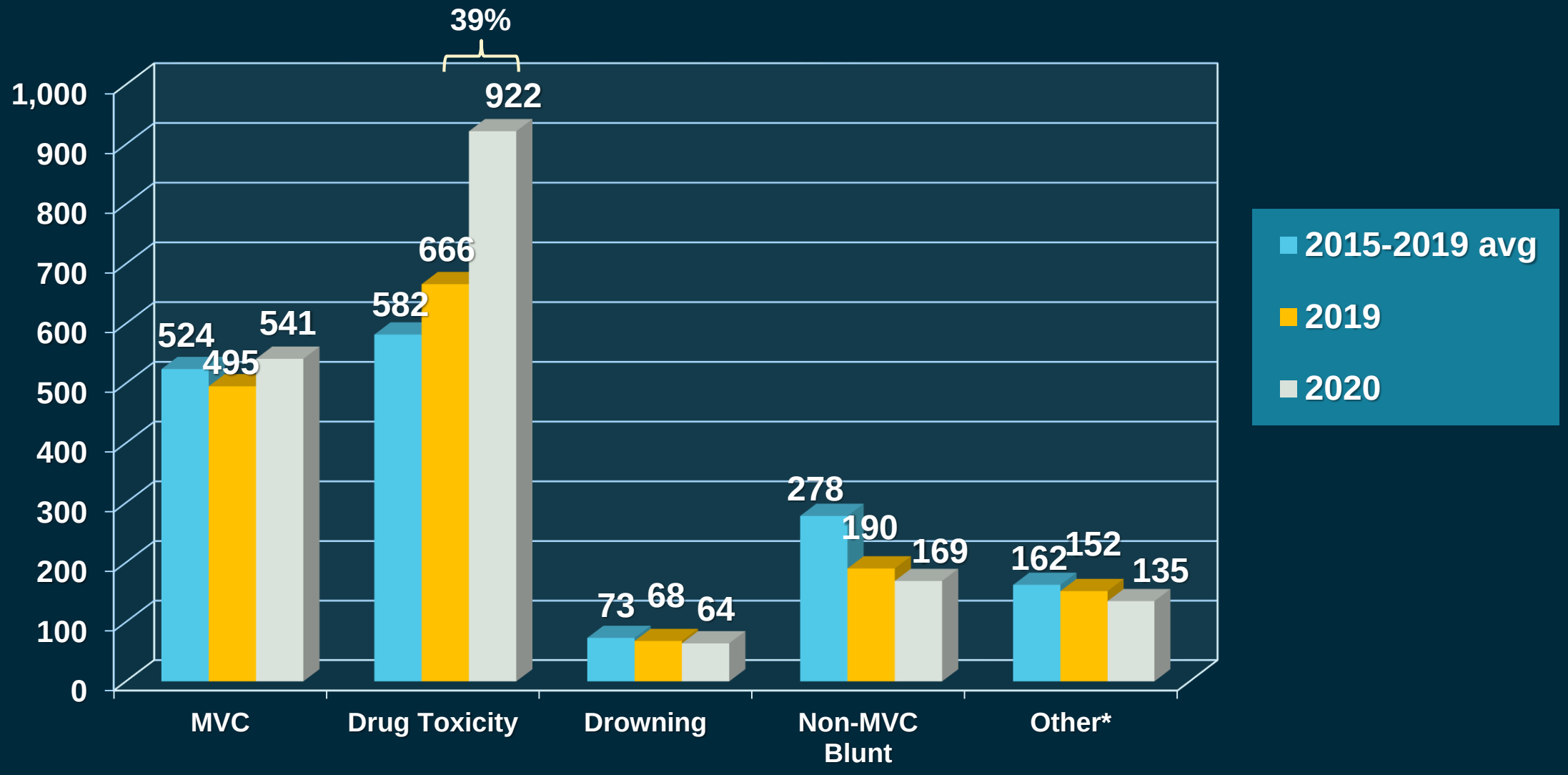
Medicolegal Accidental Drownings





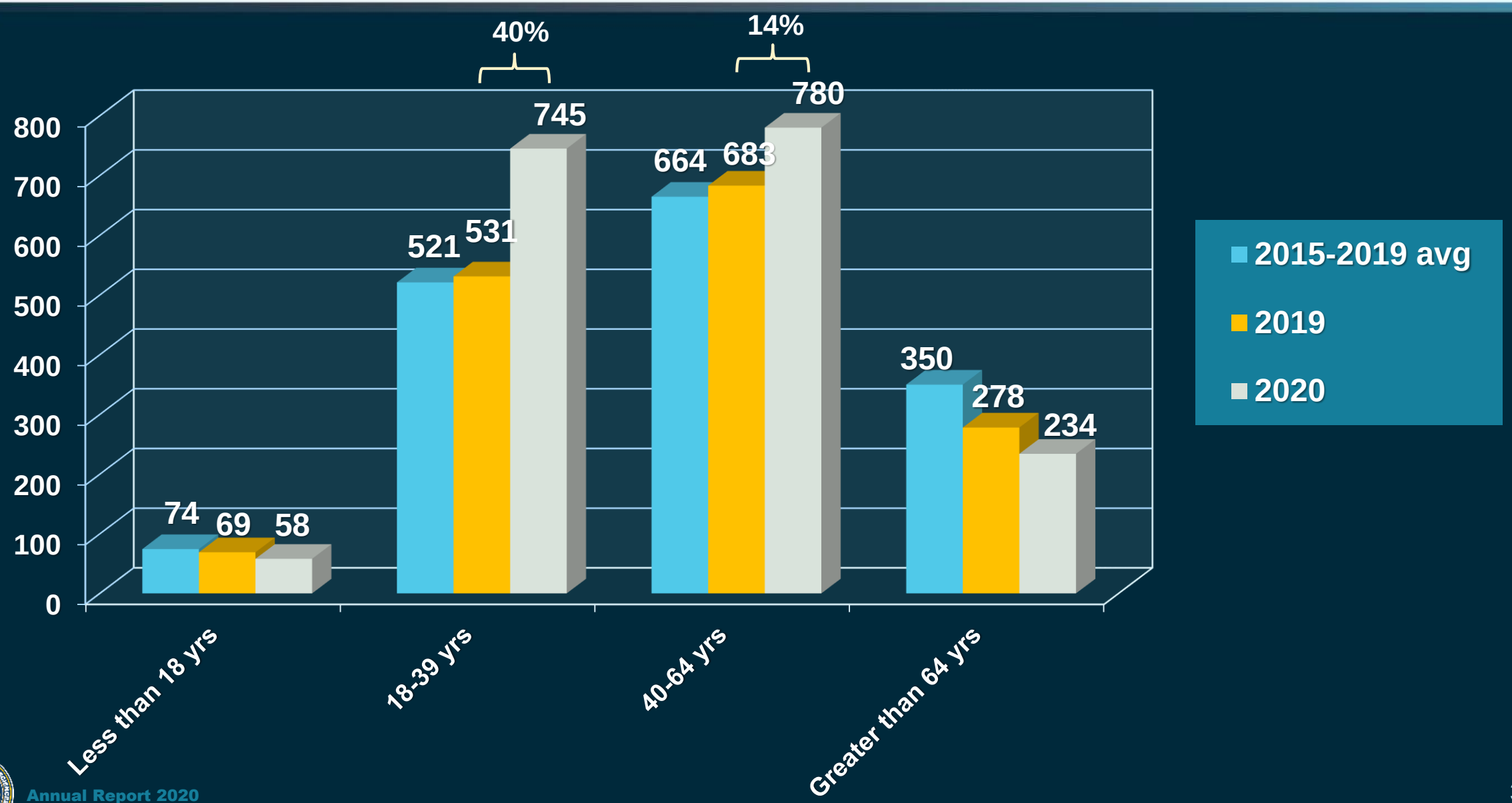
** "Other" category includes near a roadway, parking lot, open areas, and ditches.*

ML Accidental Case Comparison Between Years by Cause

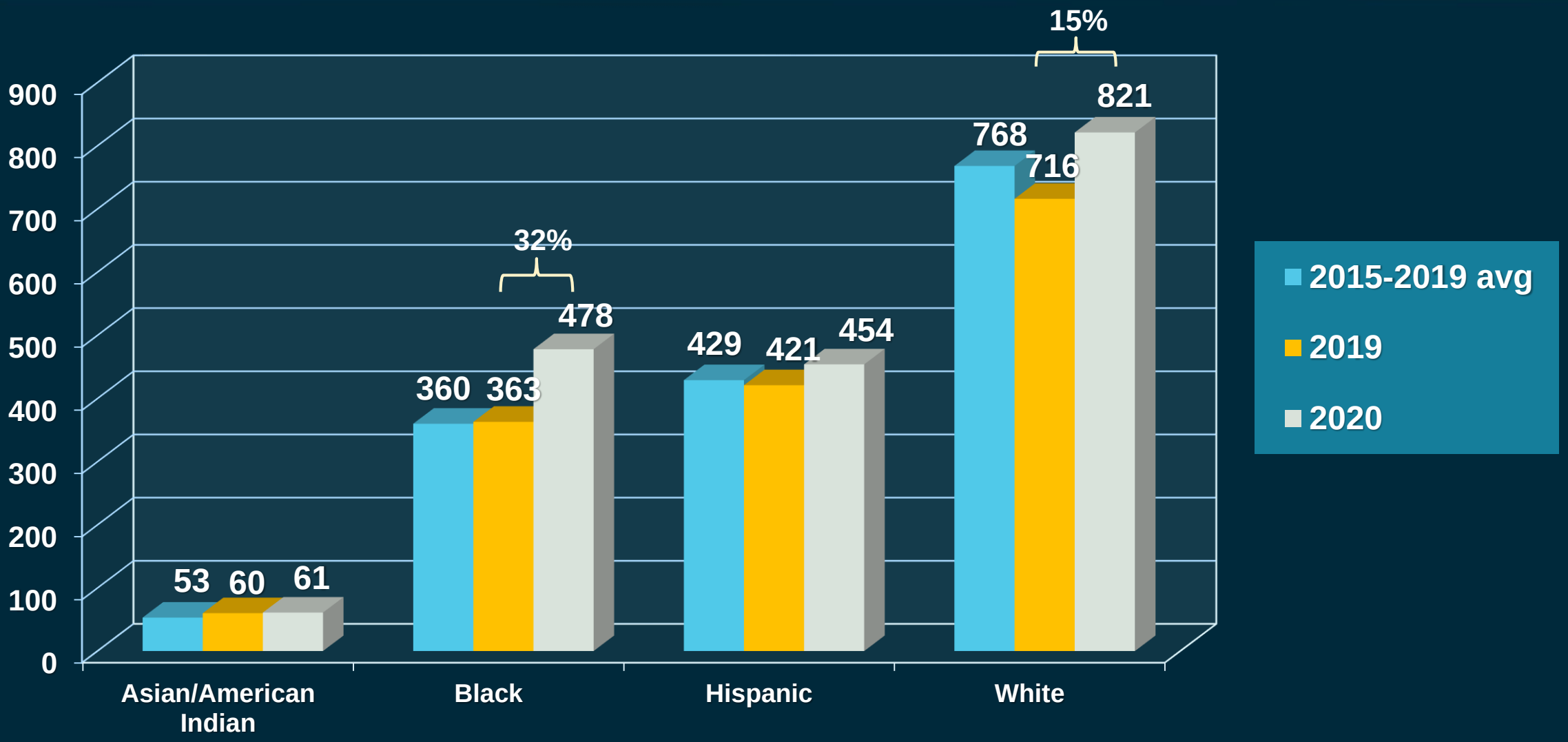


** "Other" includes asphyxia, thermal injuries, firearm injuries, sharp force injuries, hyperthermia, hypothermia, and therapeutic complications.*

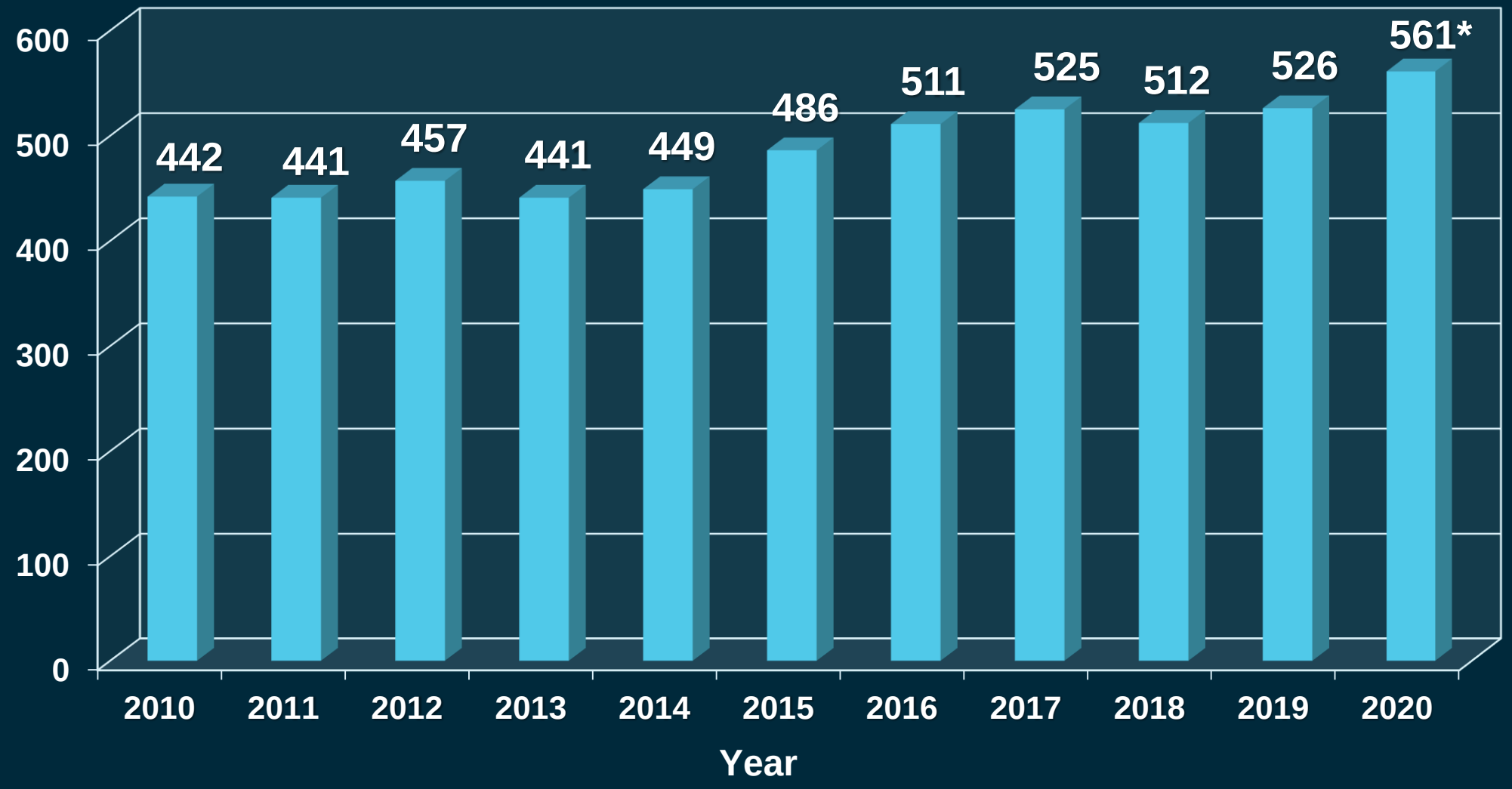
ML Accidental Case Comparison Between Years by Age



ML Accidental Case Comparison Between Years by Race



Medicolegal Suicide Cases

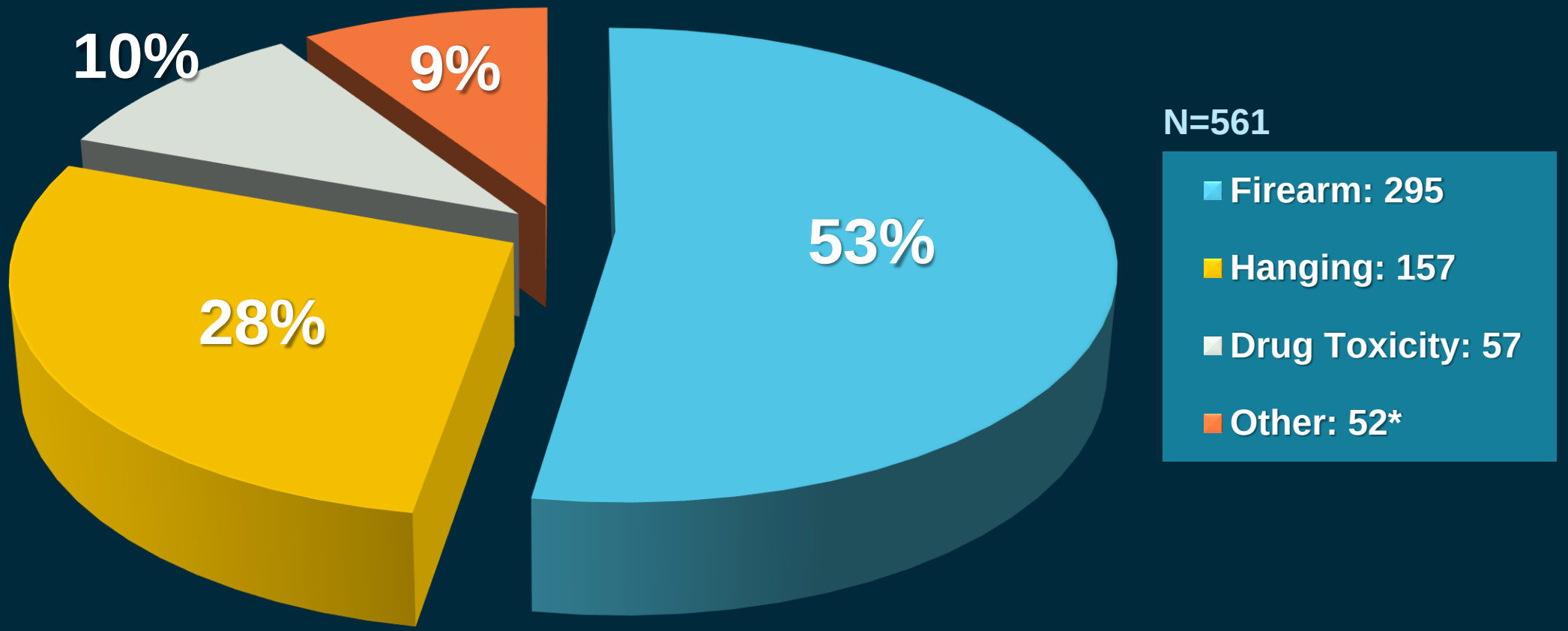


This is a 7% increase from 2019 and a 27% increase from 2011.

Medicolegal Suicide Demographics

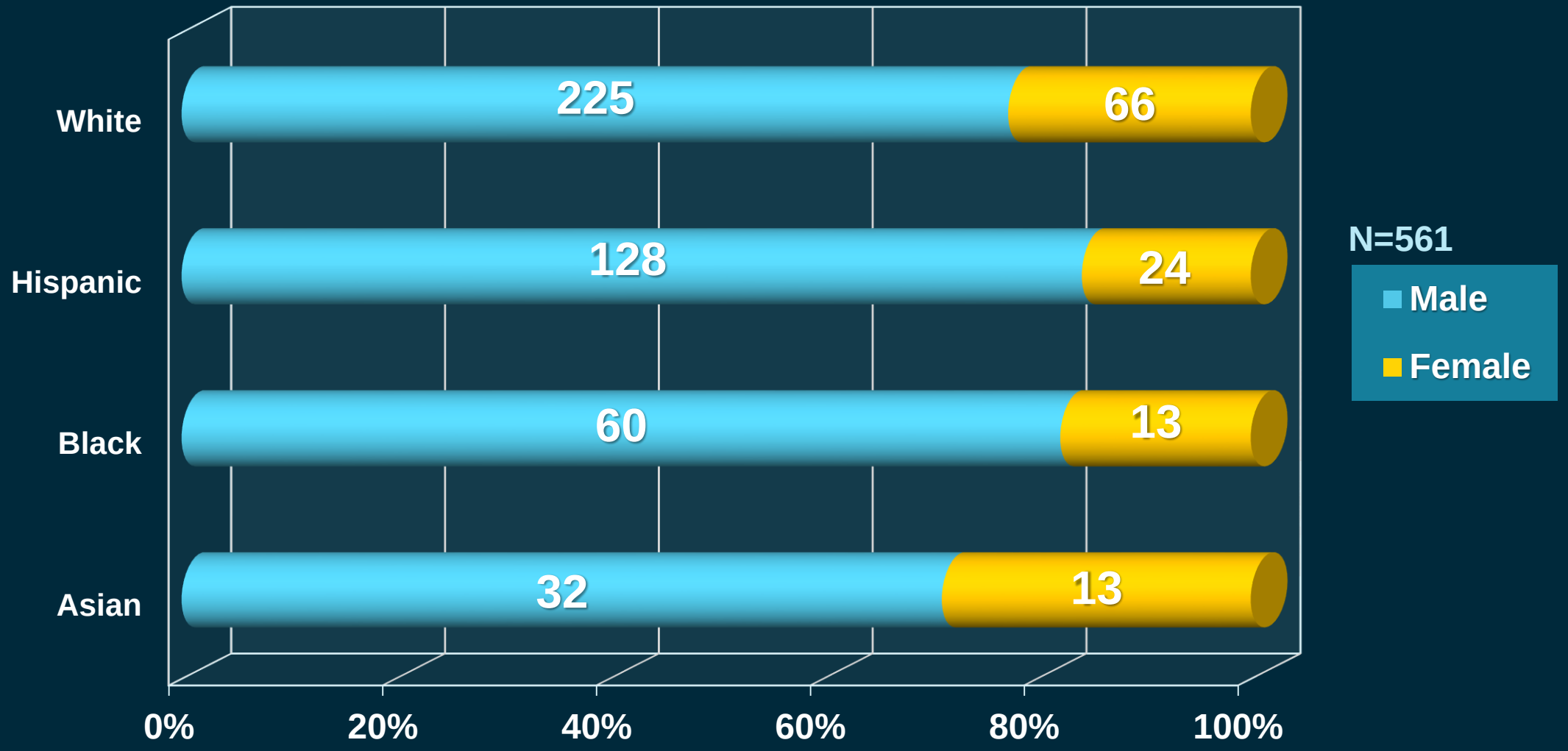
- Male to female ratio is 3 to 1.
- Age range is 7 to 94 years.
- Suicide among races are 40% White; 30% Black; 25% Hispanic; 5% Asian/American Indian, with the lowest White suicide rate in the past 5 years.
- Number of companion Suicide/Homicide cases:
  - 2017: 17
  - 2018: 14
  - 2019: 10
  - 2020: 13

Causes of Death in Suicides

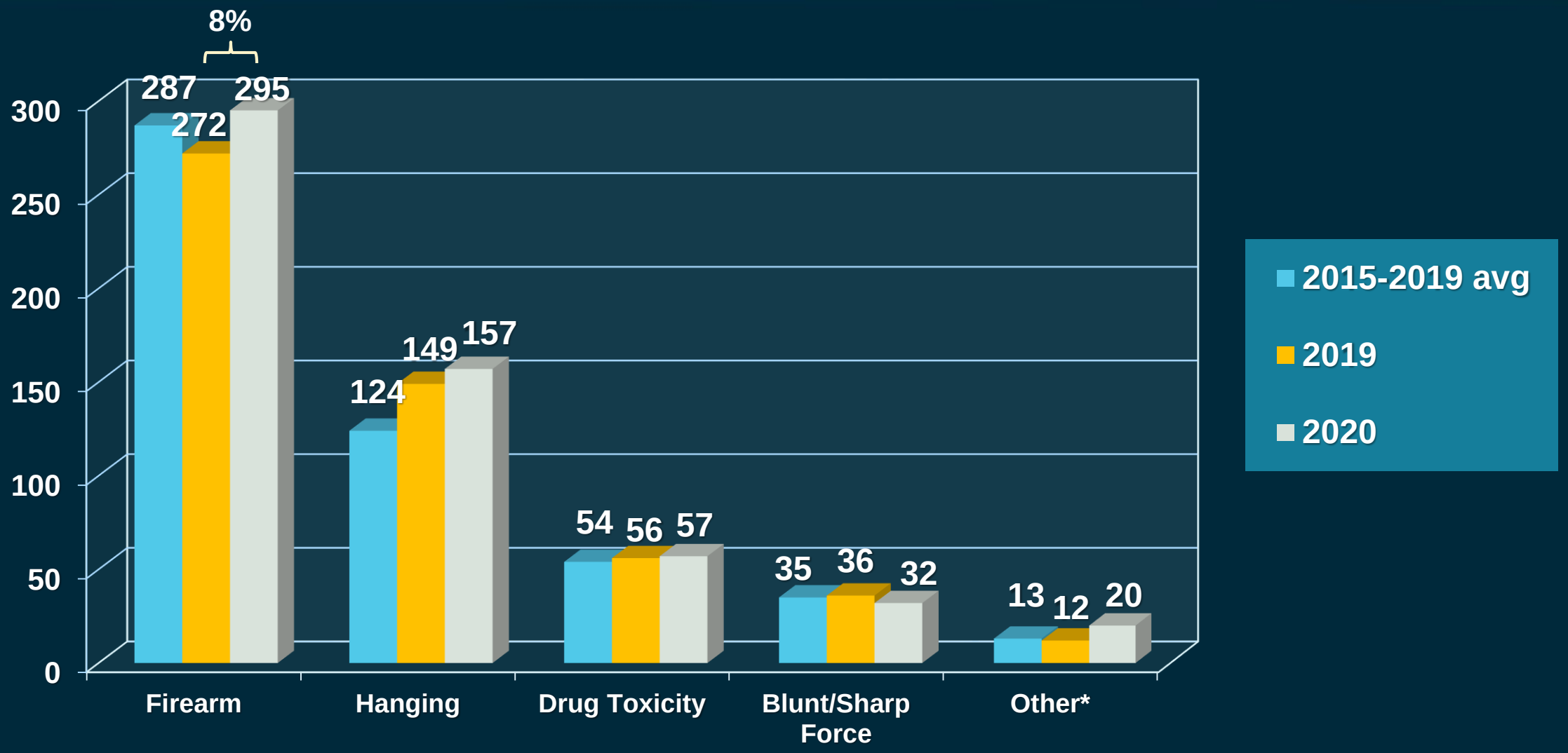


** "Other" category contains: blunt force trauma (22), asphyxiation-not due to hanging (8), sharp force (10), thermal (5) and drowning (7).*

Suicide Cases by Sex and Race/Ethnicity

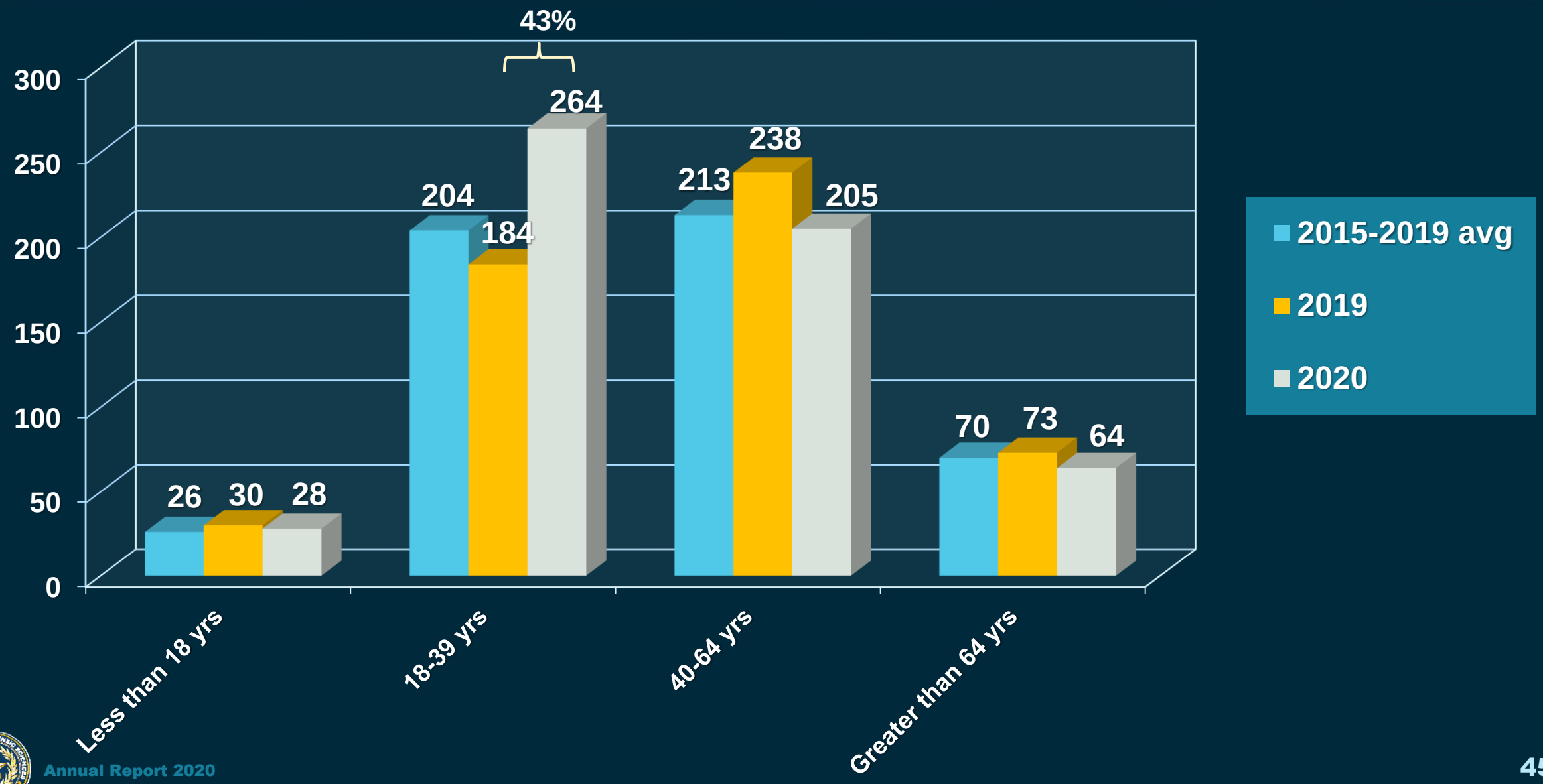


Suicide Case Comparison Between Years by Cause

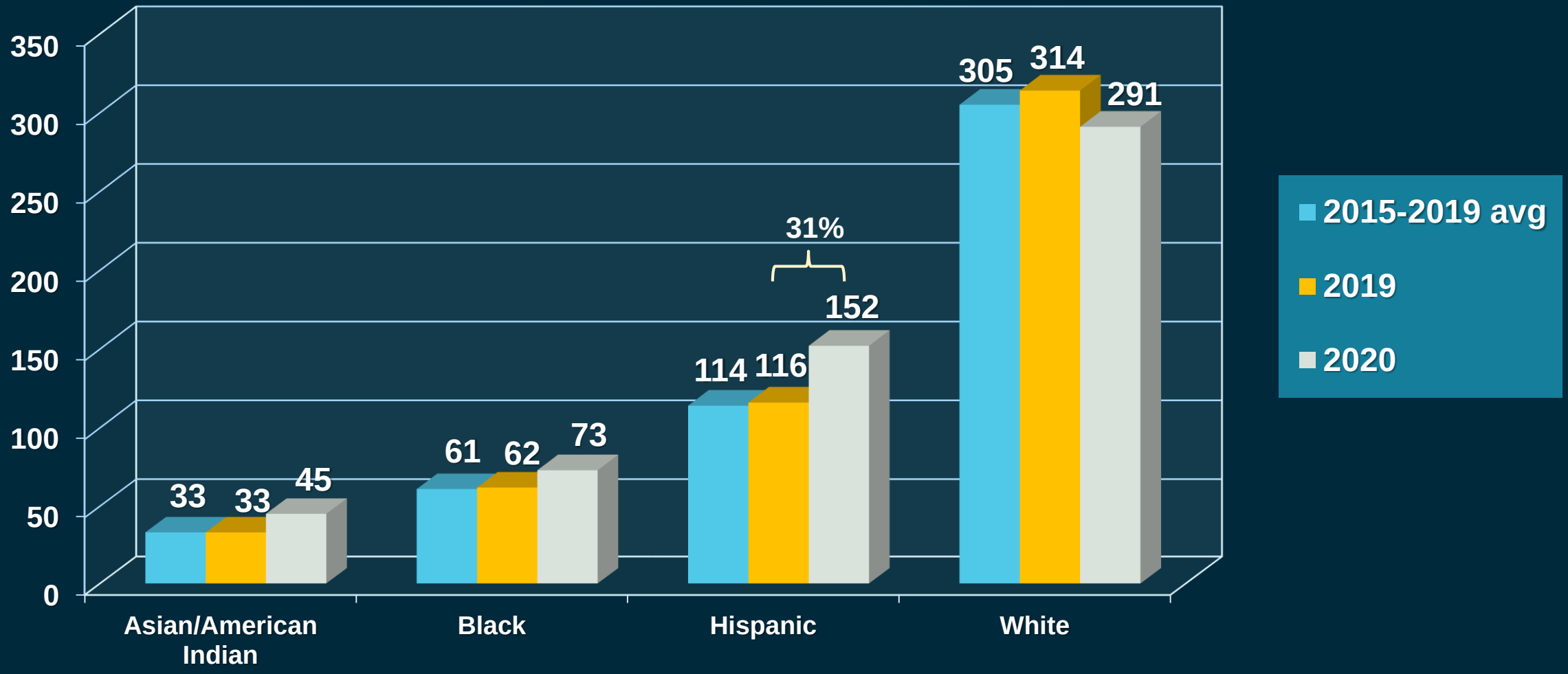


** "Other" includes asphyxia due to non-hanging, thermal injuries, and drowning.*

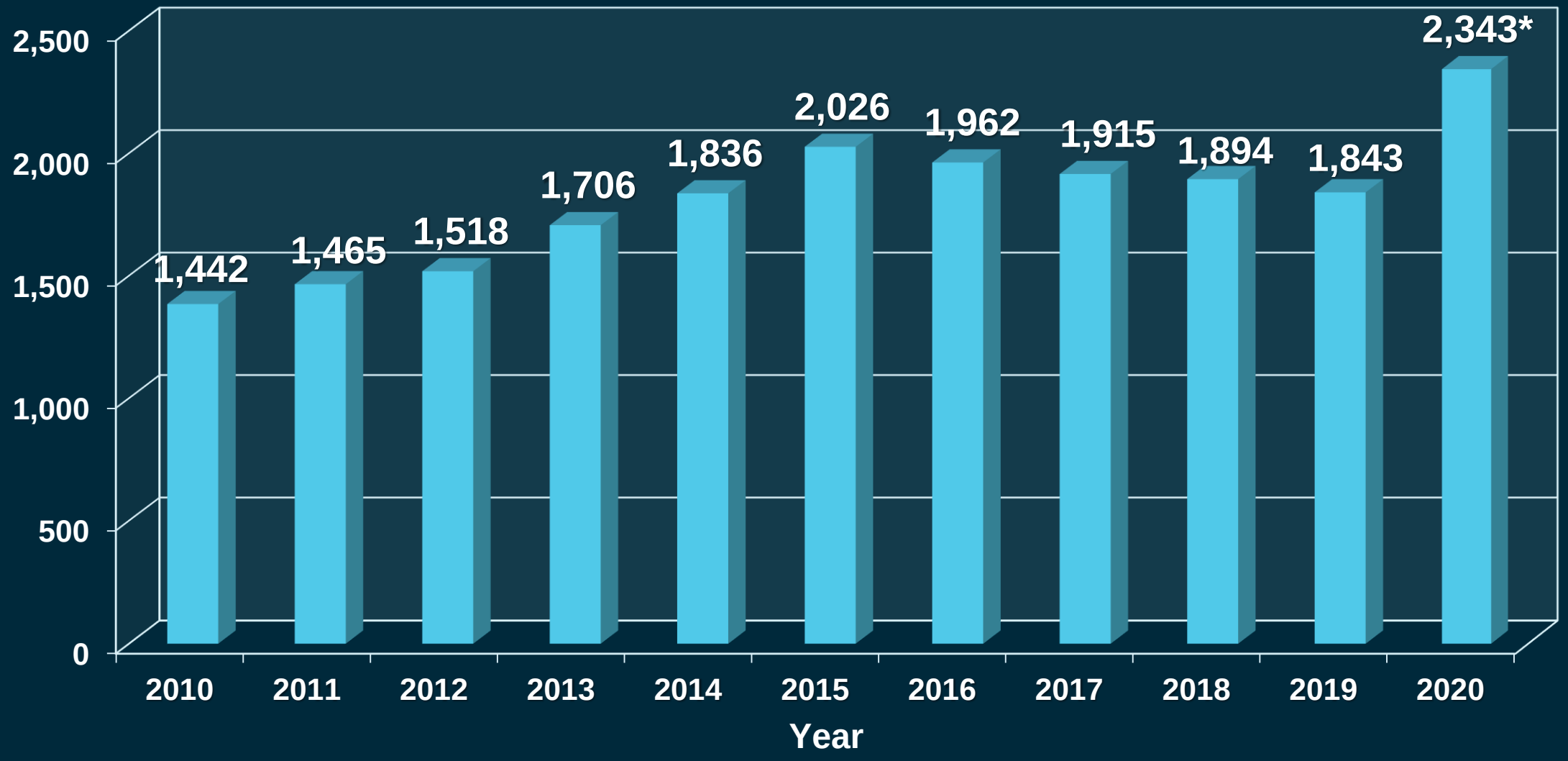
Suicide Case Comparison Between Years by Age



Suicide Case Comparison Between Years by Race

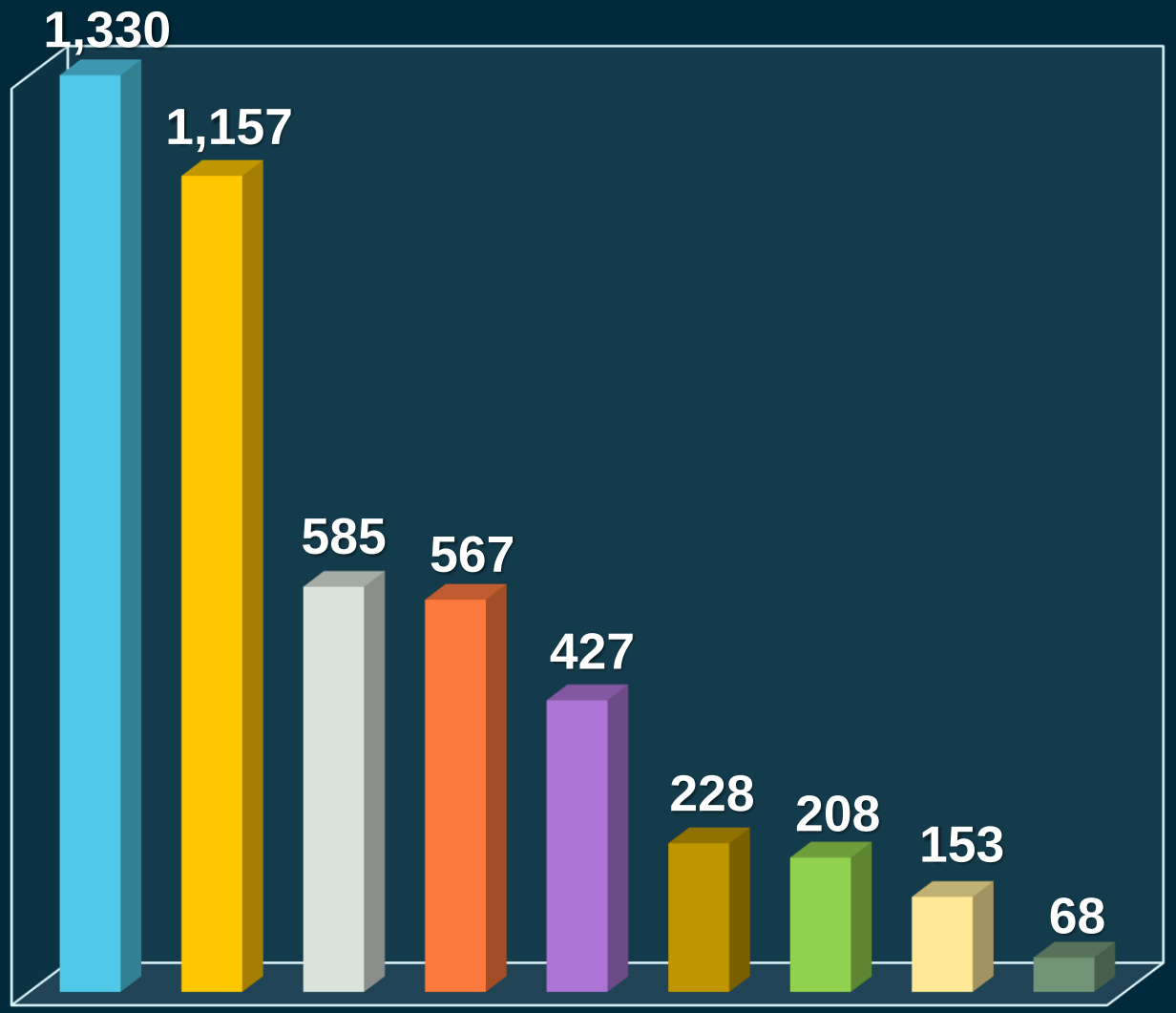


Medicolegal Natural Cases



*This is a 27% increase from 2019 and a 63% increase from 2010.

Most Frequent Causes of Medicolegal Natural Death

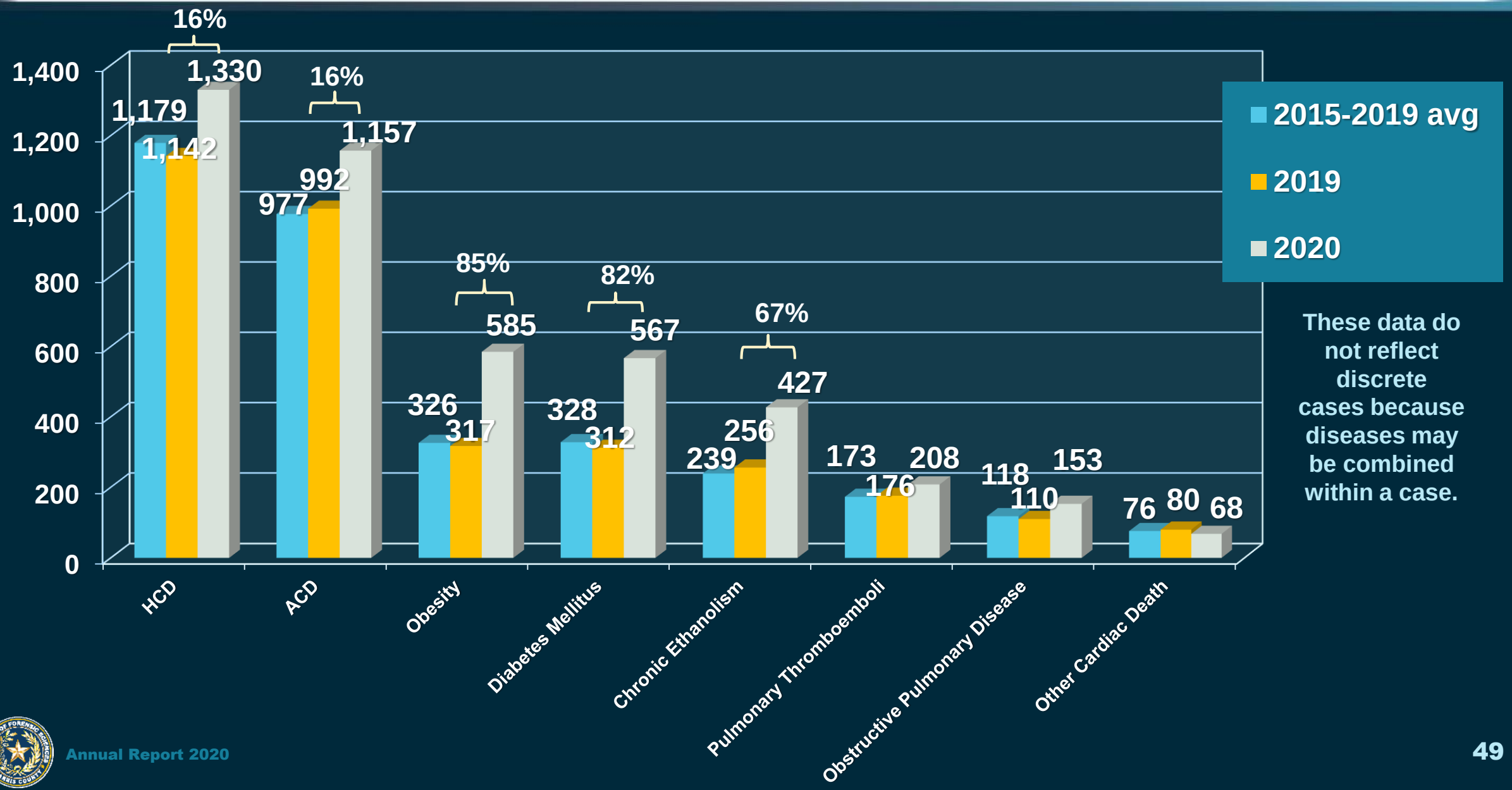


2,343 Natural Deaths in 2020

- 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

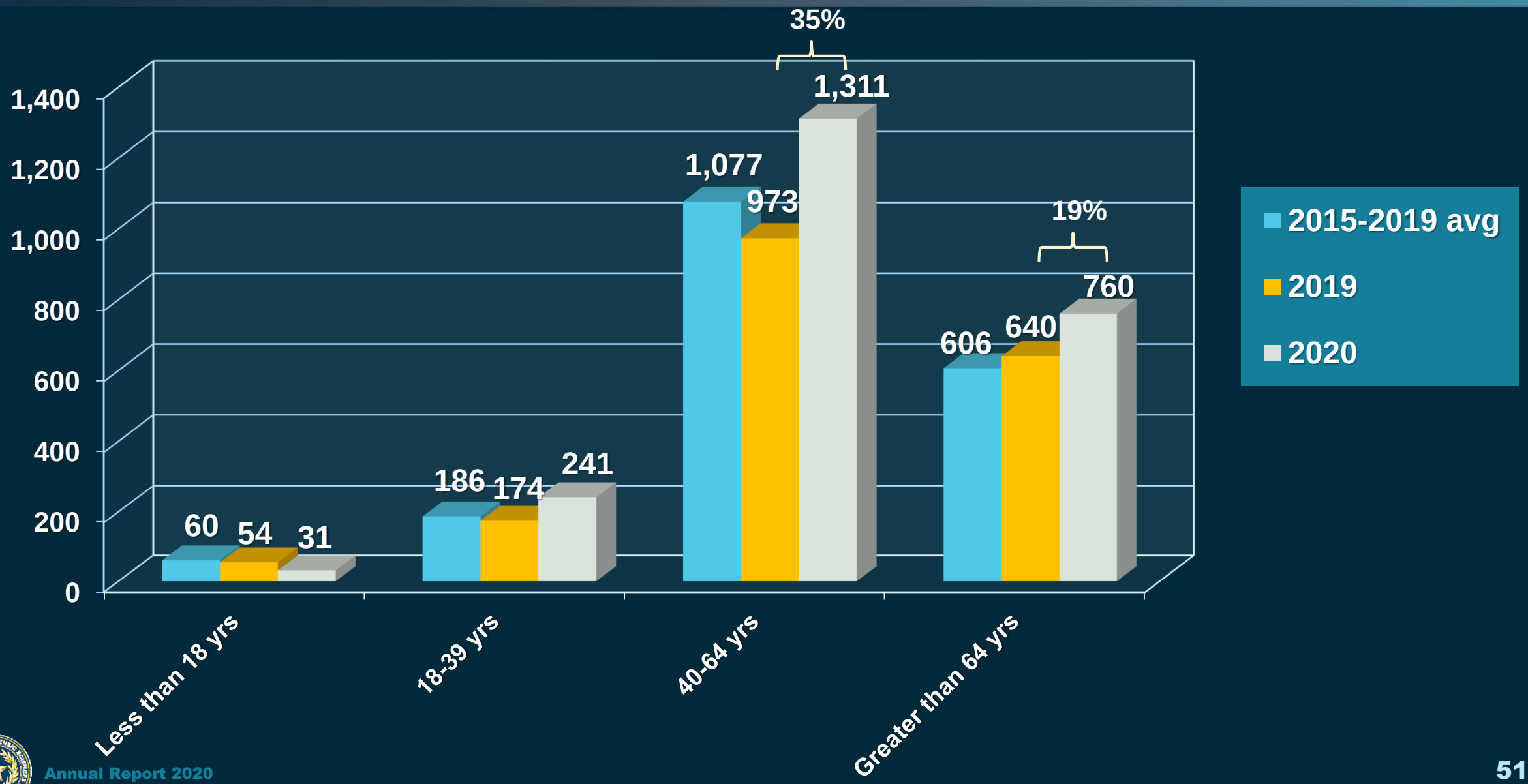


These data do not reflect discrete cases because diseases may be combined within a case.

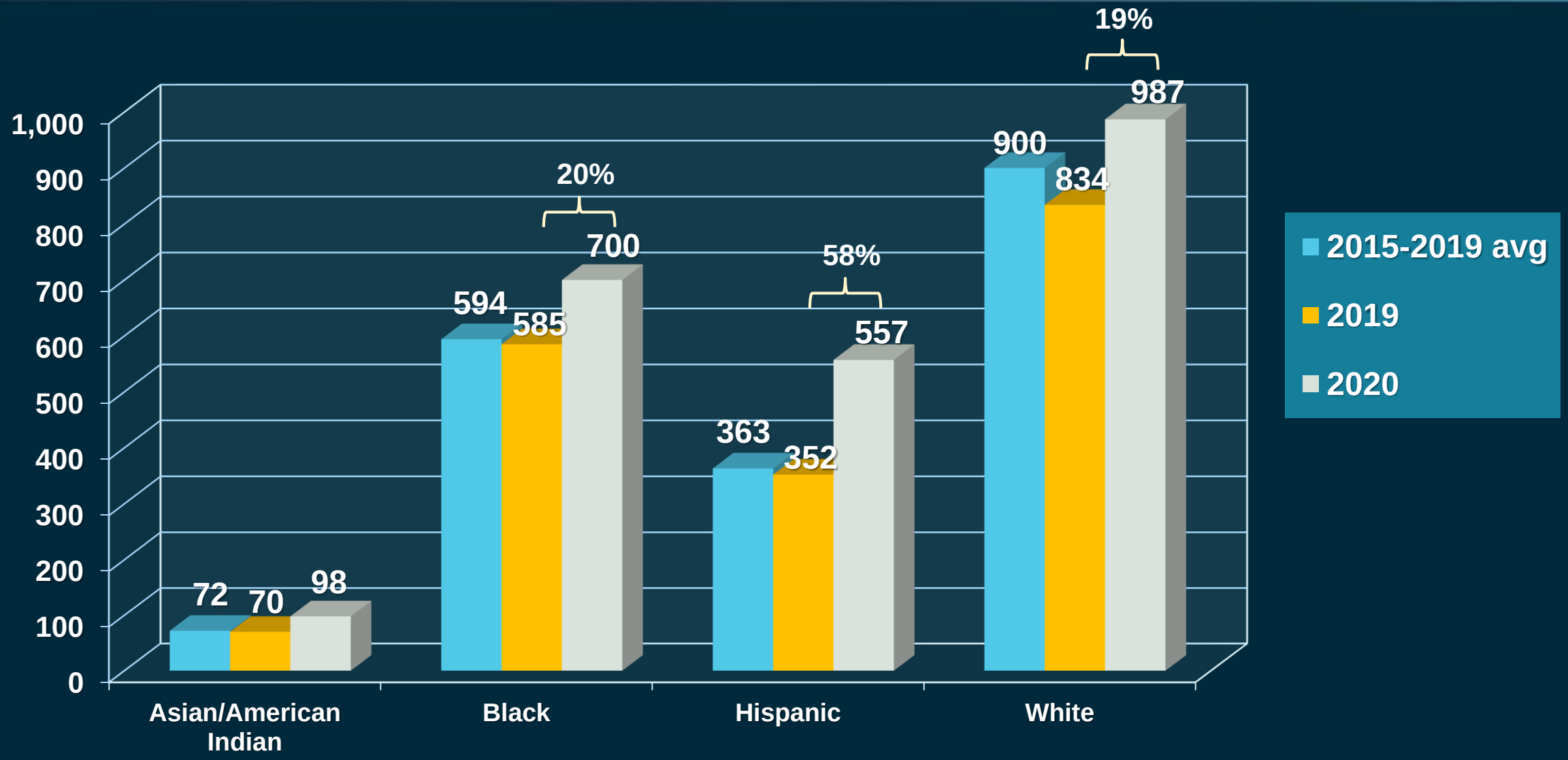
Diabetes and Obesity

- For 567 decedents, diabetes mellitus was listed as the primary cause (121) or the contributing cause (446) of death
  - 69% (391) were either overweight or obese *(Body Mass Index, BMI = 25^{+})*
- BMI was calculated for 5,089 decedents age 13 years or older, at least 60” tall and weighing at least 100 pounds:
  - 1,686 (33%) were obese with a BMI of 30 or greater
  - 1,474 (29%) were overweight with a BMI between 25 and 29
  - The greatest BMI was 98 (501 lbs. / 60 inches tall)
  - The heaviest decedent was 654 lbs. / 75 inches tall
  - 37 decedents weighed more than 400 lbs.
  - 1,929 (38%) decedents were of normal weight or underweight

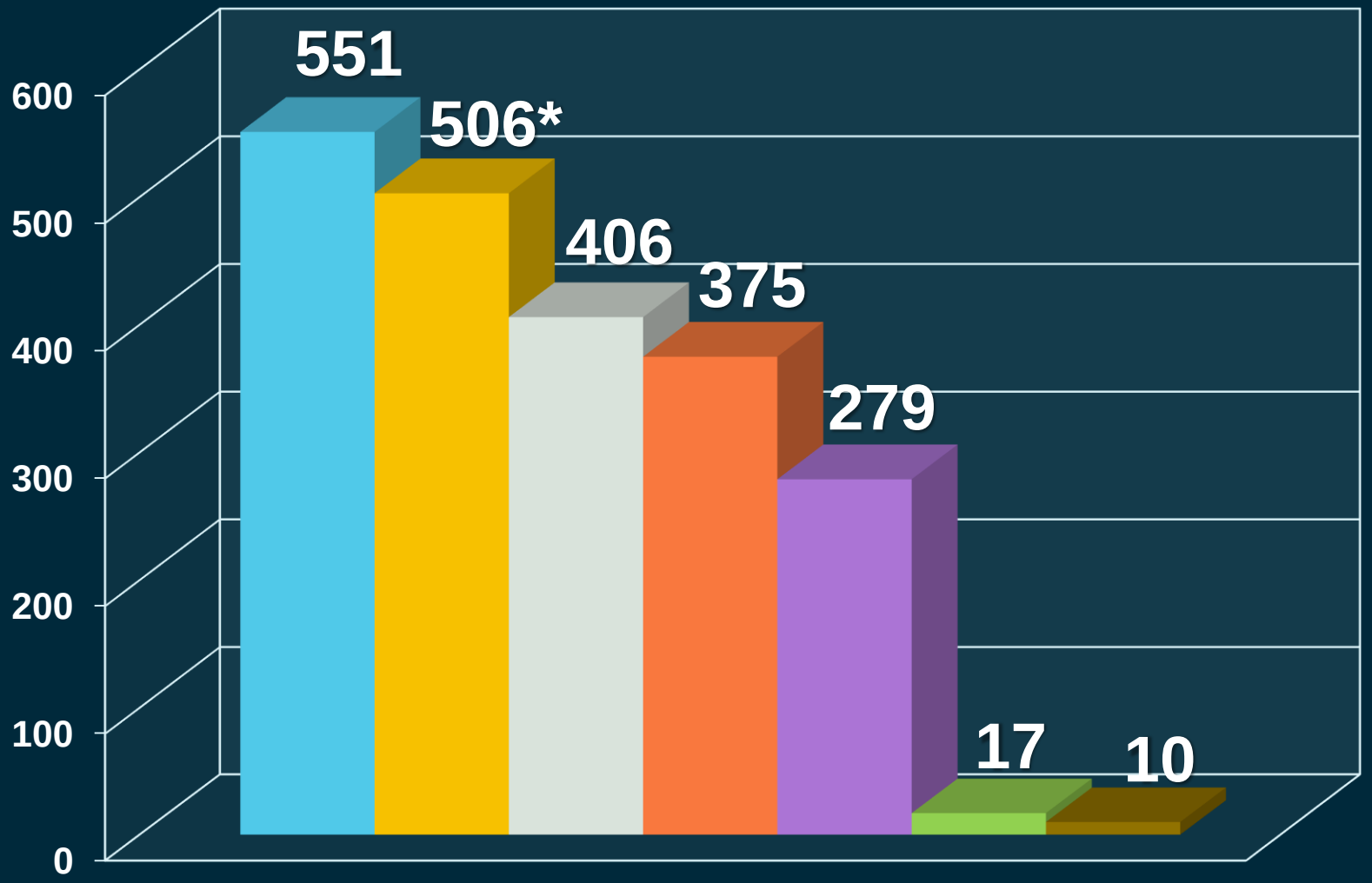
Natural Case Comparison Between Years by Age



Natural Case Comparison Between Years by Race



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



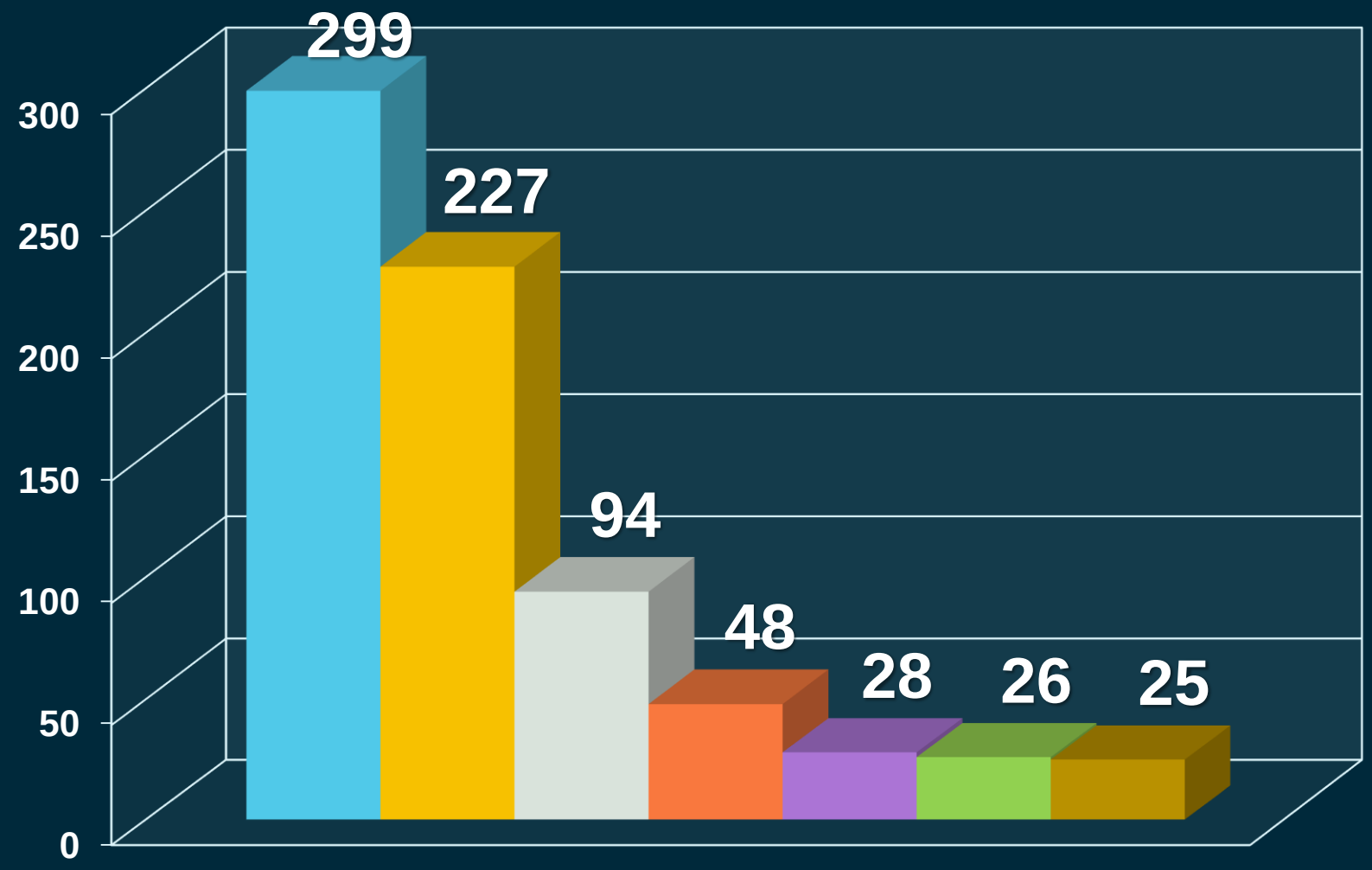
N=990

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

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

*Includes both acute ethanol toxicity and chronic alcoholism/ethanolism

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

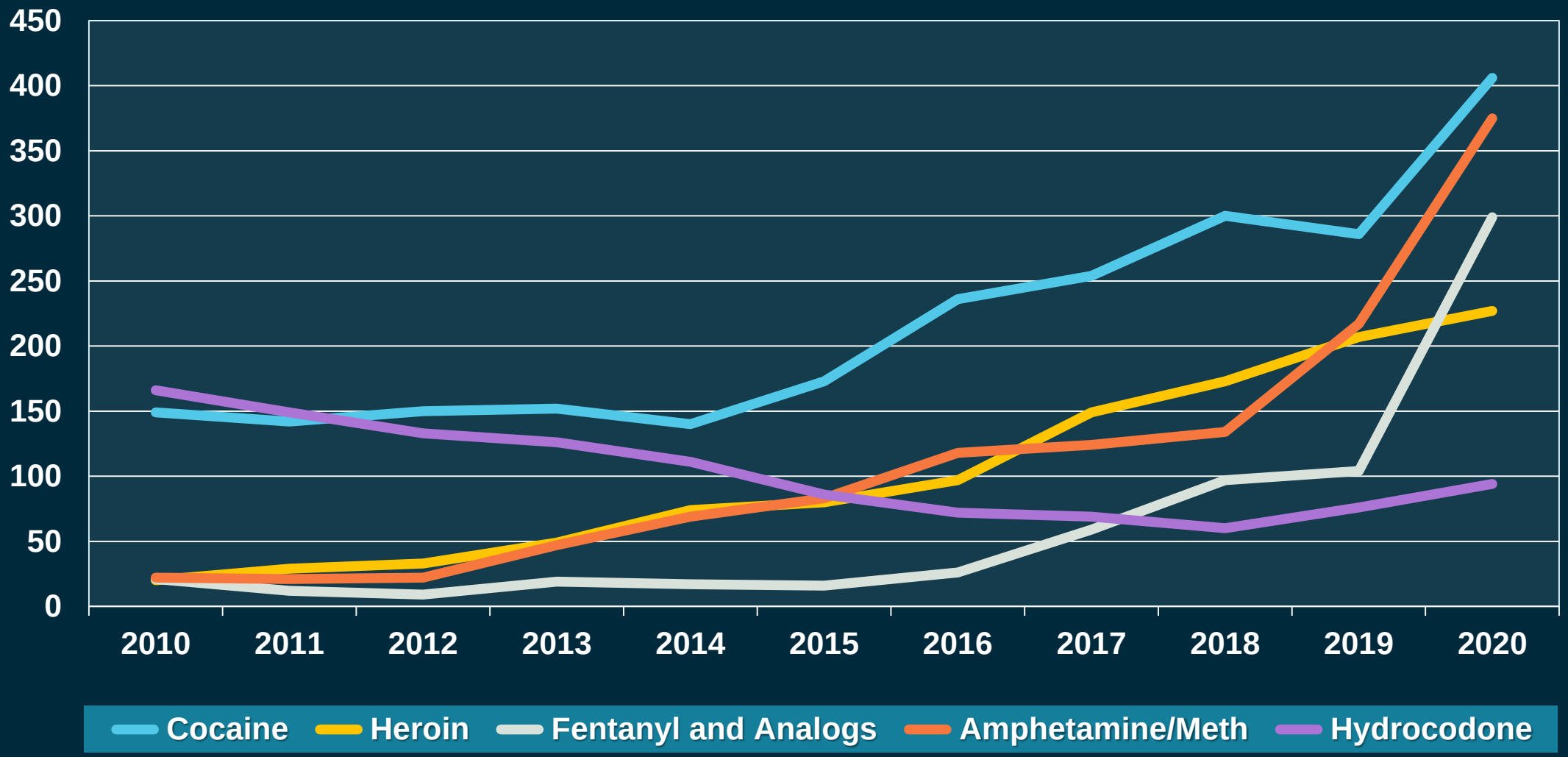


N=551

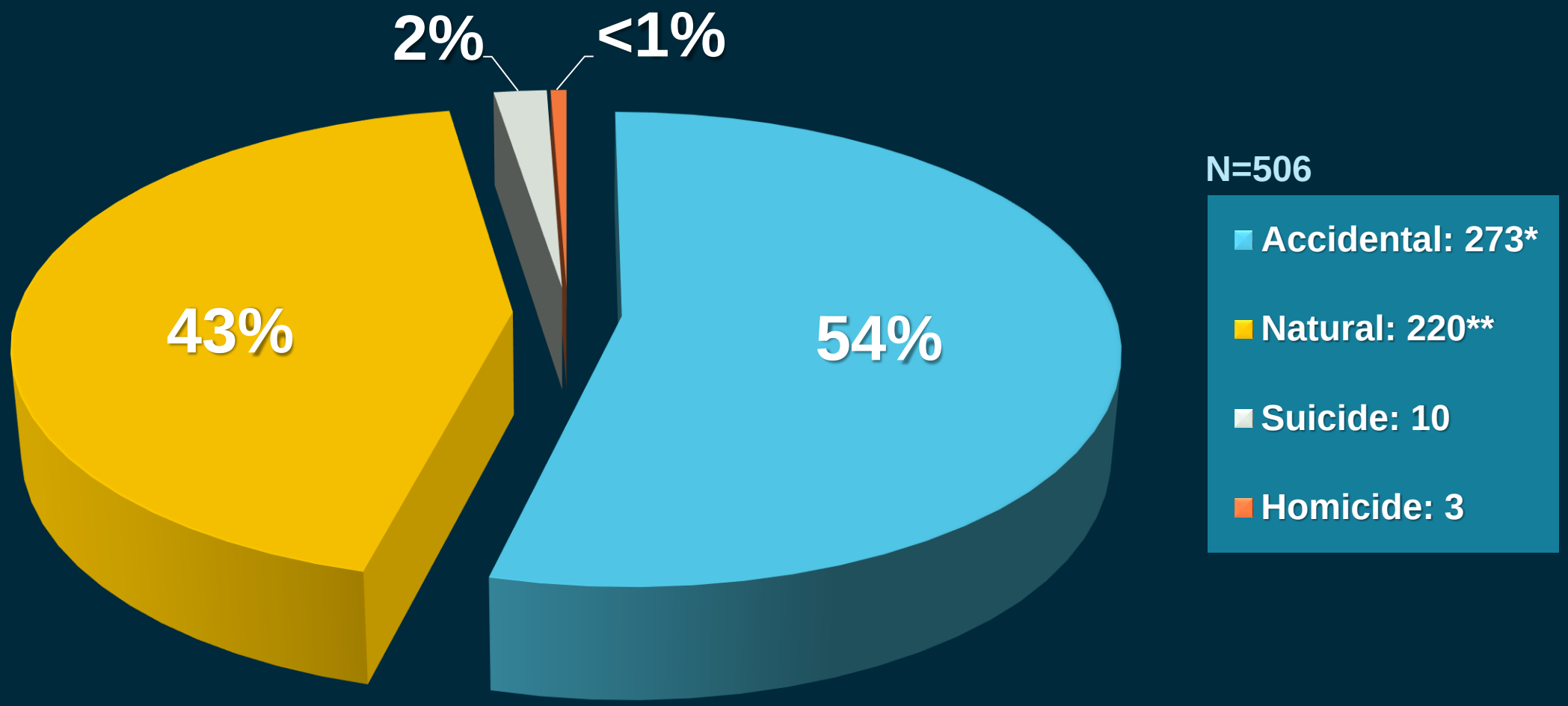
- Fentanyl and Analogs
- Heroin
- Hydrocodone
- Oxycodone
- Morphine
- Methadone
- Codeine

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

Trends in Death from Selected Drugs



Ethanol Toxicity in Primary Cause of Death for ML Cases



*For 27 accidental cases, ethanol is the sole intoxicant; 17 cases involved another drug, in addition to acute alcohol toxicity.
**For 92 deaths, the cause of death was attributed solely to chronic alcoholism.

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.

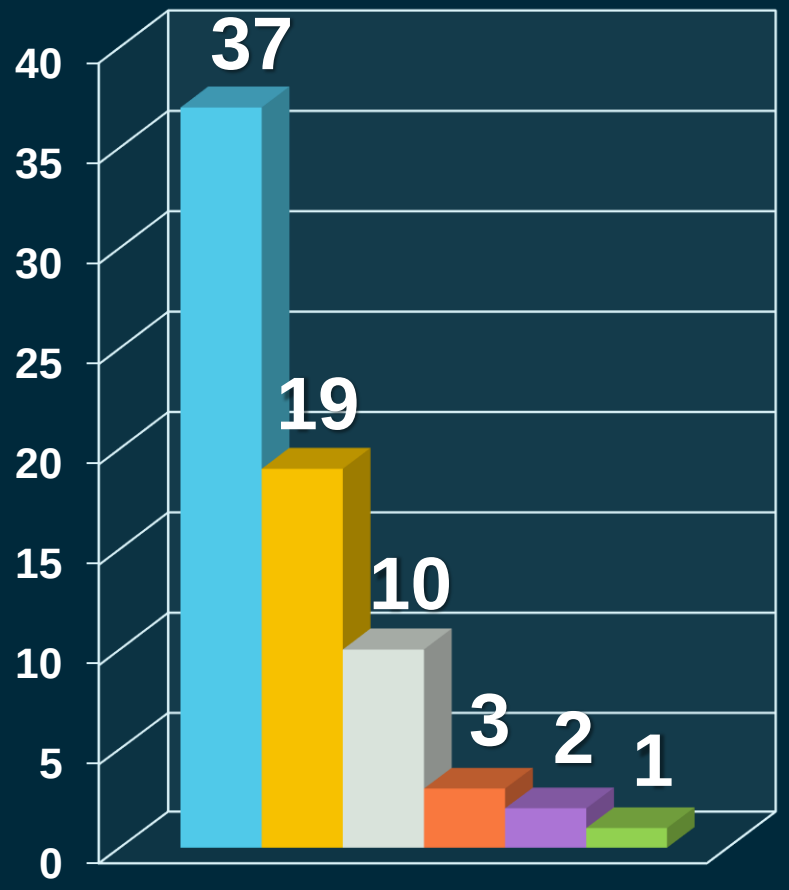
Although no mechanism of death can be identified for these infants, some risk factors may be identified. These associated findings may or may not contribute to the death, but their existence are acknowledged in the revised cause of death classification scheme. These associated findings may be intrinsic 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, 1st edition Academic Forensic Pathology International, San Diego, CA, 2019.

Unexplained Sudden Death in Infants



N=72

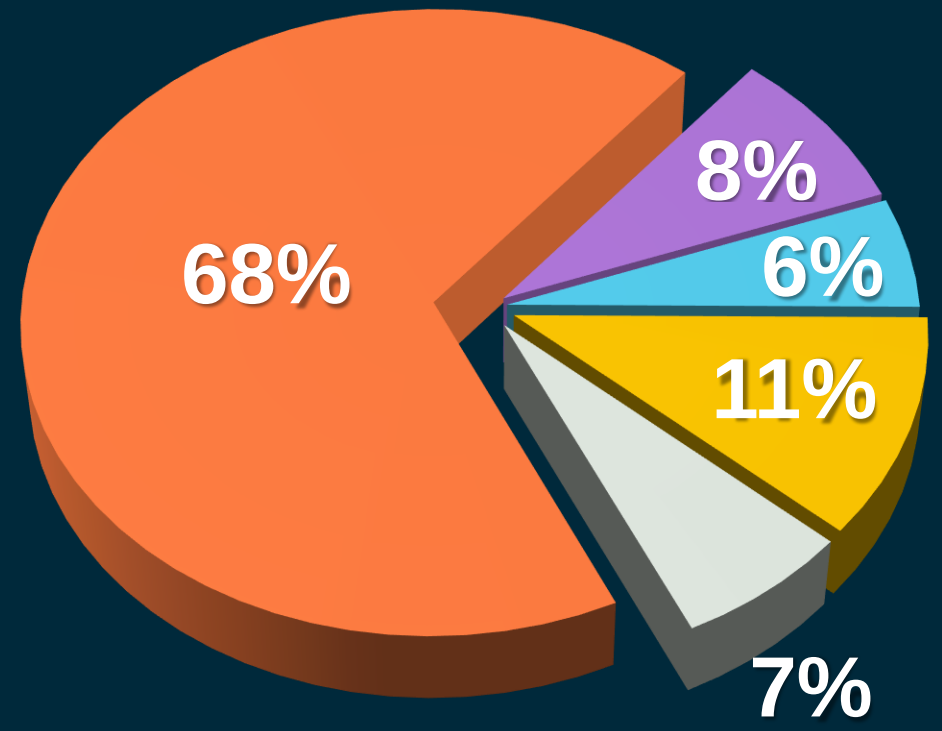
- Unexplained sudden death (extrinsic factors identified)
- Unexplained sudden death (intrinsic and extrinsic factors identified)
- Undetermined (not further specified)
- Unexplained sudden death (intrinsic factors identified)
- Unexplained sudden death (no intrinsic or extrinsic factors identified)
- Undetermined (insufficient data)

Infant/Fetal Deaths

The birth count for Harris County is estimated to be 69,988 for 2020.

(Data provided by Texas Department of State Health Services)

- **106** infant/fetal death cases
  (less than 1 year old)
- **72** cases of Undetermined Manner

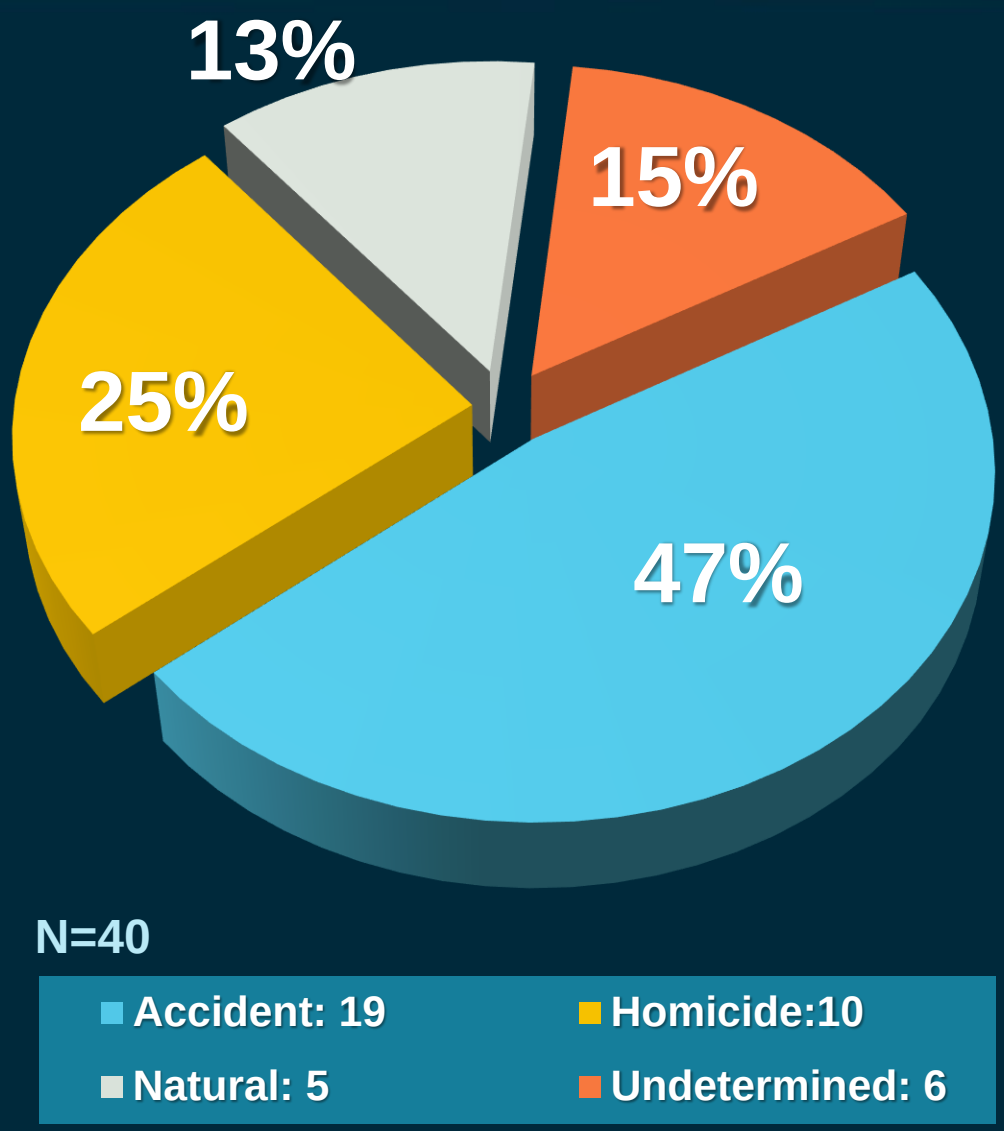


N=106

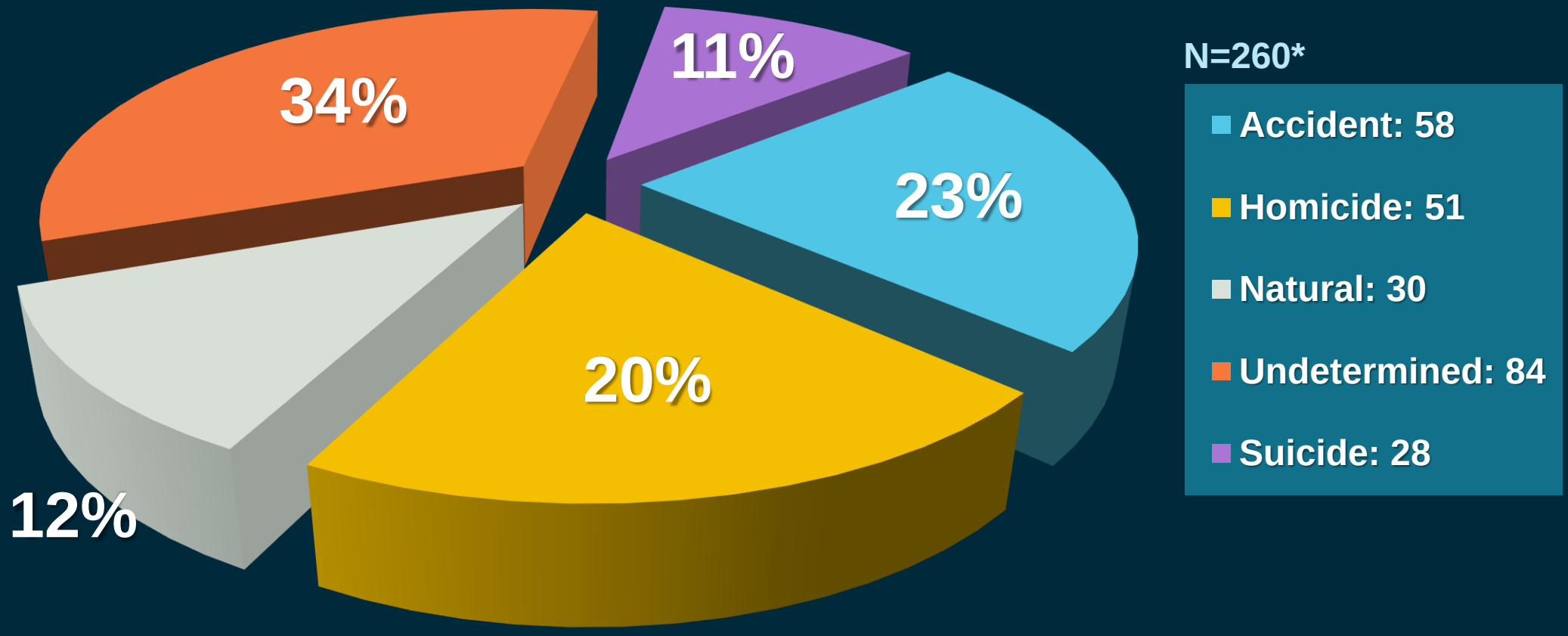
- Accident: 6
- Homicide: 12
- Natural: 7
- Undetermined: 72
- Fetal: 9

Toddler Deaths (Age 1 – 4 Years)

- Injury Deaths Include:
  - 2 toddlers died in MVCs as passengers
  - 11 toddlers died by accidental drowning
  - 10 homicide cases
    - 9 males
    - 1 female

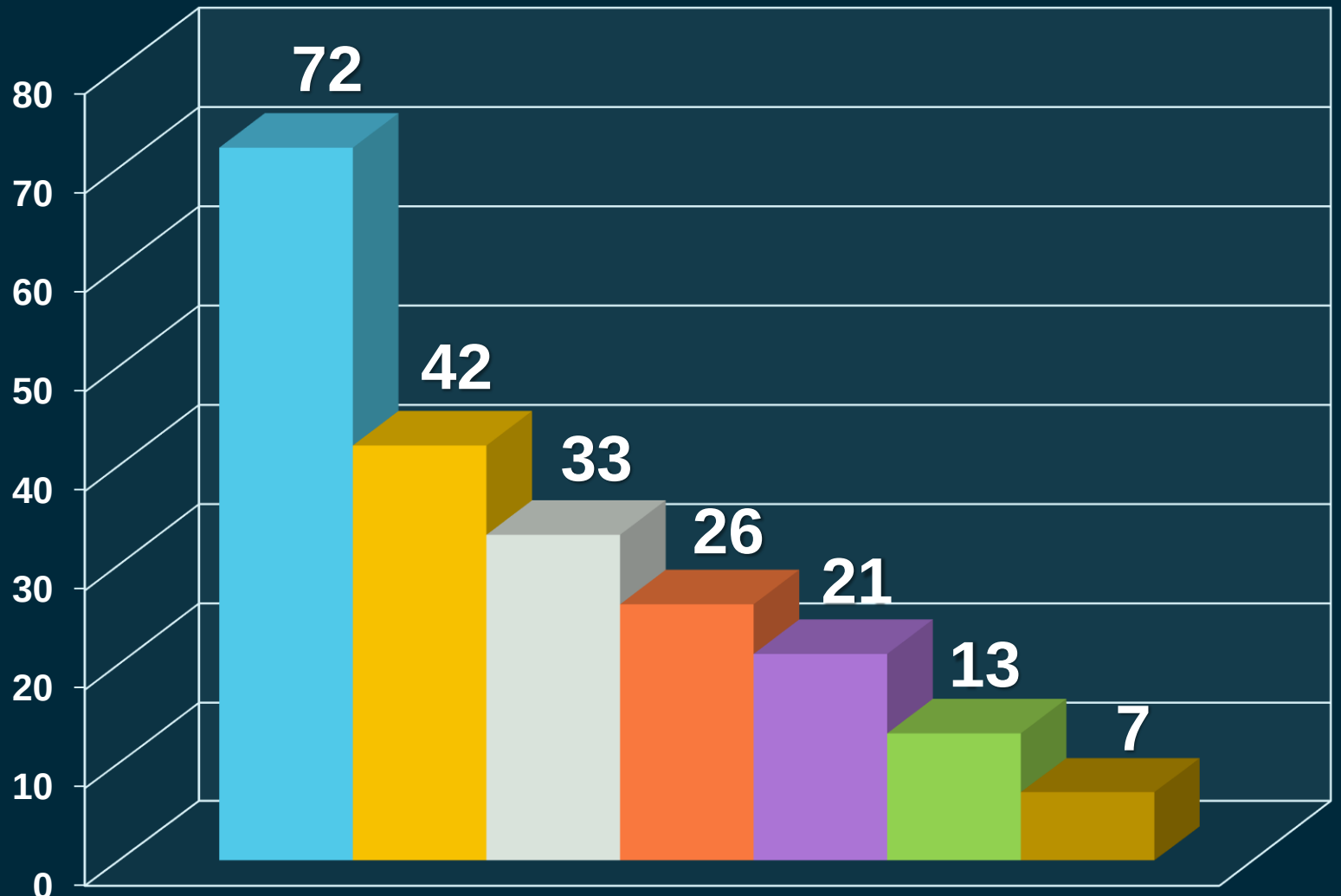


Pediatric Manner of Death (Age 0 – 17 Years)



*Excludes fetal deaths (9)

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

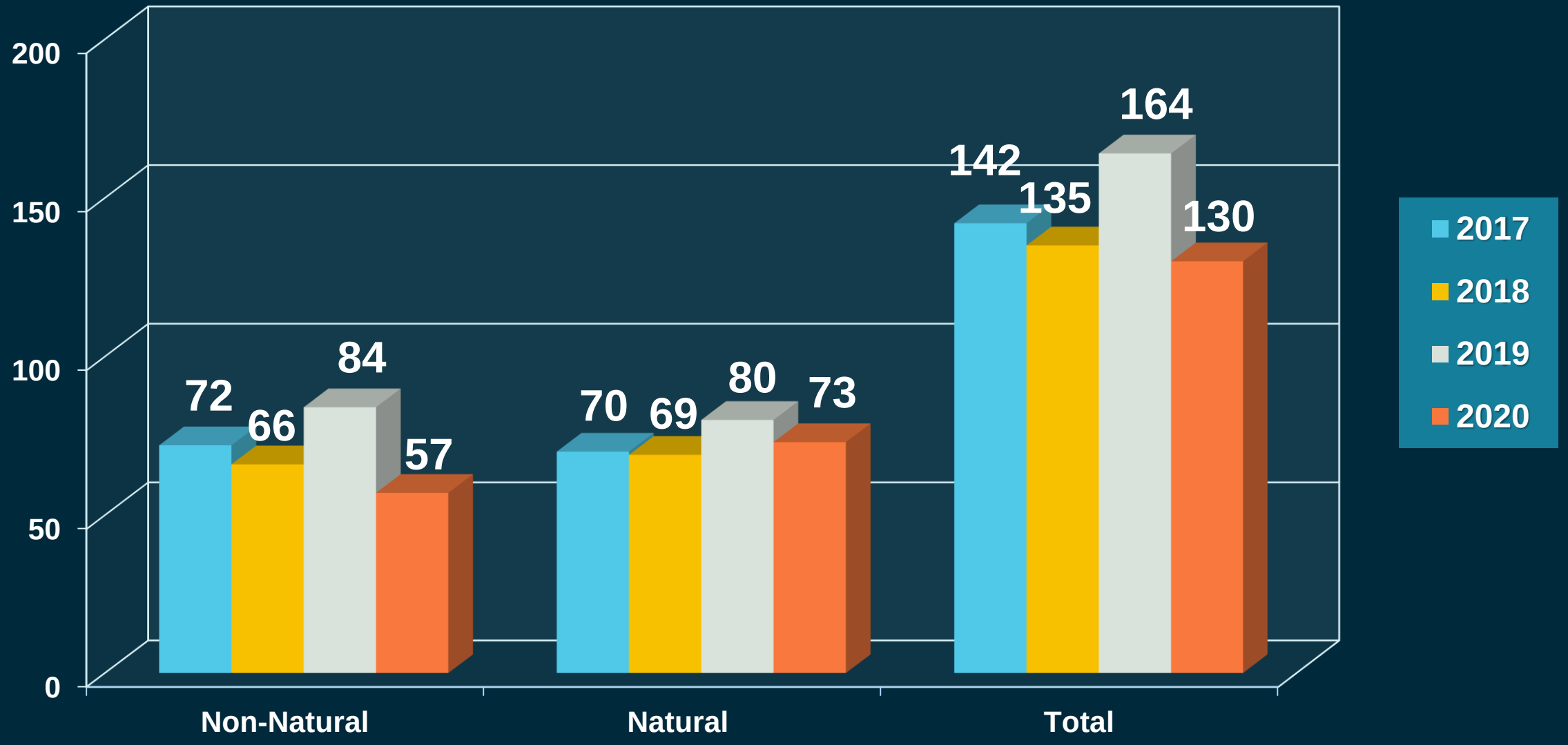


N=260*

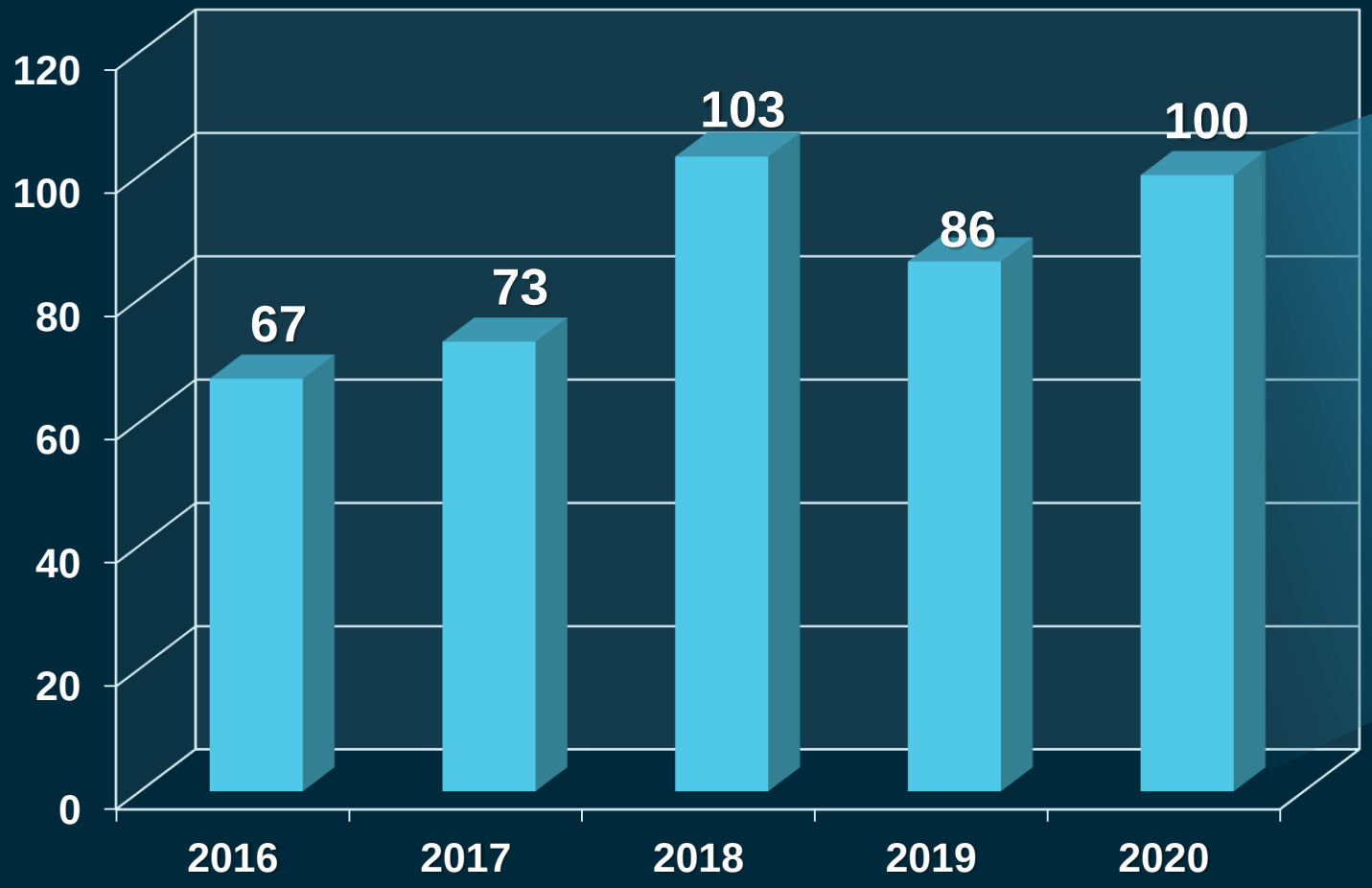
- Unexplained Sudden Death
- Firearm
- MVC
- Non-MVC Blunt Force
- Drowning
- Hanging
- Drug Toxicity

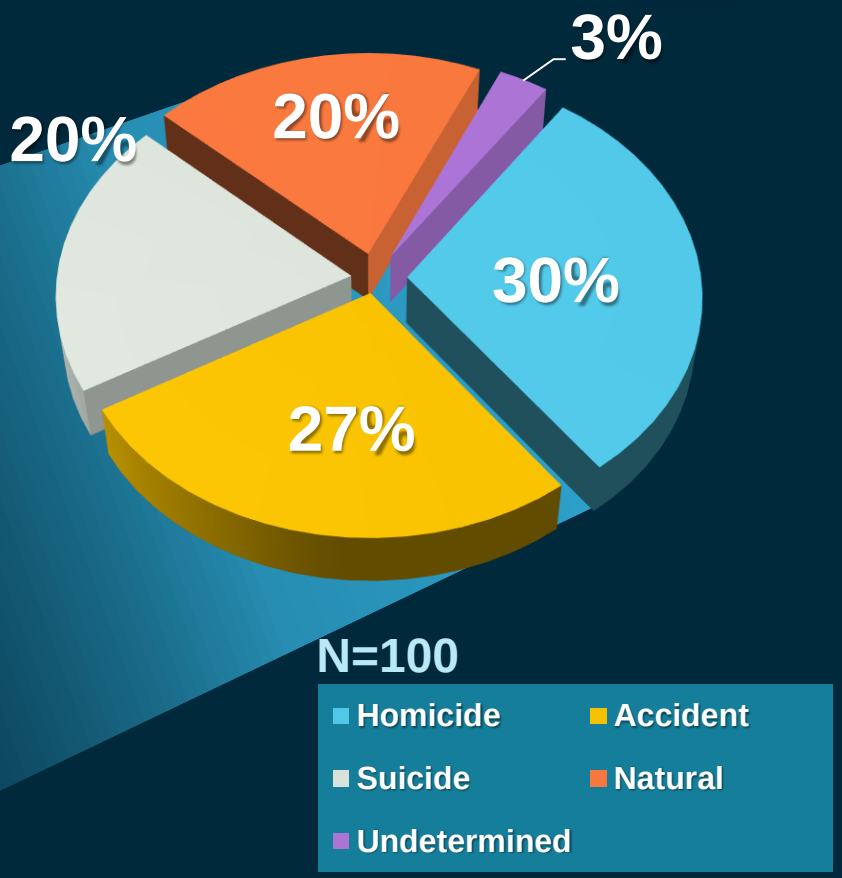
*This number represents total pediatric deaths (age 0-17 years) in 2020.

“While at Work” Deaths



Deaths During Police Intervention*



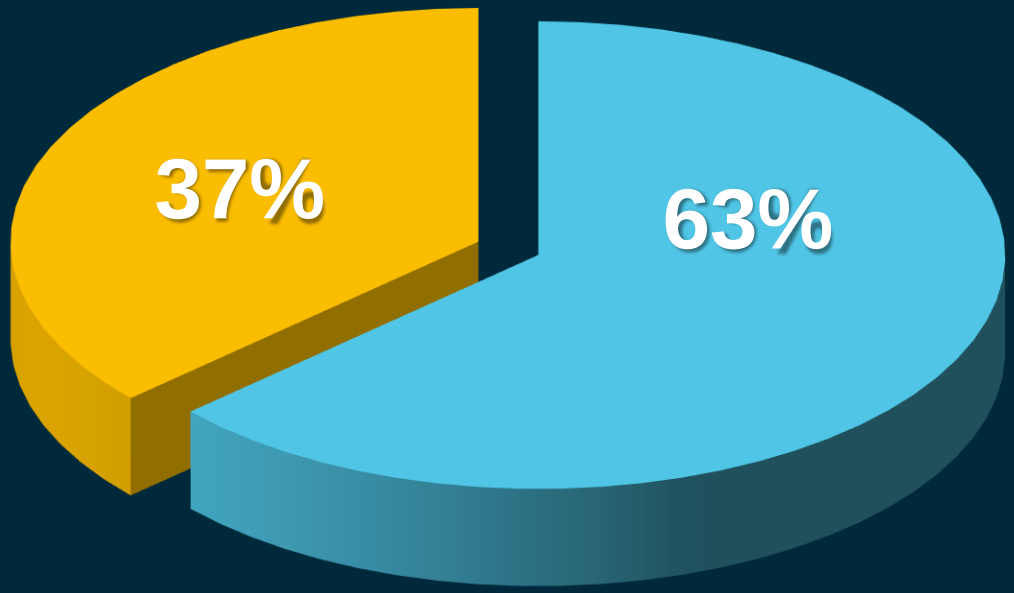


*These include deaths in which the circumstances of the death place the decedent in either direct or indirect contact with law enforcement, such as incarceration, apprehension, and pursuit. This category of death is not limited to police shootings, arrest-related deaths, apprehension deaths, or in-custody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

COVID-19 ML and Inquest Cases Demographics in 2020

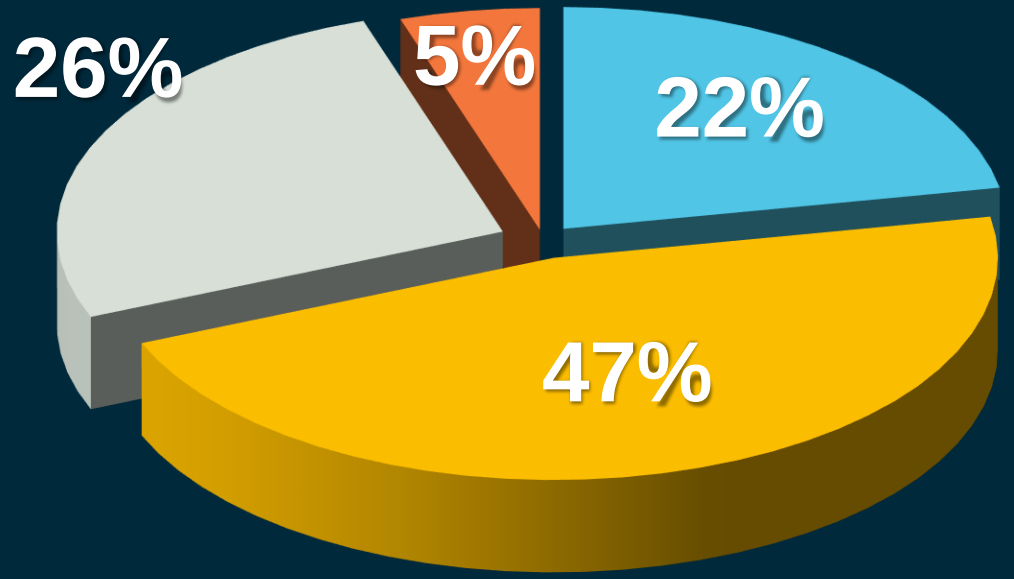
Sex

N= 908



Male: 575 Female: 333

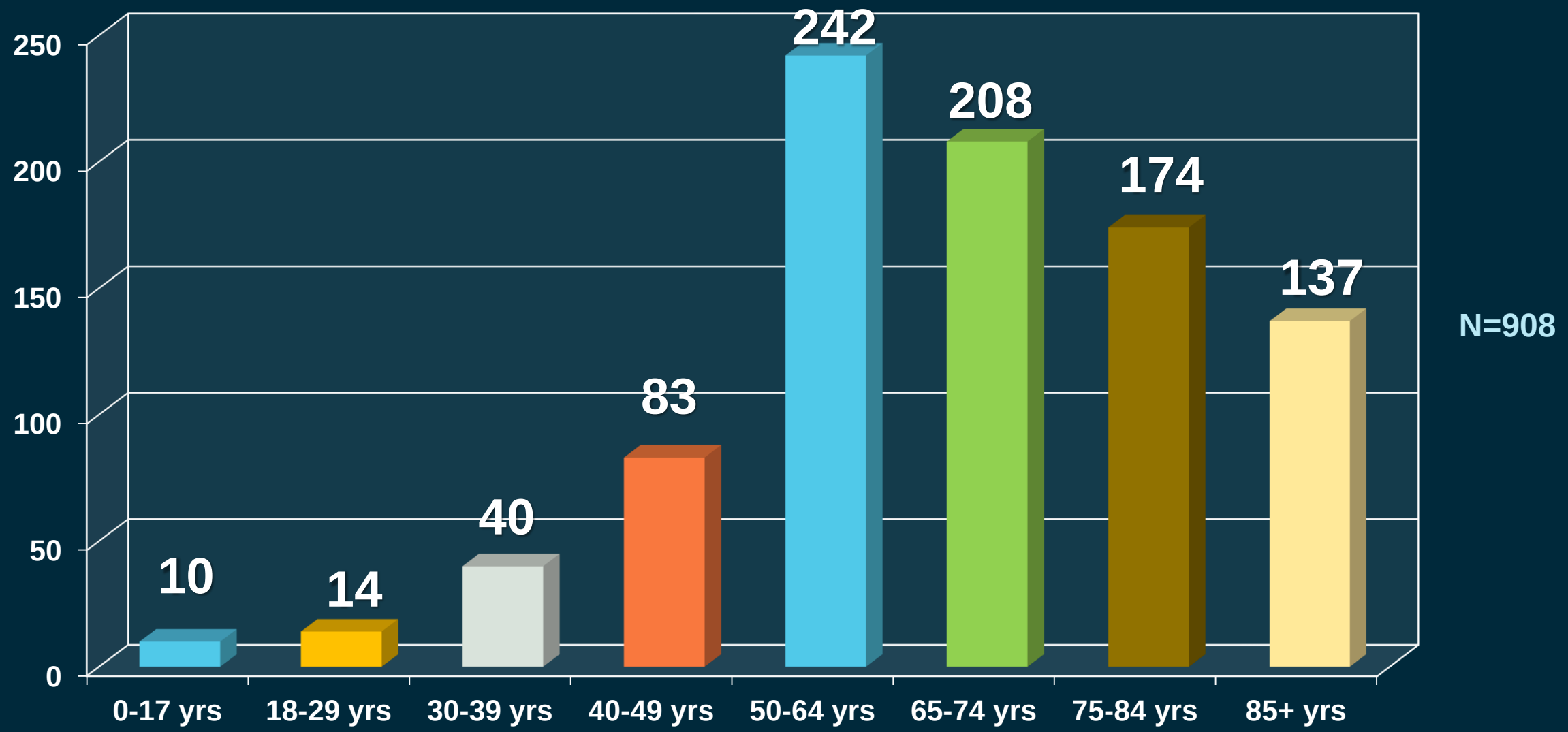
Race/Ethnicity



Black: 200 Hispanic: 424

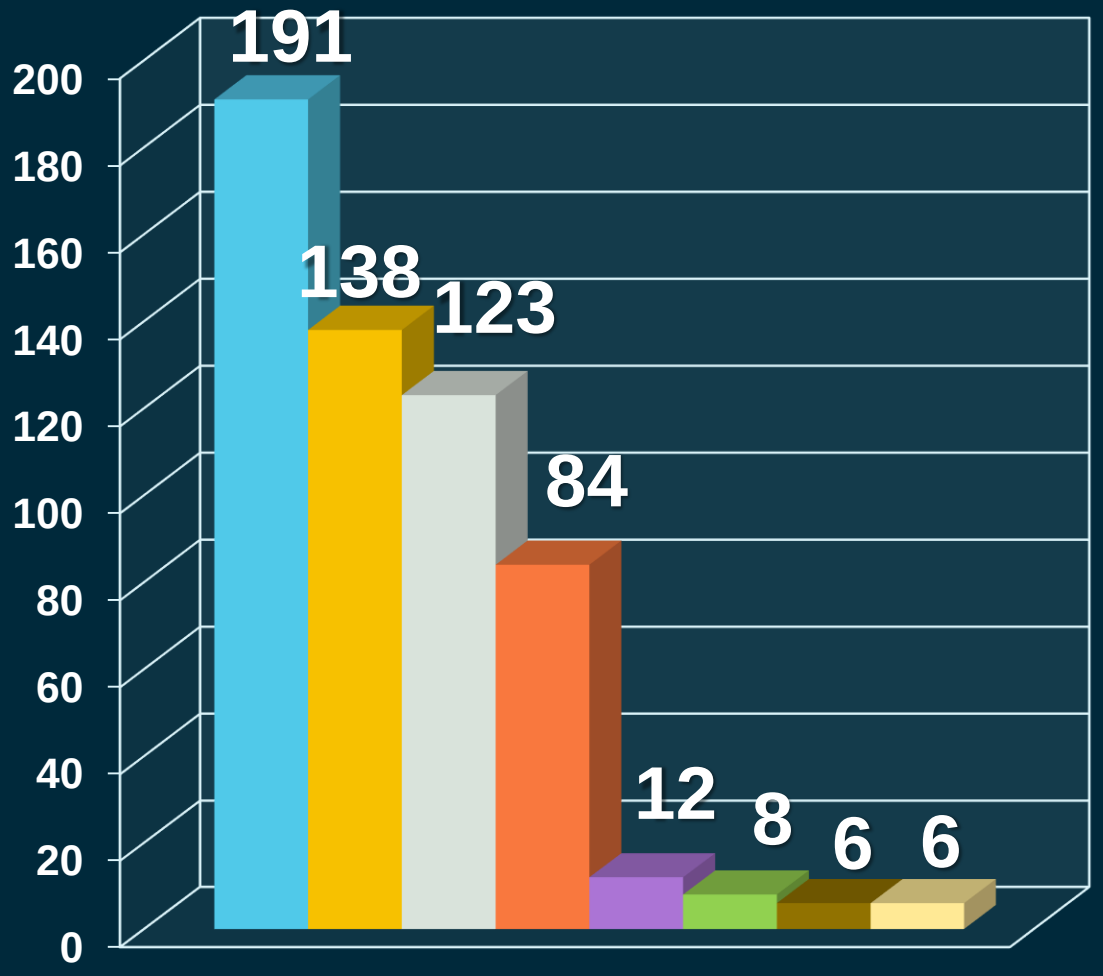
White: 238 Asian: 46

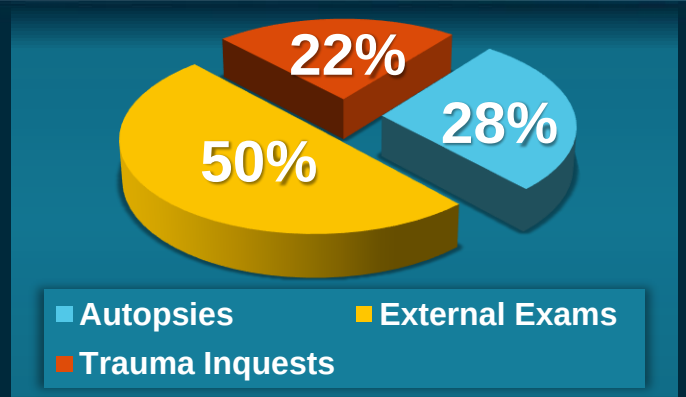
COVID-19 Medicolegal and Inquest Cases Age Distribution in 2020



N=908

Deaths Classified as COVID-19 by HCIFS





N=298*

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

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

*Includes 70 Trauma Inquest cases

ML Cases Received by Manner in 2020

Manner of Death	2015-2019 Average	2020	Difference (2020 compared to 2015-2019 avg)	% Change (2020 compared to 2015-2019 avg)
	N	N		
Suicide	511	561	50	10%
Homicide	465	658	193	42%
Accidental	1,607	1,817	210	13%
Natural	1,921	2,343	422	22%
Undetermined	151	206	55	36%
Total	**4,655**	**5,585**	**930**	**20%**

ML Cases Received by Manner/Cause in 2020

Manner of Death	2015-2019 Average	2020	Difference (2020 compared to 2015-2019 avg)	% Change (2020 compared to 2015-2019 avg)
	N	N		
Suicide; Firearm	287	295	8	3%
Suicide; Hanging	124	157	33	27%
Homicide; Firearm	370	543	173	47%
Accidental; Drug Toxicity	582	922	340	58%
Accidental; MVC	524	541	17	3%
Natural*; Cardiac Diseases	1,521	1,863	342	22%
Natural*; Obesity	326	585	259	79%
Natural*; Diabetes	328	567	239	73%
Natural*; Chronic Ethanolism	239	427	188	79%
Natural*; COVID-19	0	228	N/A	N/A
Total	**4,301**	**6,128**	**1,599**	**37%**

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

Organ and Tissue Donation Summary

- HCIFS maintains agreements with:
  - LifeGift
  - Lions Eye Bank of Texas at Baylor College of Medicine
  - Biograft Transplant Services
- 323 ML cases were released in 2020 for organ and/or tissue donation

Forensic Anthropology

- Staffed by four doctoral-level forensic anthropologists, all diplomates of the American Board of Forensic Anthropology

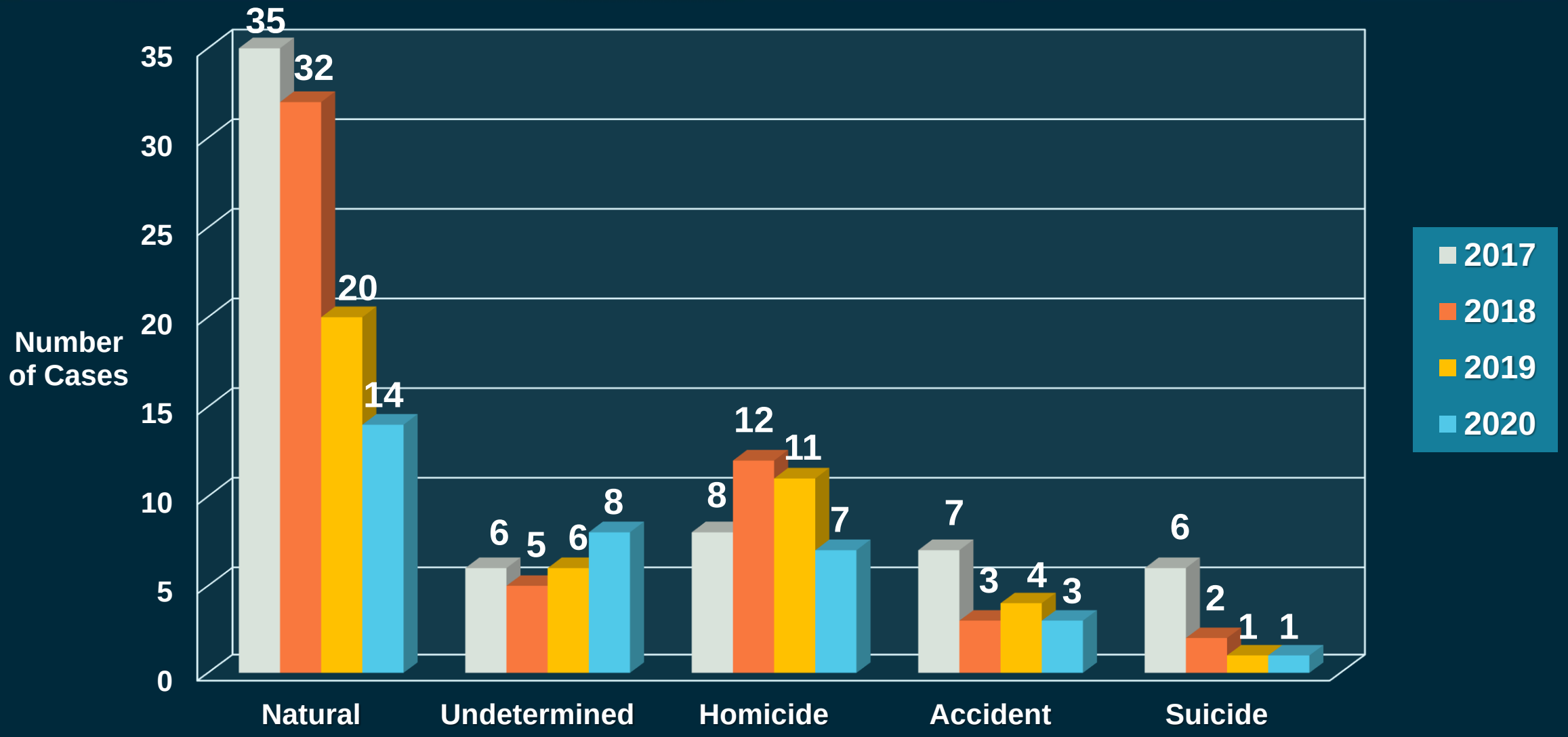
- 2020 casework:
  - 410 total cases received with written reports provided
    → This is a 25% increase from the 5-year average
  - 247 trauma cases analyzed
  - 20 death scenes with skeletal recovery
  - 36 cases of remains determined to be non-human

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

- 2020 Casework:
  - 33 Cases
  - 10 Scene Collections
  - 18 Autopsy Collections
  - 1 Scene and Autopsy Collection

Forensic Entomology 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

2020 Accomplishments

- **473** standard operating procedures reviewed
- **202** proficiency tests administered
- **387** court orders processed
- **15** internal audits conducted
- **79** internal training sessions provided

Crime Laboratory Services

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

Shau Lin Hon/Slyworks Photography

Statistical Summary

- Cases received: 22,781
  - Up 7% from 2019
- Cases completed: 22,965
  - Up 8% from 2019
- Total Number of submitting agencies: 85
- 61% of laboratory personnel have a professional certification
  - American Board of Criminalistics: 48 analysts
  - American Board of Forensic Toxicology: 14 analysts
  - Association of Firearm and Tool Mark Examiners: 6 examiners

Crime Laboratory Services

DRUG CHEMISTRY

Analyzes suspected drug evidence seized by law enforcement agencies

Drug Chemistry Laboratory

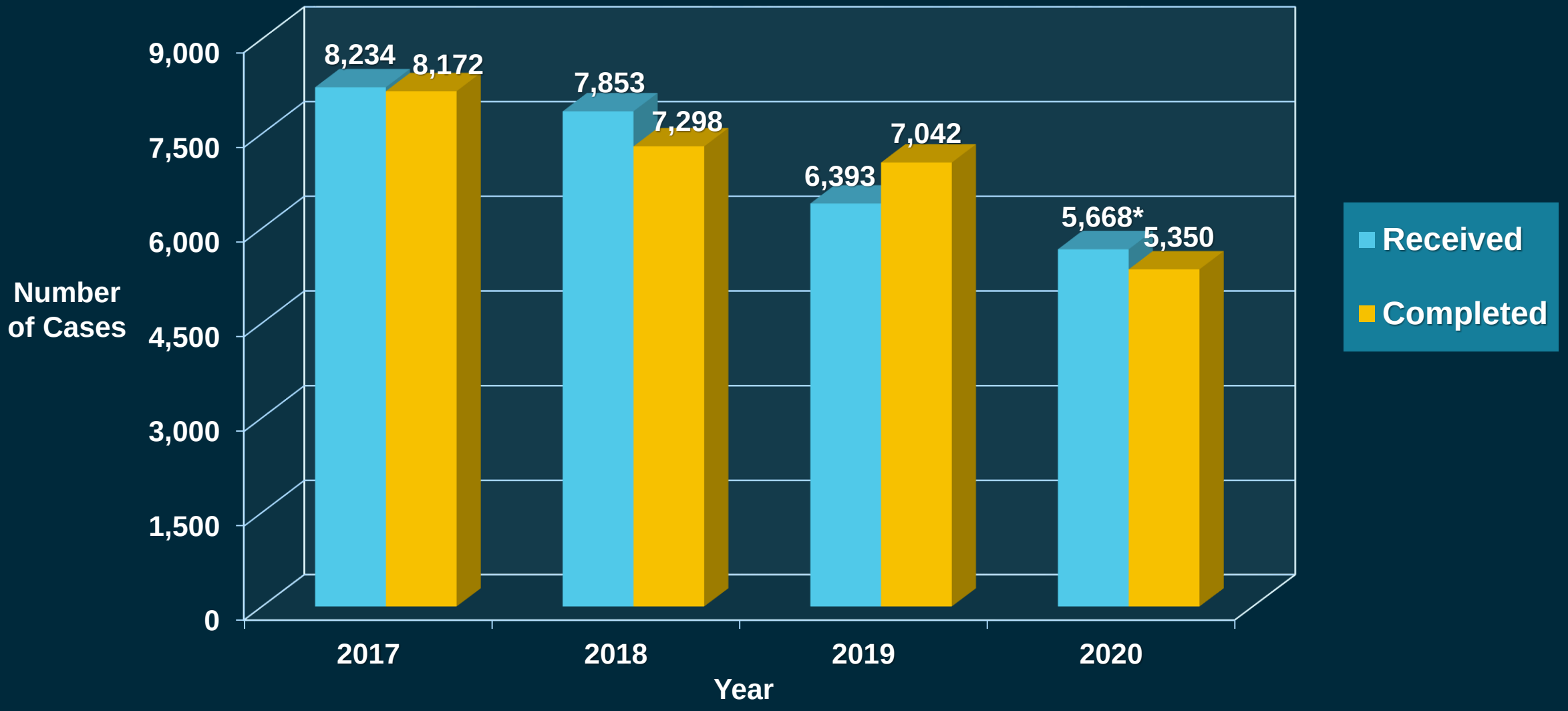
In accordance with Texas state statutes, identifies confiscated, illegal, and dangerous drugs, including:

- Plant material
- Powders, tablets, liquids
- Drug paraphernalia

The laboratory also develops and implements methods to identify new “designer” drugs including:

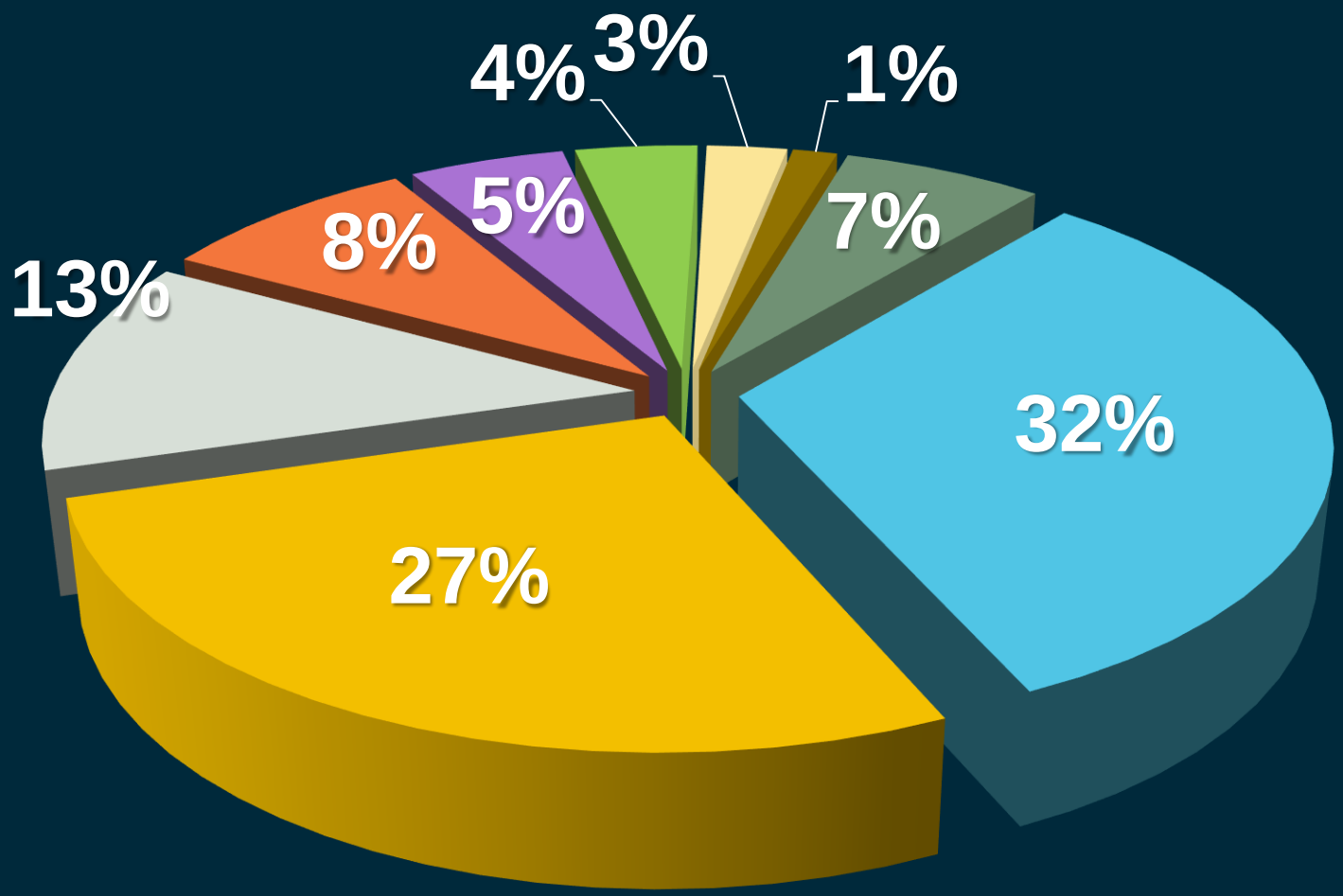
- Synthetic cannabinoids
- Opioid derivatives

Drug Cases Received and Completed



*This reflects a 6% decrease from 2019 in cases received.

Positive Test Results

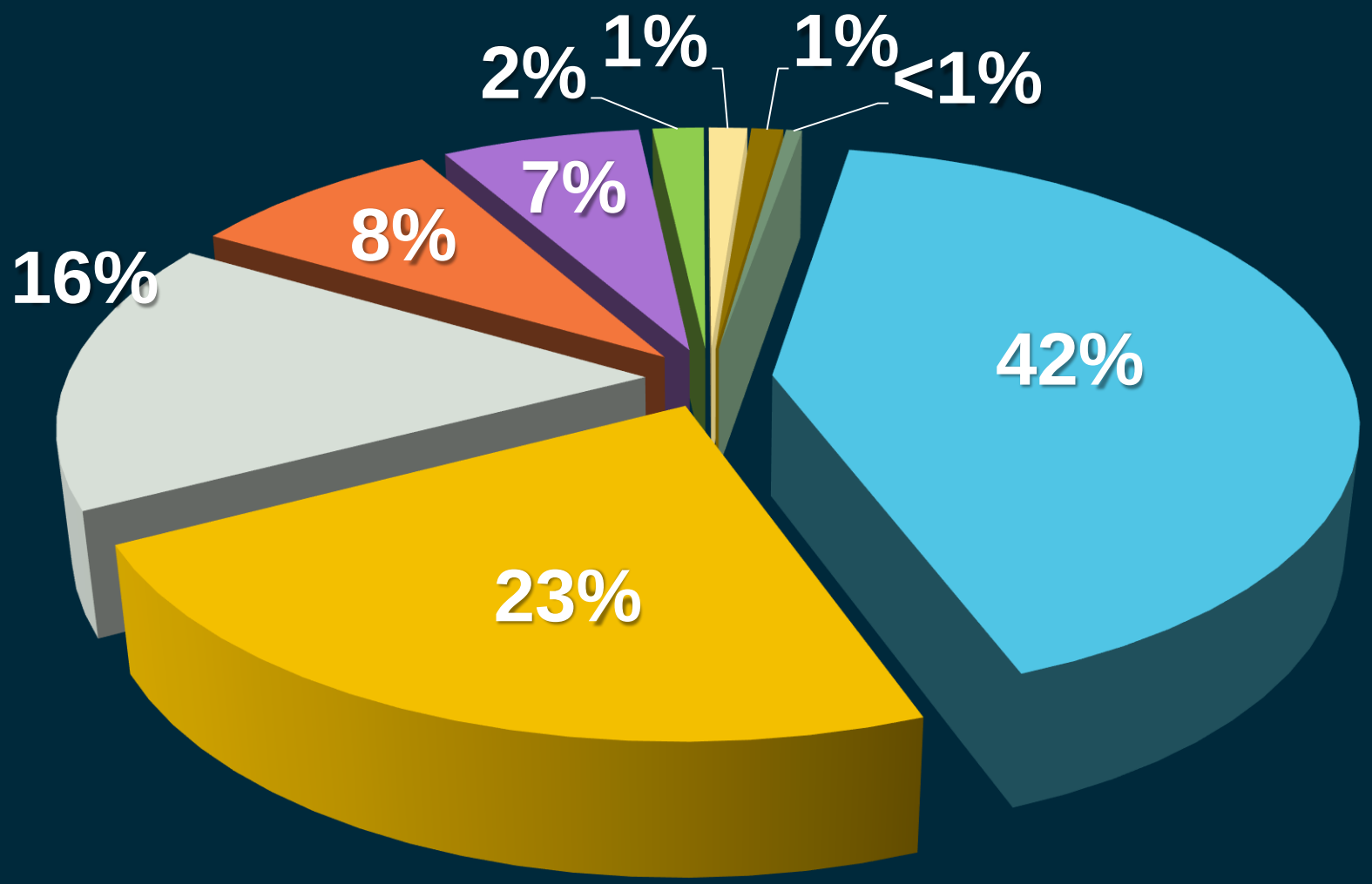


N=13,736

- Methamphetamine: 4,431
- Non-Controlled Substances*: 3,719
- Prescription Drugs: 1,717
- Cocaine: 1,163
- Opioids: 698
- THC: 549
- Designer Drugs: 361
- Marihuana: 200
- Other Controlled Substances: 898

*Non-controlled substances include caffeine, acetaminophen, oils, waxes, edible THC and marihuana plant.
**Other controlled substances include anti-seizure medicines and anti-depressants.

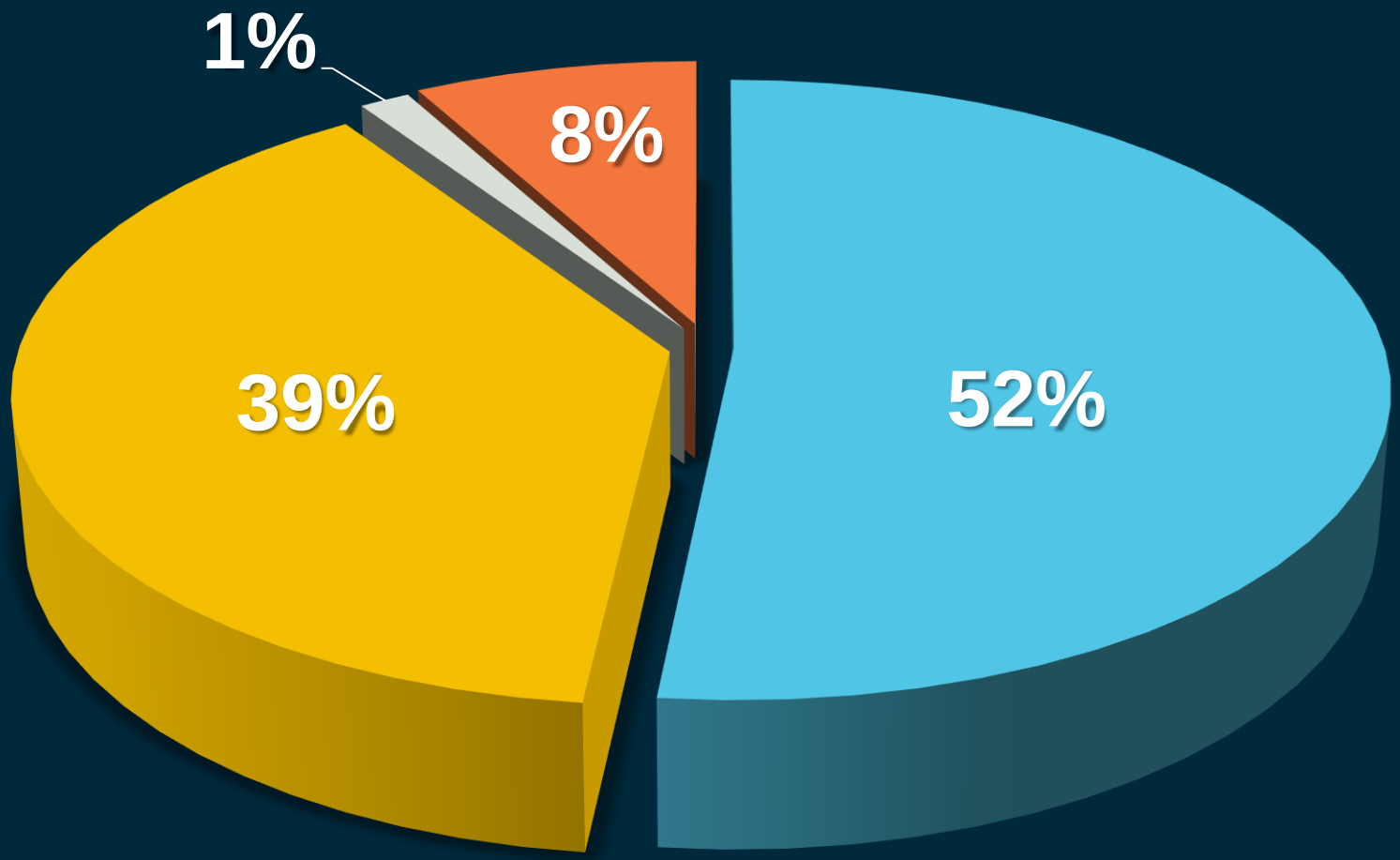
Opioid Test Results



N=949

- Heroin: 395
- Fentanyl: 218
- Hydrocodone: 152
- Codeine: 79
- Oxycodone: 62
- Carfentanil: 16
- Fentanyl Derivatives: 12
- Methadone: 10
- Hydromorphone: 5

Designer Drug Test Results



N=698

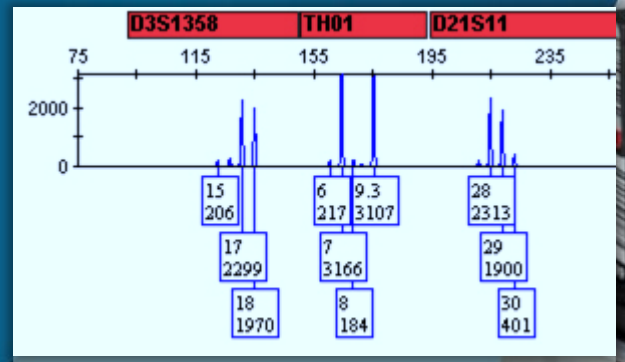
- Synthetic Marihuana: 361
- Bath Salts: 271
- NBOMe / NBOH: 10
- Other: 56

These data do not reflect discrete cases because multiple drugs may be detected in one case.

Crime Laboratory Services

FORENSIC GENETICS

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



Shau Lin Hon/Slyworks Photography

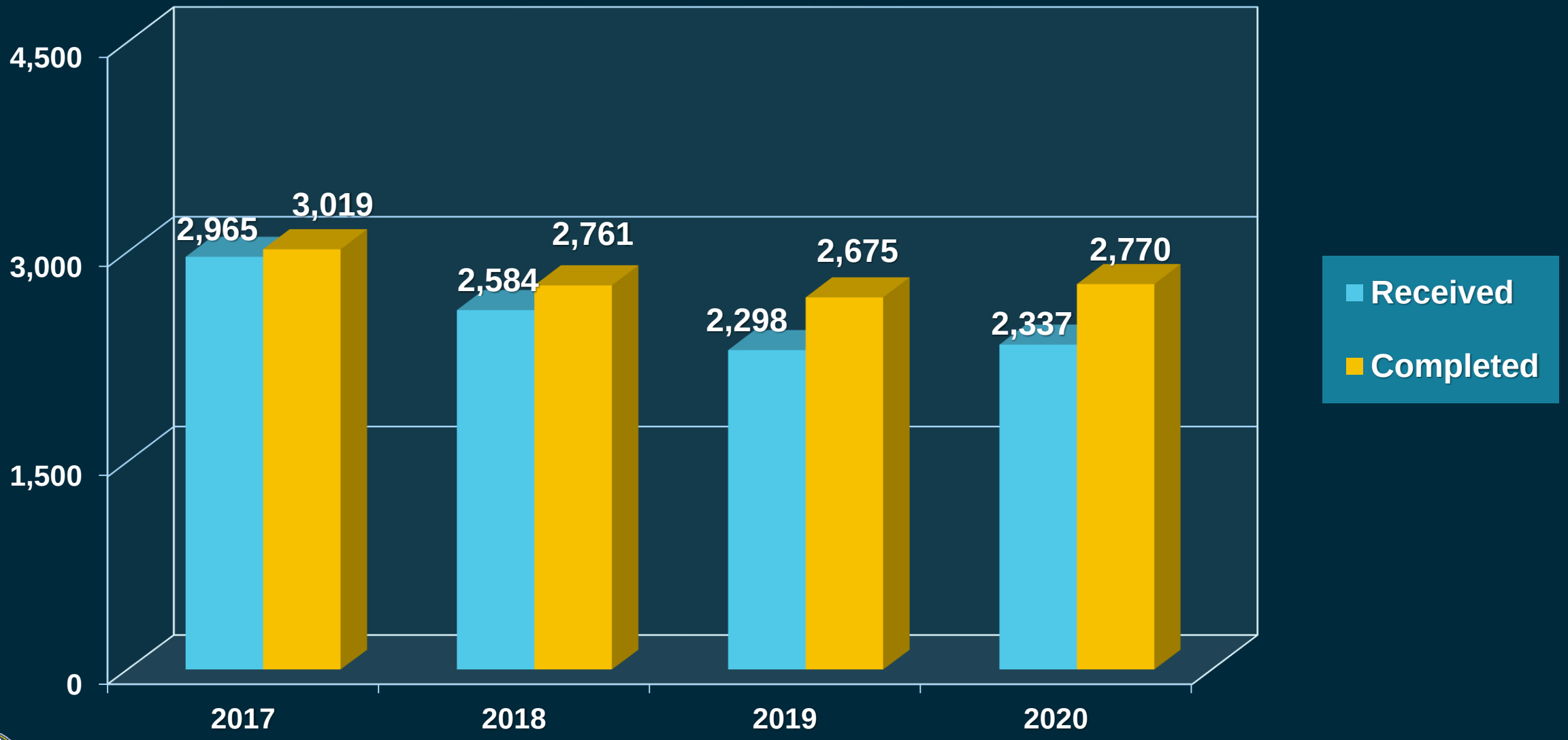
Forensic Genetics Laboratory

Conducts DNA testing primarily for:

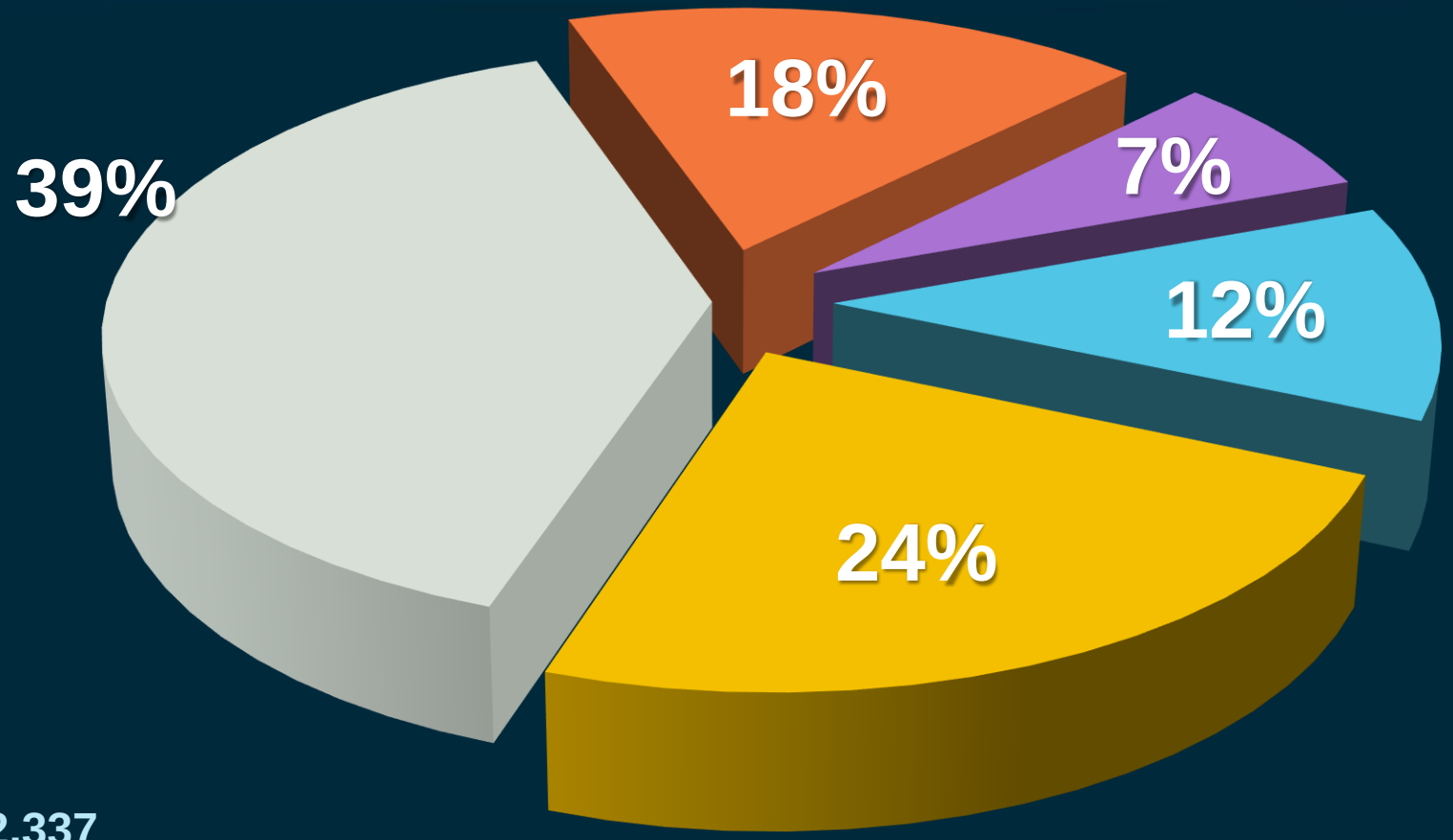
- Law enforcement agencies
- HCIFS medical examiners to assist in positively identifying decedents
- Cases submitted for DNA testing include crimes against persons such as sexual assault, homicide, and robbery; as well as property crimes such as burglary and theft
- Crimes against persons are given first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

Shau Lin Hon/Slyworks Photography

Genetics Cases Received and Completed



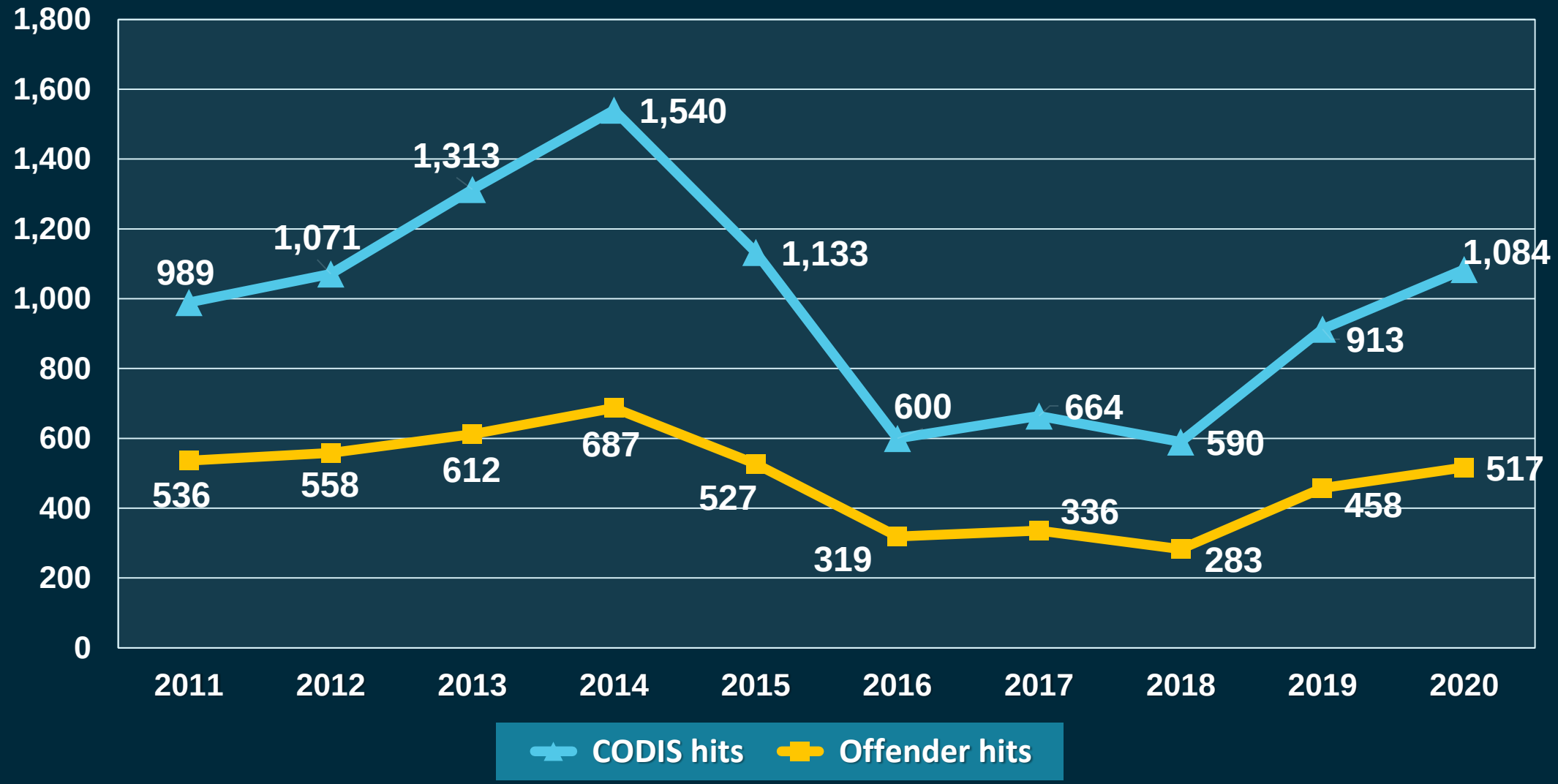
Case Submissions by Type



N=2,337

- Property: 279
- Assault/Robbery: 554
- Sexual Assault: 919
- Homicide/Death Investigation: 423
- Other: 162

CODIS Hits (Combined DNA Index System)



Trace Evidence DNA Collection Team

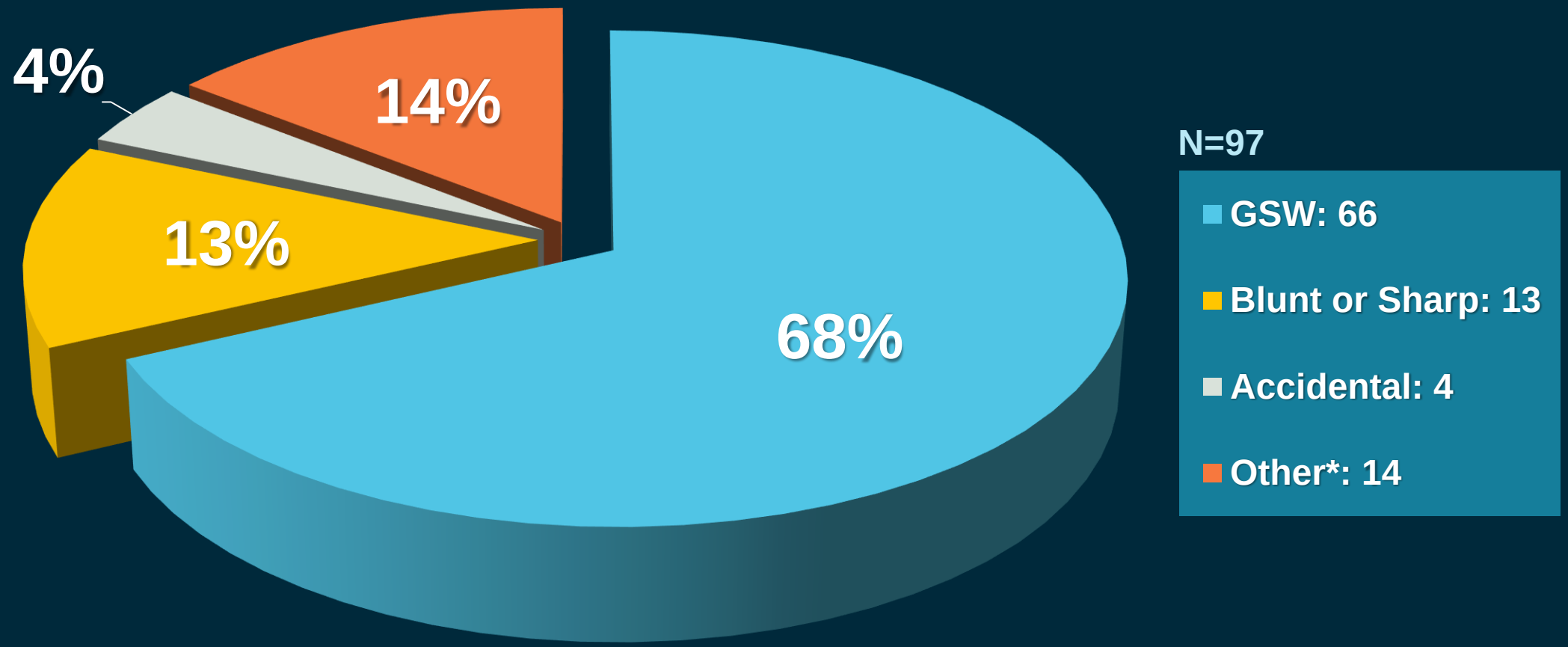
Specialized DNA analysts who attend select death scenes to collect DNA and trace evidence from bodies that have been:

- Dumped
- Bound
- Thought to have been in close contact with the 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: Homicide Cases by Cause of Death



** "Other" manner and causes include strangulation/asphyxia, homicidal violence, and suicide.*

Crime Laboratory Services

FORENSIC TOXICOLOGY

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

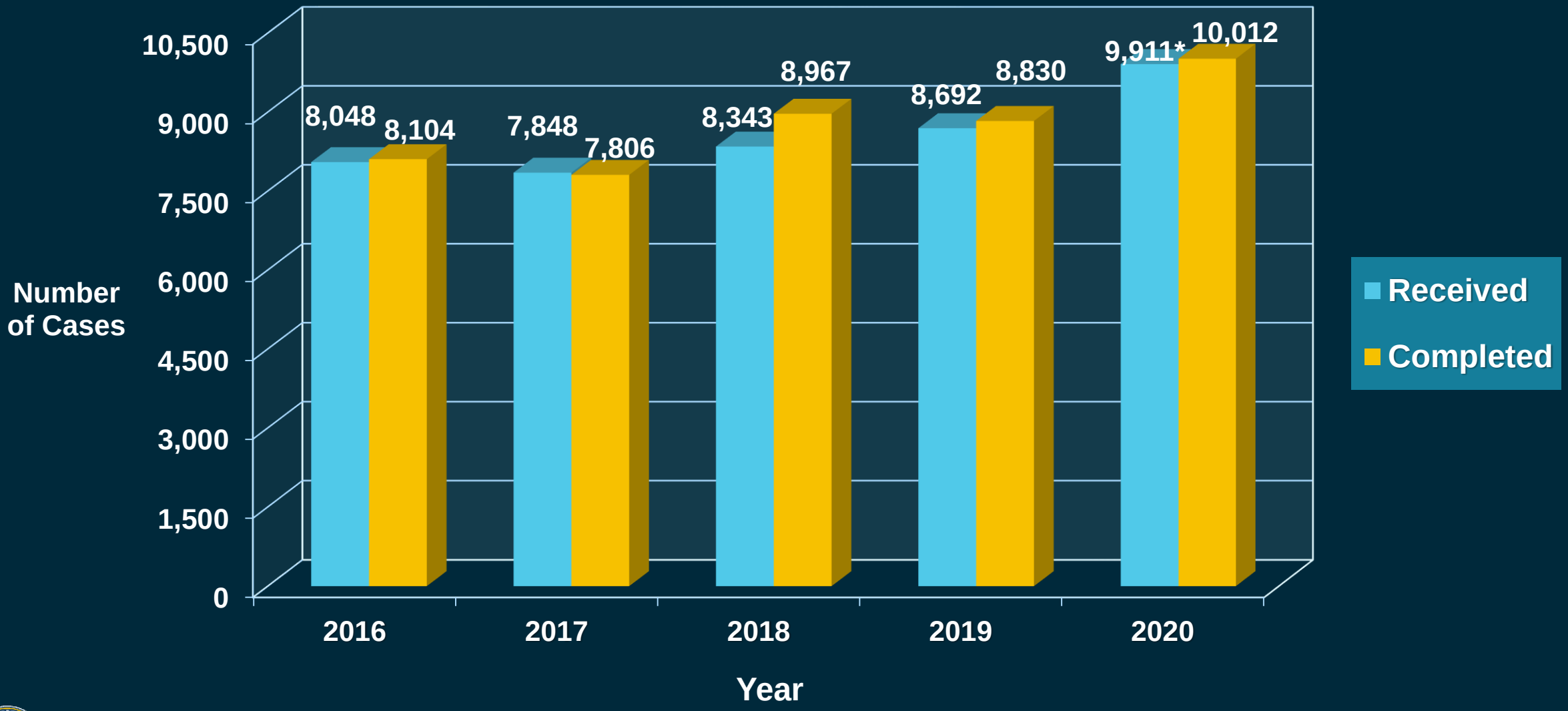
Forensic Toxicology Laboratory

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
- Other criminal investigations

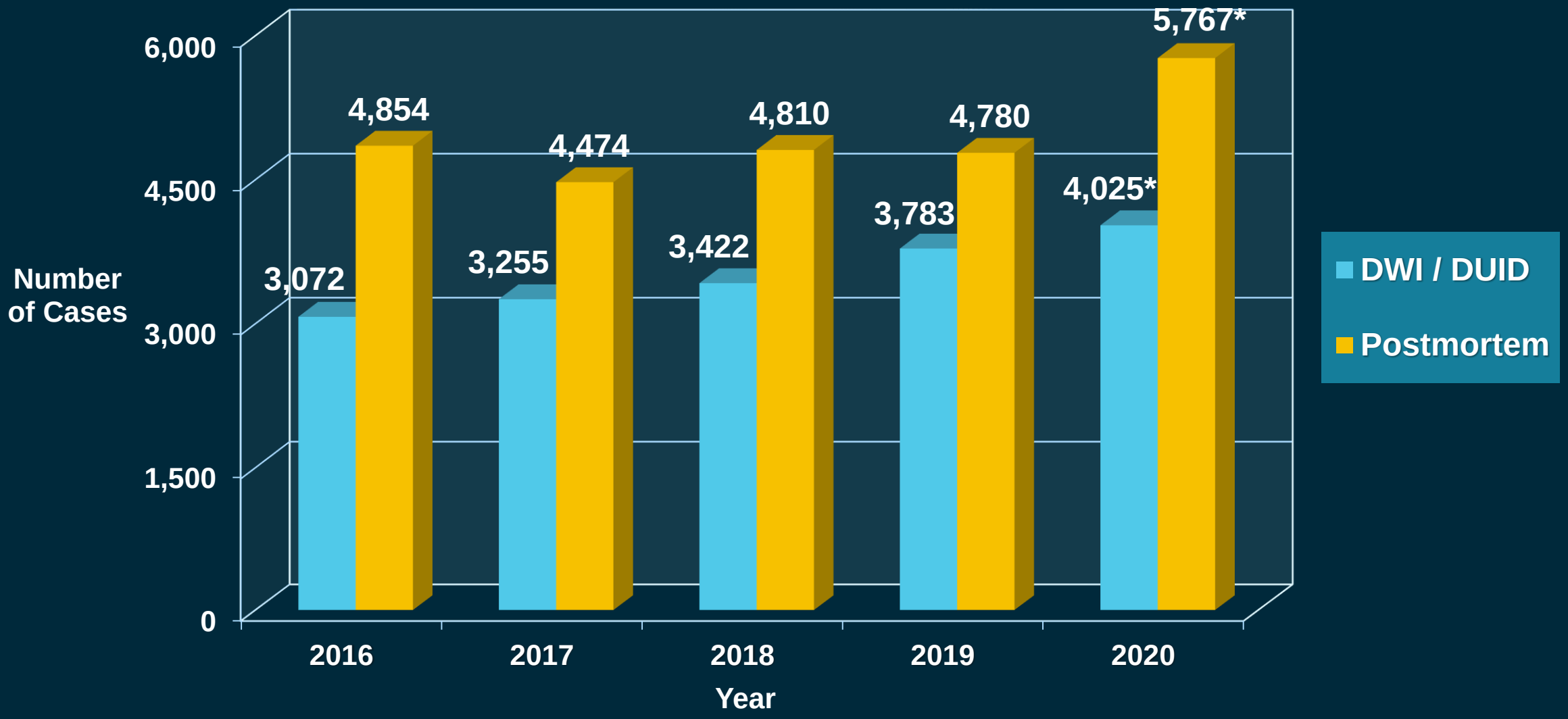
The only forensic toxicology laboratory in Texas **dually accredited** by the ANSI National Accreditation Board and the American Board of Forensic Toxicology

Cases Received and Completed



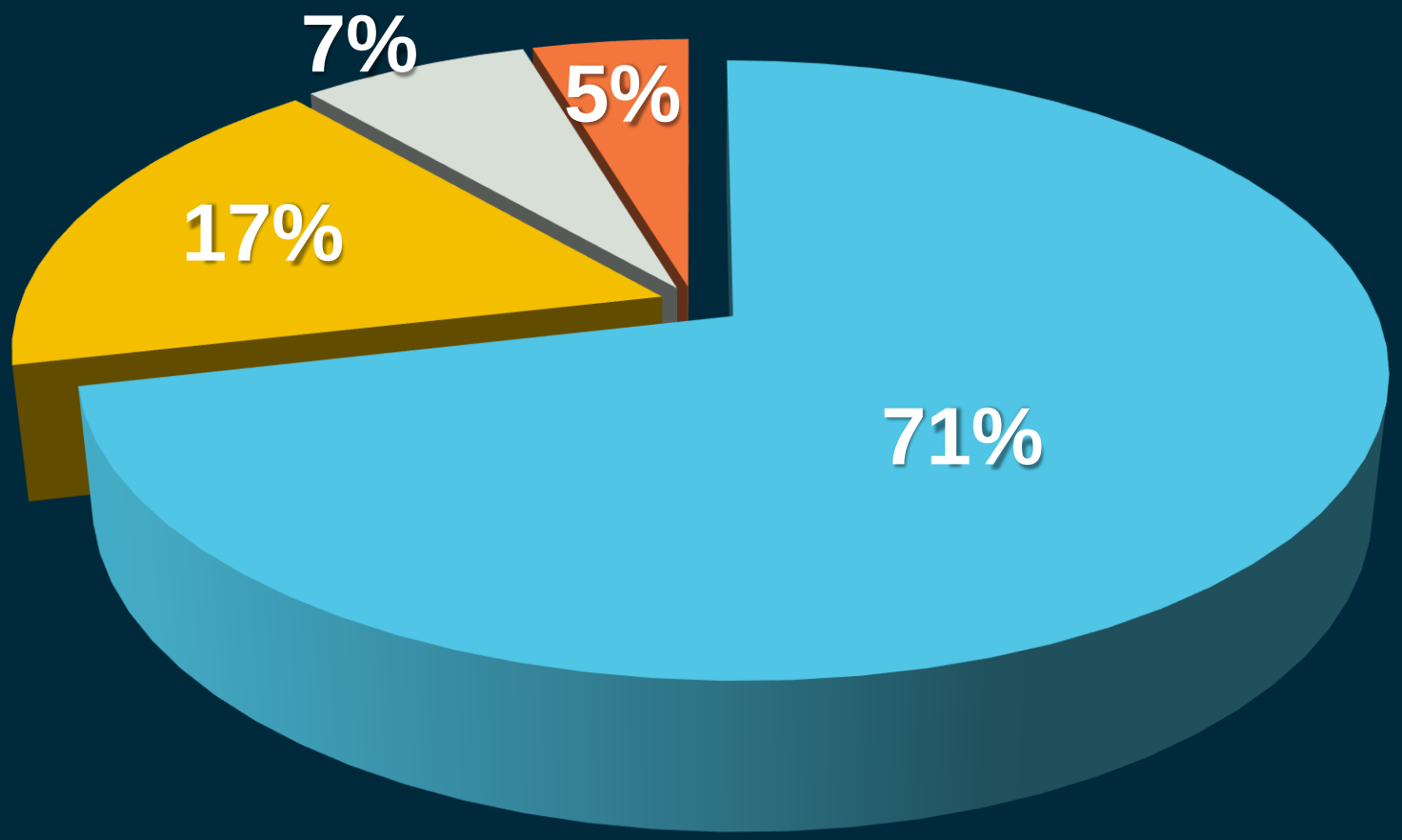
This reflects a 14% increase from 2019 in total cases received.

Cases Received by Type



**Compared to 2019, this is a 6% increase in cases received for DWI/DUID and a 21% increase in cases received for postmortem cases.*

DWI Case Results

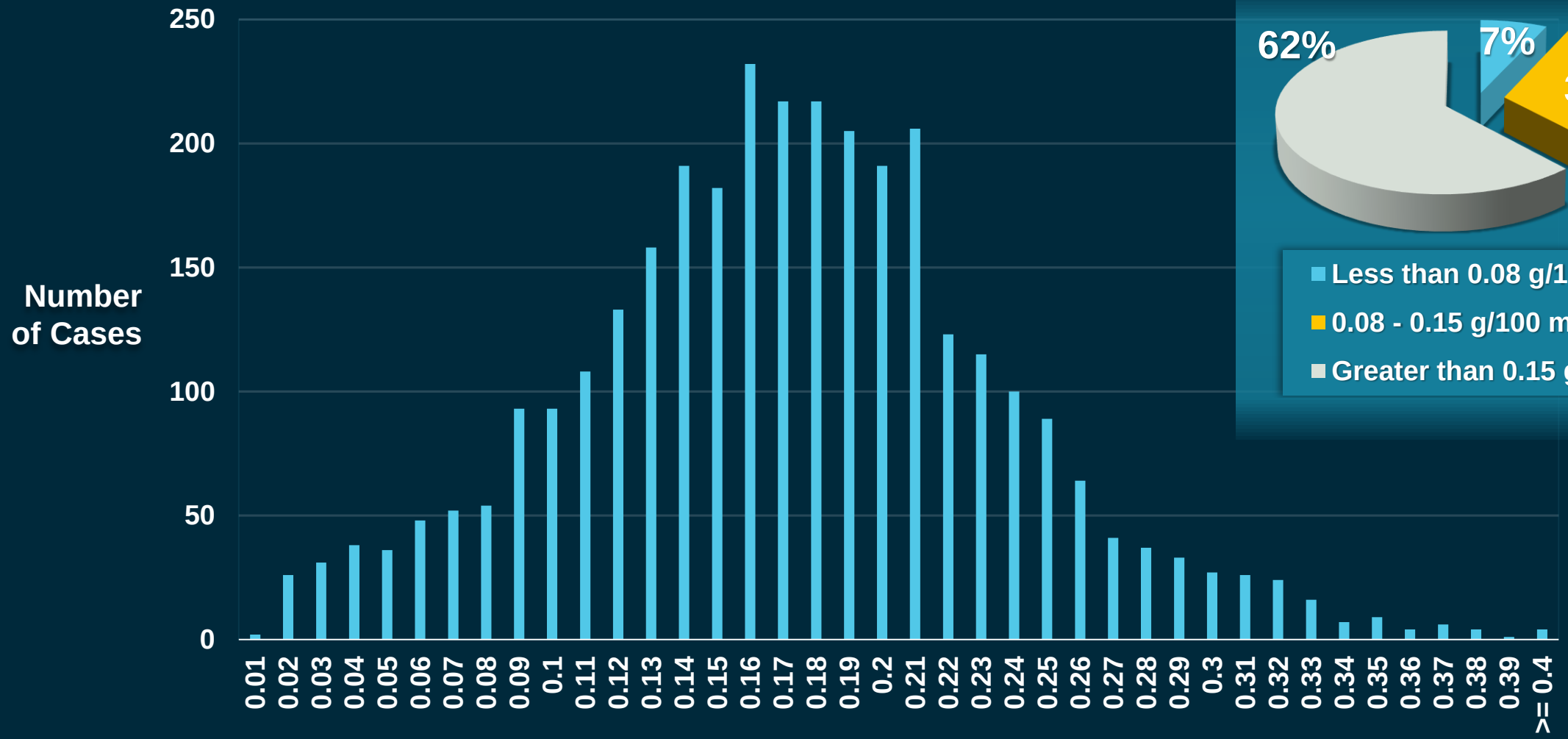


N=4,025

- Alcohol Positive Only*: 2,874
- Drug Positive Only: 694
- Alcohol and Drug Positive: 271
- Negative: 186

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

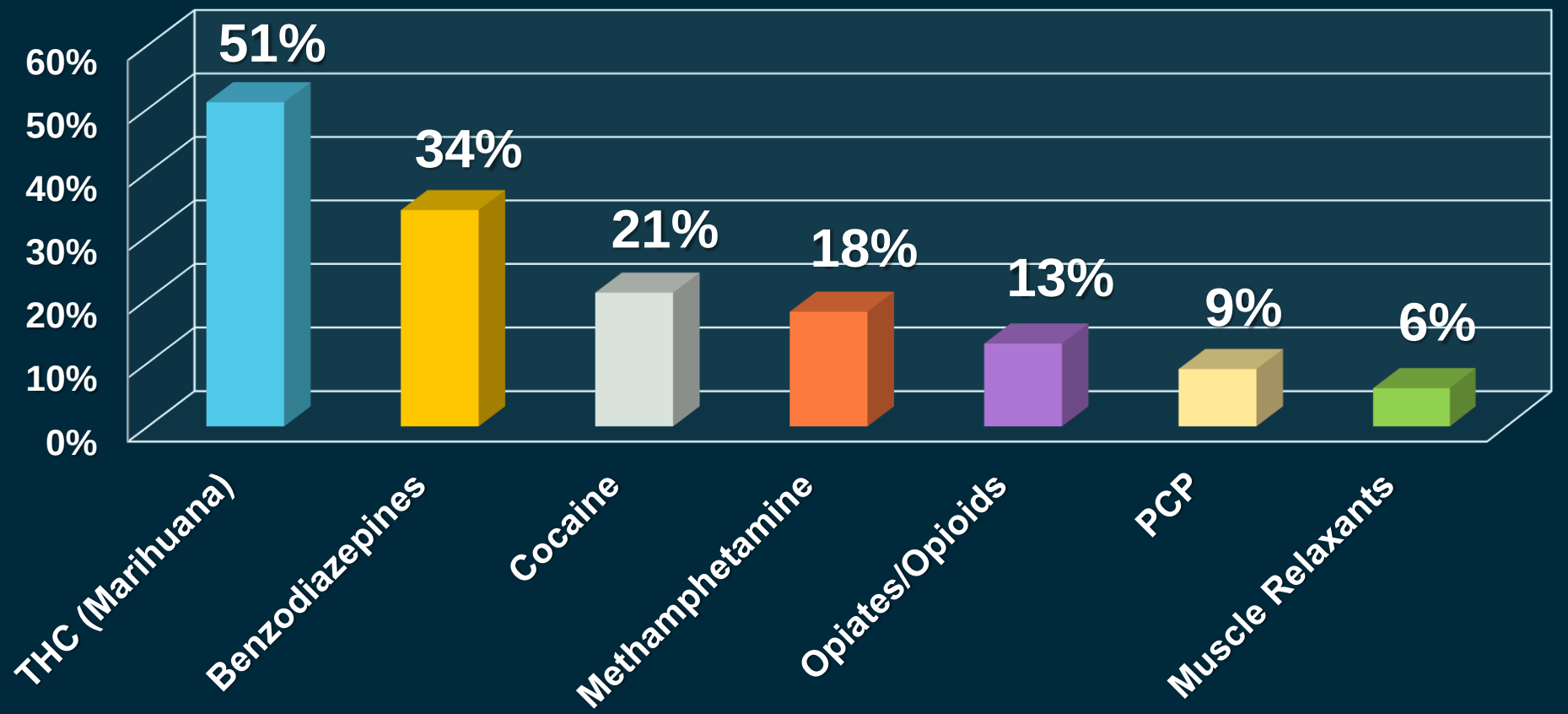
DWI Blood Alcohol Concentrations



Drug Prevalence in DWI Cases

N=1,151

Number of Drug-Tested Cases



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

Crime Laboratory Services

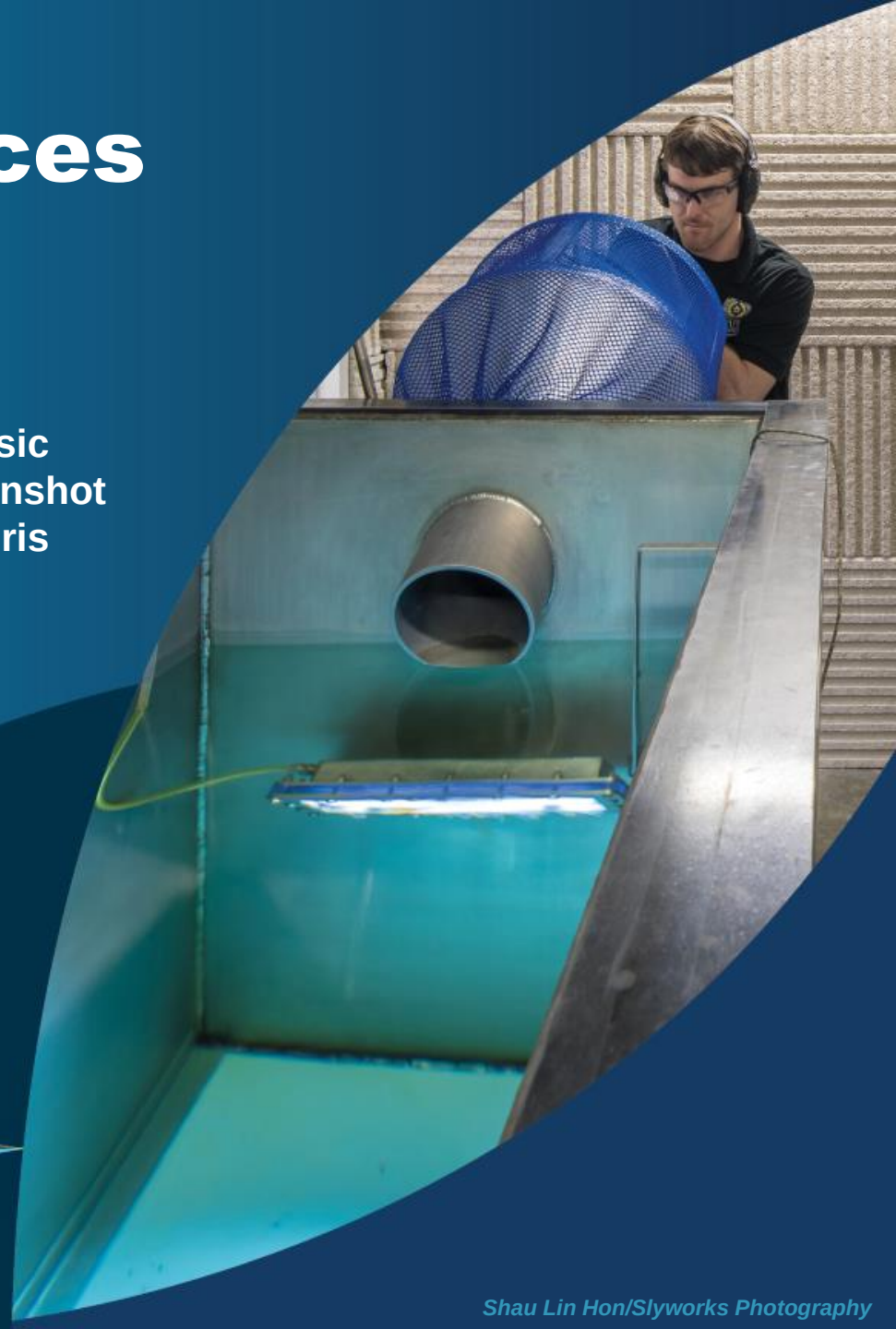
PHYSICAL EVIDENCE

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

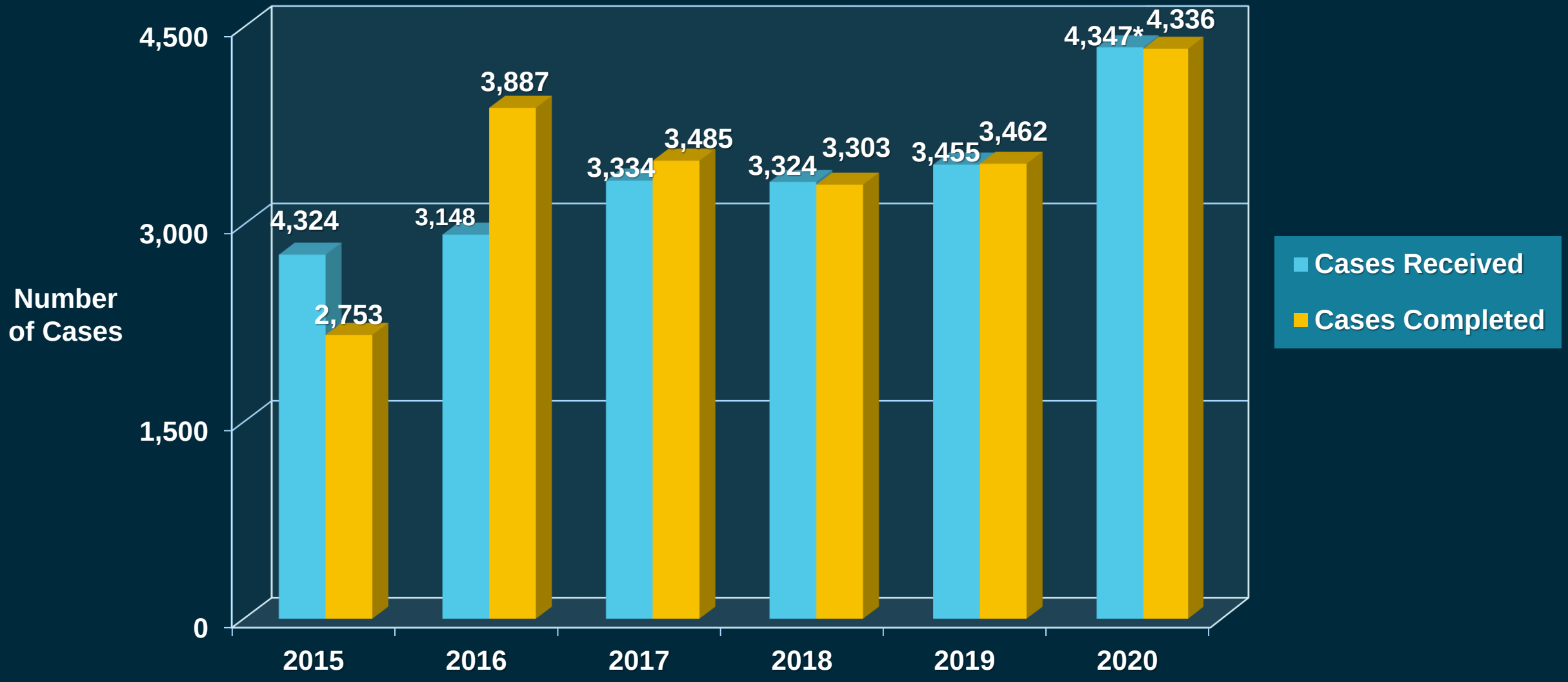


Shau Lin Hon/Slyworks Photography

Firearms Identification Laboratory

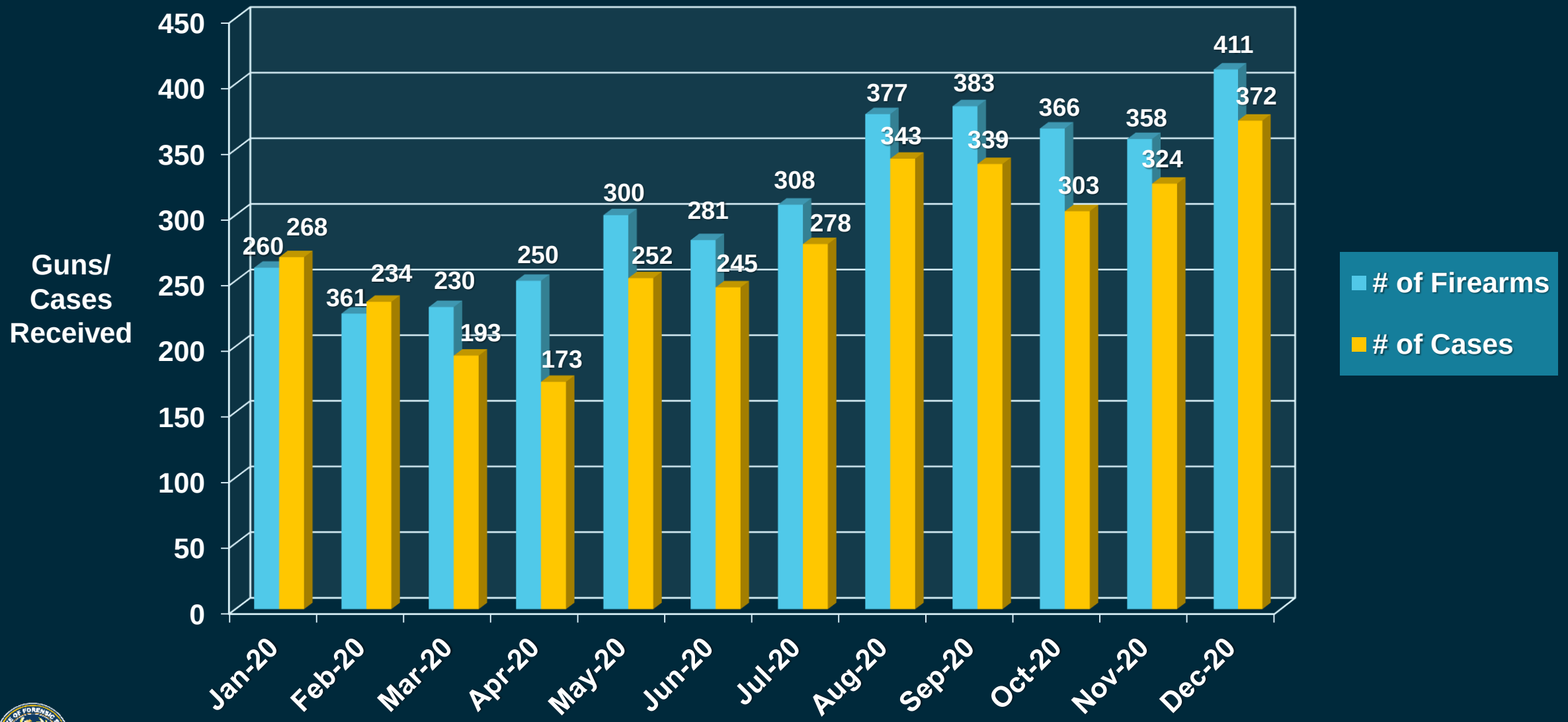
- Conducts examinations of evidence related to investigations of gun-related offenses
- Cases received are comprised of weapons, bullets, and cartridge casings
- Serves as a regional facility for the National Integrated Ballistics Information Network database

Firearms Identification Casework



*This reflects a 26% increase from 2019 in cases received completed.

Firearms IBIS (Test-Fire Only) Case Submission in 2020

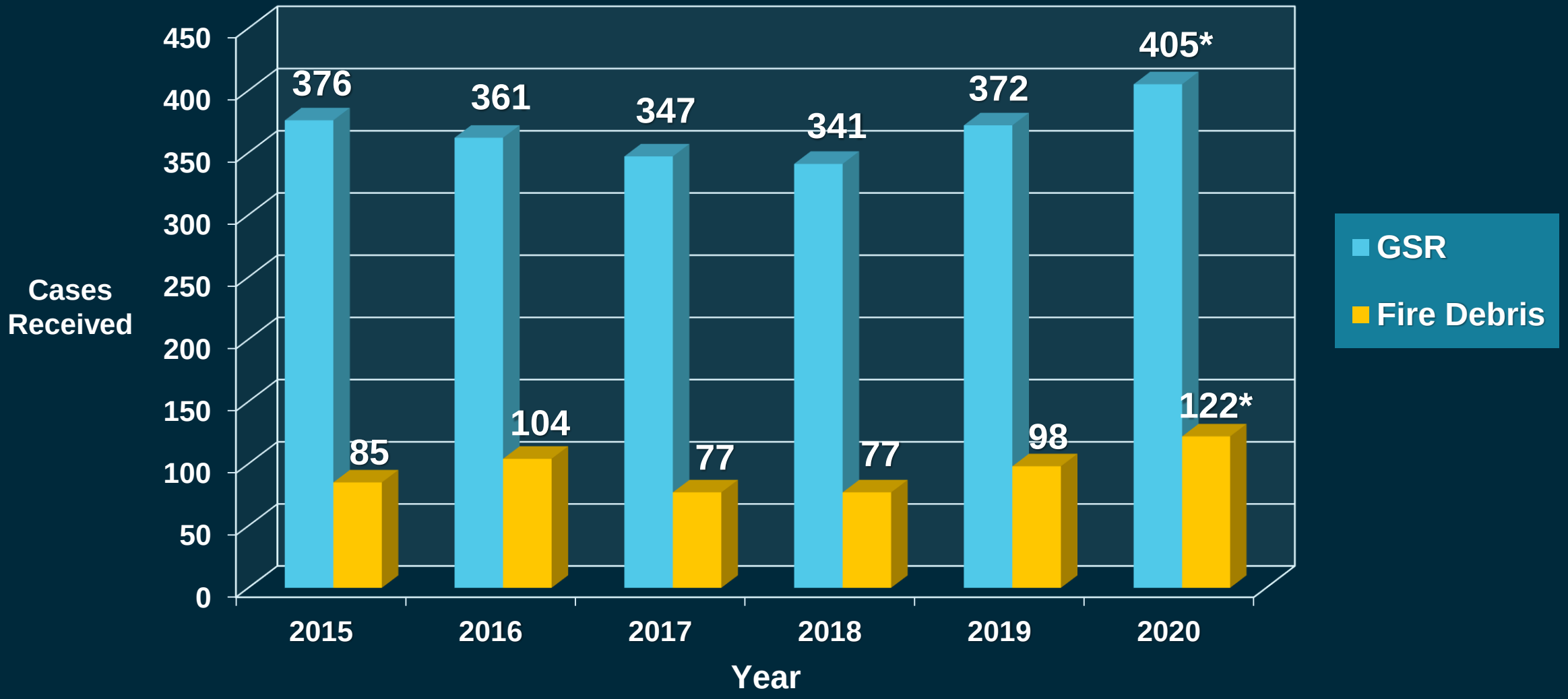


Trace Evidence

Provides analytical support to the HCIFS Medical Examiner Services and law enforcement in three 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 2019, this is a 9% increase in cases received for GSR and a 24% increase for fire debris.
**Nine paint analysis cases were received in 2020. (Paint analysis was a new category of testing introduced by the Trace Evidence Lab in late 2017.)

Published Scientific Work

Published articles in peer-reviewed journals

Publications by HCIFS Doctors and Scientists

	Title	Authors	Publication
1	Endogenous GHB in Segmented Hair Part II: Intra-individual Variation for Exogenous Discrimination	Strickland, E.C., Thomas, J.L., Lloyd, E.W., Smith, M.A., LeBeau, M.A., Montgomery, M.A., Karas, R.P., Peters, E.M., Miller, M.L.	*Journal of Analytical Toxicology* 2020, https://doi.org/10.1093/jat/bkaa086
2	A Rapid LC-MS-MS Method for the Quantitation of Anti-Epileptic Drugs in Urine	Feng, S., Bridgewater, B., Strickland, E.C., McIntire, G.	*Journal of Analytical Toxicology* 2020, https://doi.org/10.1093/jat/bkaa095
3	Endogenous GHB in Segmented Hair Part I: Inter-individual Variation for Group Comparisons	Thomas, J.L., Strickland, E.C., Lloyd, E.W., Donnelly, C.C., Rankoth, A., Pieczonka, S.M., Colpoys, C., Smith, M.A., LeBeau, M.A., Montgomery, M.A., Karas, R.P., Peters, E.M., Miller, M.L.	*Journal of Analytical Toxicology* 2020, https://doi.org/10.1093/jat/bkaa080
4	A Dilute and Shoot LC-MS/MS Method for Antipsychotics in Urine	Feng, S., Enders, J.R., Cummings, O.T., Strickland, E.C., McIntire, T., McIntire, G.	*Journal of Analytical Toxicology* 2020, 44 (4), 331-338
5	Identification of suvorexant in blood using LC-MS/MS: Important considerations for matrix effects and quantitative interferences in targeted assays	Skillman, B. and Kerrigan, S.	*Journal of Analytical Toxicology* 2020, 44 (3), 245-255
6	CYP450-Mediated metabolism of suvorexant and investigation of metabolites in forensic case specimens	Skillman, B. and Kerrigan, S.	*Forensic Science International* 2020, 312, 110307
7	Drug-Mediated Ion Suppression and Mitigation of Interferences Using Liquid Chromatography-Quadrupole/Time of Flight Mass Spectrometry (LC-Q/TOF-MS) and Liquid Chromatography Tandem Mass Spectrometry (LC-MS/MS)	Skillman, B. and Kerrigan, S.	*Journal of Chromatography B* 2020, 1152, 122265
8	Development of a Novel Finger-Trigger Interface for Trigger Pull Measurement	Fairbanks E, Turner J, Ma J, Yu J.	*Journal of Forensic Sciences* 2020, 65 (6): 1954-1960
9	ISO Standards Addressing Issues of Bias and Impartiality in Forensic Work	Dror, I.E. & Pierce, M.L.	*Journal of Forensic Sciences*, 65(3), 800-808. DOI: 10.1111/1556-4029.14265
10	Development and Implementation of an Effective Blind Proficiency Testing Program	Pierce, M.L. & Cook, L.J.	*Journal of Forensic Sciences*, 65(3), 809-814. DOI: 10.1111/1556-4029.14269

Publications by HCIFS Doctors and Scientists, cont'd

	Title	Authors	Publication
11	Quality assurance through standard operating procedures development and deviation: A MLDI systems response to the COVID-19 pandemic	Drake, S.A., Pierce, M., Gumpeni, P., Giardino, E., and Wolf, D.A.	*Journal of Forensic Nursing* (2020) Oct 2; PMID: 33017342
12	Letter to the editor: Morphoproteomics identifies the vitamin D receptor as a potential therapeutic partner in alveolar pneumocyte for COVID-19 infected patients	Brown R.E., Wolf, D.A., Tahseen, D.	*Annals of Clinical and Laboratory Sciences* (2020) 20:699-700. PMID 33067219
13	Bleeding to death in a big city: An analysis of all trauma deaths from hemorrhage in a metropolitan area over one year	Kalkwarf, K.J., Drake, S.A., Yang, Y., Thetford, C., Myers, L., Brock, M., Wolf, D.A., Persse, D., Wade, C.E., and Holcomb, J.B.	*Journal of Trauma and Acute Care Surgery* (2020). 89(4):575-587. PMID: 32590562
14	Learning from suicide deaths in Harris County, Texas	DeMello, A., Yang, Y., Schulte, J., Wolf, D.A., Holcomb, J., Bless, B., Demeter, K., Wade, C., and Drake, S.A.	*Death Studies* (2020) June 13:1-11. PMID: 32536264
15	Morphoproteomics and etiopathogenic features of pulmonary COVID-19 with therapeutic implications: A case study.	Brown, R.E., Wolf, D.A., Hunter, R.L., Zhao, B., and Buja, L.M.	*Annals of Clinical and Laboratory Sciences* (2020) 50(3):308-313. PMID: 32581017
16	Coronavirus disease 2019 (COVID-19): Report of three autopsies from Houston, Texas and review of autopsy findings from other United States cities	Buja, L.M., Wolf, D.A., Zhao, B., Akkanti, B., McDonald, M., Lelenwa, L., Reilly, N., Ottaviani, G., Elghetany, M.T., Trujillo, D.O, Aisenberg, G.M., Madjid, M., and Kar, Biswajit	*Cardiovascular Pathology* (2020) 48:1-14. PMID: 32434133
17	Spatial correlates of gun deaths in Harris County, TX	Levine, N., Drake, S.A., Reynolds, T., Yang, Y., Wolf, D.A., Persse, D., Wade, C.E., and Holcomb, J.B.	*Homicide Studies* (2020), 25(1) 37-60; doi: 10.1177/1088767920924448
18	Evaluation of forensic knowledge and perceived ability in emergency nurse practitioner education	Drake, S.A., Godwin, K.M., Wolf, D.A., and Gallagher, M.	*Journal of Forensic Nursing* (2020) 16(1):22-28. PMID: 32068676
19	Establishing a regional pediatric trauma preventable/potentially preventable death rate	Drake, S.A., Holcomb, J.B., Yang, Y., Thetford, C., Myers, L., Brock, M., Wolf, D.A., Persse, D., Naik-Mathuria, B.J., Wade, C.E., and Harting, M.T.	*Pediatric Surgery International* (2020) 36(2):179-189. PMID: 31701301
20	Establishing a regional trauma preventable/potentially preventable death rate	Drake, S.A., Holcomb, J.B., Yang, Y., Thetford, C., Myers, L., Brock, M., Wolf, D.A., Cron, S., Persse, D., McCarthy, J., Kao, L., Todd, S.R., Naik-Mathuria, B.J., Cox, C., Kitagowa, R., Sandberg, G., and Wade, C.E.	*Annals of Surgery* (2020) 271(2)375-382. PMID 30067544

Publications by HCIFS Doctors and Scientists, cont'd

	Title	Authors	Publication
21	Developmental Plasticity of the Flesh Fly Blaesoxipha plinthopyga (Diptera: Sarcophagidae) on Different Substrates.	El-Hefnawy, A.A., Abul Dahab, F.F., Ibrahim, A.A., Salama, E.M., Mahmoud, S.H., Sanford, M.R., Kovar, S.J. and Tarone, A.M.	*Journal of Medical Entomology*, 57: 1686–1693. https://doi.org/10.1093/jme/tjz230
22	Facultative Viviparity in a Flesh Fly (Diptera: Sarcophagidae): Forensic Implications of High Variability in Rates of Oviparity in Blaesoxipha plinthopyga (Diptera: Sarcophagidae)	Lesne, P., Srivastav, S.P., El-Hefnawy, A., Parrott, J.J., Sanford, M.R. and Tarone, A.M.	*Journal of Medical Entomology*, 57: 697–704. https://doi.org/10.1093/jme/tjaa107
23	Entomological Evidence Collection Methods: American Board of Forensic Entomology Approved Protocols	Sanford, M.R., Byrd, J.H., Tomberlin, J.K. and W.J.R.	In Byrd Jason H, K, T.J. (eds.), Forensic Entomol. Util. Arthropods Leg. Investig. CRC Press, Boca Raton, FL.
24	Is PMI the Hypothesis or the Null Hypothesis?	Sanford, M.R., and Tarone, A.M.	pp. 311–332. In Byrd, J.H., Tomberlin, J.K. (eds.), Forensic Entomol. Util. Arthropods Leg. Investig. CRC Press, Boca Raton, FL.
25	Hypothermia-related Deaths: A 10-year Retrospective Study of Two Major Metropolitan Cities in the United States	Dickinson, G.M., Maya, G.X., Lo, Y., & Jarvis, H.C.	*Journal of Forensic Sciences*, 65(6), 2013-2018. https://doi.org/10.1111/1556-4029.14518
26	The First Step in an Investigation of Quantitative Ultrasound as a Technique for Evaluating Infant Bone Strength	Soto Martinez M.E., Love, J.C., Crowder C.M., Wiersema J.M., Pinto D.C., Fleischman J.M., Derrick SM, Gao S., Greely C, Donaruma-Kwoh M, Bachim A.	*Journal of Forensic Sciences*. https://doi.org/10.1111/1556-4029.14605
27	The Role of the Forensic Anthropologist in the Pediatric Autopsy: Interpretations, Contributions, and Challenges	Fleischman J.M., Soto Martinez M.E., Wiersema J.M., Pinto D.C	*WIREs Forensic Science* e1389
28	A Model for Forensic Anthropology Training	Pinto DC, Pierce M.L, Wiersema, J.M.	*Forensic Anthropology Journal* 3(2):91-96
29	Quality Assurance in Disaster Victim Identification: The Case for Standards. In Disaster Victim Identification in the 21st Century: A US Perspective, edited by JA Williams and VW Weedn	Wiersema JM, Pierce M.L.	*Wiley Press*. In press.
30	Medicolegal Jurisdiction and Public and Private Agencies. In Disaster Victim Identification in the 21st Century: A US Perspective, edited by JA Williams and VW Weedn.	Williams J, Wiersema J.M.	*Wiley Press*. In press.

Internship 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.

- 14 interns from the following disciplines were on site in 2020.

  - Anthropology – 1 intern
  - Forensic Investigations – 6 interns
  - Family Assistance – 7 interns

Medical Examiner Fellowship Programs

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.

Crime Laboratory Fellowship Programs

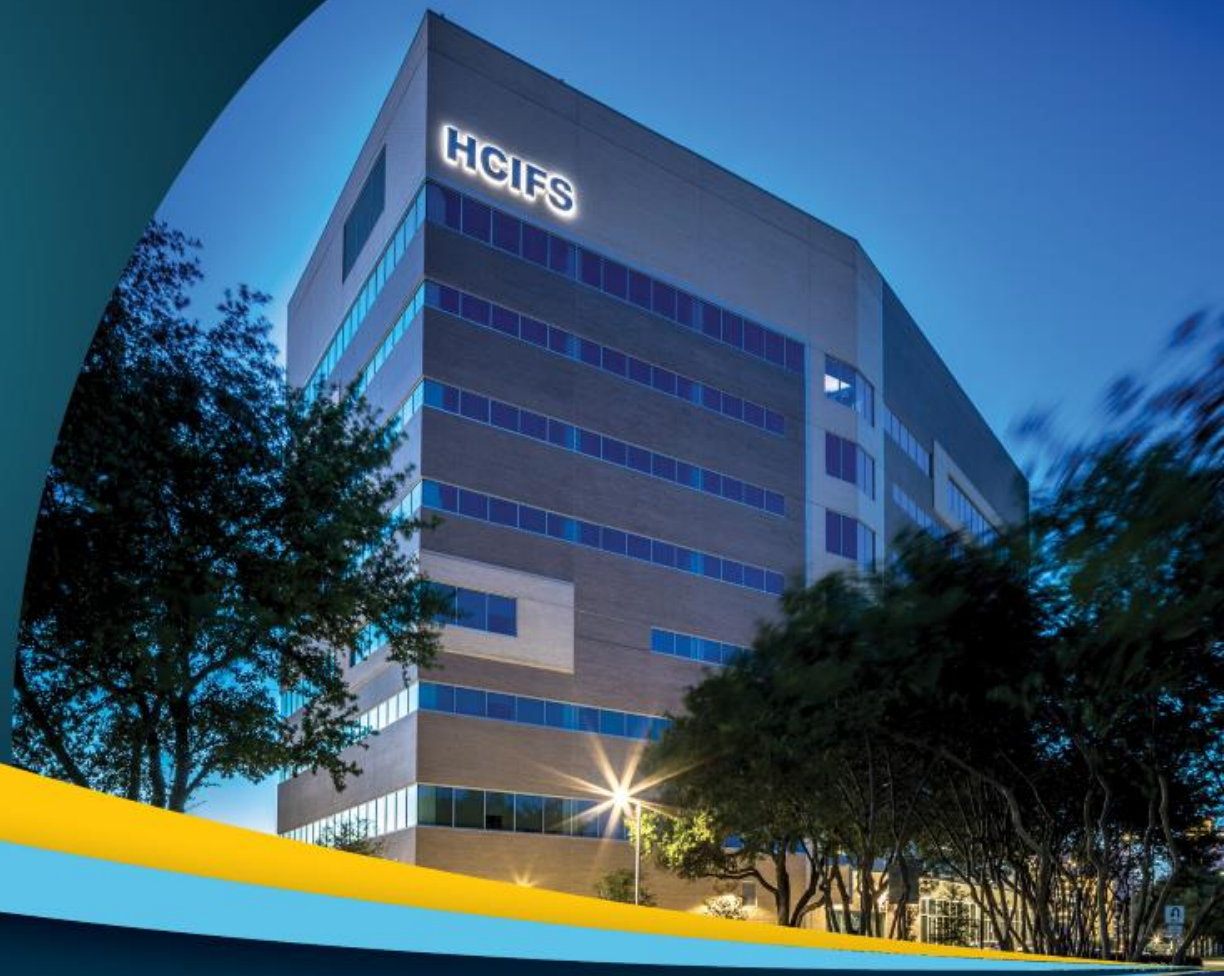
Forensic Genetics:

A 2-year program designed to train life science doctorates in casework and validation methods

Upon completion of the program, fellows will have been trained in all casework methods in the same manner as a staff analyst. These methods include forensic serology, state-of-the-art DNA analysis methods, DNA interpretation, statistical analysis, and expert witness testimony.

Thank you!

2020 Annual Report



HARRIS COUNTY
INSTITUTE OF FORENSIC SCIENCES

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