



# Analysis of Forensic Death Statistics From 2013 to 2022 and Autopsy Practices in Türkiye

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**Background:** Autopsy rates are significantly lower than what they should be worldwide. Additionally, autopsy practices vary between countries.

**Aims:** To examine the autopsy rates, the distribution and temporal changes of forensic autopsy cases, so as to identify the areas in the death investigation system that require improvement in Türkiye.

**Study Design:** Cross-sectional study.

**Methods:** “Forensic Death Examination Statistics” of the Council of Forensic Medicine (CFM) and “Death Statistics” of the Turkish Statistical Institute were compared and analyzed for the years 2013-2022 in Turkey.

**Results:** The number of forensic death cases sent to the CFM has increased over time. For all causes of deaths, the autopsy rate is approximately 3.6-4.8%. The cause-specific mortality rates for deaths due to sharp instrument trauma, blunt trauma, occupational accident, undetermined, and poisoning have increased over the years. “The percentage of “undetermined” deaths, which are important to demonstrate negative autopsies, was 14.2% in 2021.

**Conclusion:** Although the autopsy rates have slightly increased in a volatile trend over time in Turkey, they are still not at the desired level. Thus, it is essential to further raise awareness among all professionals involved in death investigations about the importance of autopsies.

## INTRODUCTION

There are three organizations in Turkey that are involved in the field of forensic medicine and include the following: universities in Turkey; the Council of Forensic Medicine (CFM), which is affiliated to the Ministry of Justice, and its departments (group presidency and branch offices) in cities; and forensic medicine clinics affiliated to the Ministry of Health (MH). Nowadays, medicolegal autopsies are performed by the CFM. In the CFM branch offices, only forensic medicine specialists, autopsy technicians, and a few officers are employed. However, in the more well-equipped departments such as the group presidencies, forensic medicine specialists, forensic pathologists, biologists, chemists, and autopsy technicians are employed.

In Turkey, the “integrated service” approach is employed, in which the forensic medicine specialist simultaneously performs duties of clinical forensic medicine (e.g., evaluation of medicolegal trauma

cases, sexual assault victims, and forensic psychiatric cases) and forensic pathology (performs the autopsy).<sup>1</sup> Forensic medicine specialists affiliated to the CFM perform both these duties. A forensic pathologist is one who has received specialized training in pathology after completing medical school, and they differ from forensic medicine specialists. A forensic pathologist examines pathology samples obtained during autopsies. The pathological, toxicological, and biological samples obtained from autopsies performed at branch offices are sent to group presidencies for analysis. Forensic medicine specialists affiliated to the MH or universities predominantly provide clinical forensic medicine services. However, they are authorized to perform autopsies if required.

A forensic physician is a general practitioner affiliated to the MH who determines the cause of death if death occurs outside the health institution and if forensic deaths occur at health institutions. If the physician can identify a reason for natural death, the body can be

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buried without an autopsy after a death certificate is issued with the permission of a prosecutor or judge. If the judge or prosecutor deems further examination of the body necessary or if the cause of death cannot be determined, an autopsy may be performed. According to the Turkish laws, a general medicine physician can perform an autopsy in obligatory cases. However, no such situations exist in practice today. In every instance of unnatural death, such as suspicious death, homicide, or suicide, the body is sent to the forensic specialists affiliated to the Ministry of Justice for postmortem examination.

In this study, we examined the forensic death statistics of the CFM and MH departments in Turkey and the manner of death rates over the years. In doing so, we aimed to assist the departments in improving the forensic medicine practices. Additionally, we have

analyzed the autopsy rates and presented the practices followed for forensic autopsies in Turkey.

**MATERIALS AND METHODS**

As part of the death investigation process, bodies are sent to the CFM for an autopsy (Figure 1). Currently, almost all legal autopsies are currently performed at the CFM. In Turkey, the CFM structure is as follows: one central organization located in İstanbul, 14 group presidencies in populous provinces, and 80 branches in other cities and counties under the control of the central organization.<sup>2</sup> The “Forensic Death Examination Statistics” of the CFM for the years 2013-2021 were obtained from the Justice Statistics Publication Archive, which are available on the website of the Directorate General of Judicial Records and Statistics.<sup>3</sup> Since the 2022 data were not available; they were not included in the

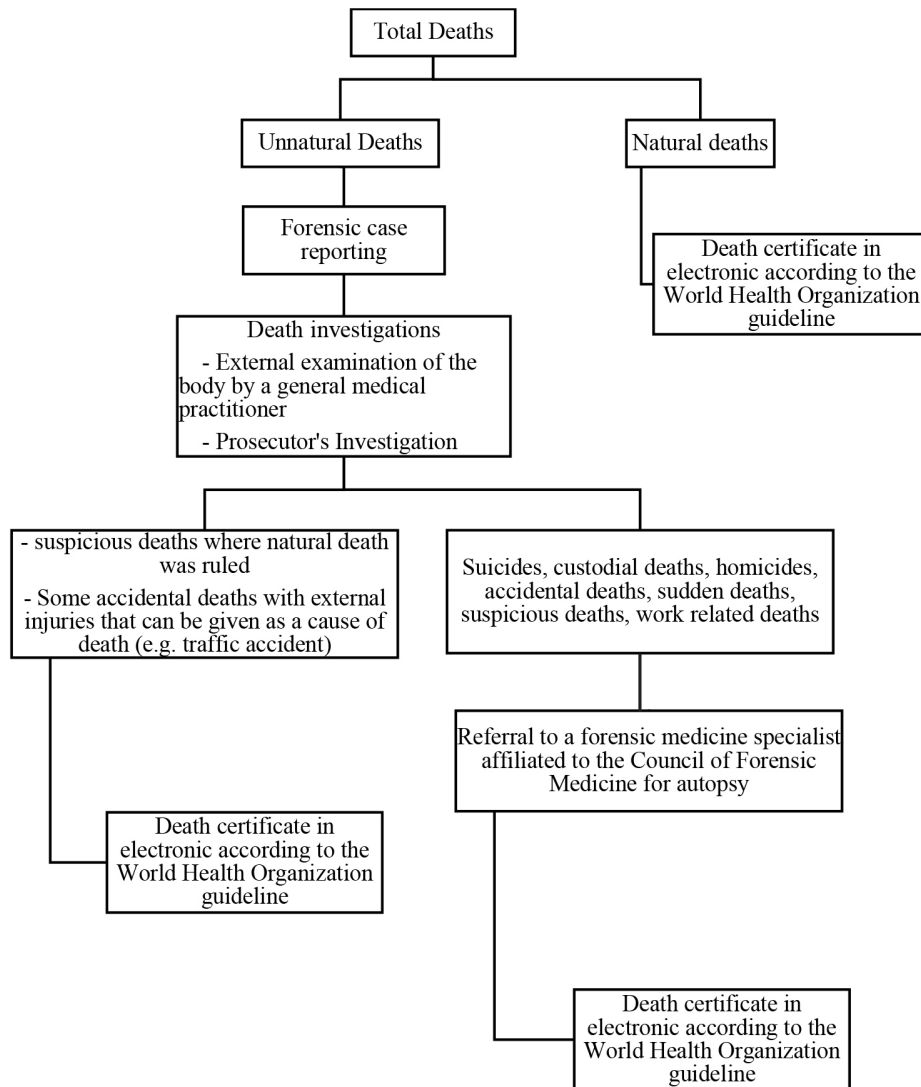


FIG. 1. Death investigation system of Türkiye.

study. The Turkish Statistical Institute (TSI) publishes the “Death and Cause of Death Statistics” using the databases of the Central Population Administration System and MH Death Notification System.<sup>4</sup> Population data and homicide and suicide statistics for the years 2013-2022 were obtained from the TSI website.<sup>4</sup> Based on the Turkish Statistical Law No. 5,429, data from publications or databases can be reused within the scope of the Official Statistics Portal without the need for any permission by disclosing the source. Thus, in this internet-based cross-sectional study, the “forensic death examination data” and “death statistics” were compared. To determine how the trend of forensic cases has changed over the years, the cause-specific mortality (death) rate, was calculated using the following formula: Cause-specific death rate = number of deaths due to a specific cause/mid-year population x 1,000,000. Cause-specific death rate is the number of deaths due to a specific cause per million inhabitants in a given year.

### RESULTS

The rate of forensic death examination cases referred to the CFM for all deaths varied between 3.6 and 4.8% over the years (Table 1). In 2021, 12,411 (49.8%) forensic death examinations were performed at 14 group presidencies and the central organization. Additionally, 12,489 (50.2%) forensic death examinations were performed in the branch offices in other provinces.

The most common causes for which death examinations were performed by the CFM were road accident deaths, undetermined causes of deaths, deaths due to a preexisting disease, and blunt traumatic deaths. Between 2013 and 2021, the numbers and percentages of forensic death examinations performed in Turkey according to their causes, are provided in Table 2. The cause-specific mortality rates per 1,000,000 people according to the cause of death are provided in Table 3. The cause-specific mortality rates were categorized as “increasing,” “decreasing,” and “volatile” trends” according to the cause of death.

Although the percentage of deaths due to gunshot injuries decreased from 14.5% to 8.9%, the cause-specific death rate was 23.1-33.5 per 1,000,000 people (mild volatile trend) between 2013 and 2021. Although the deaths due to injuries from sharp instruments decreased from 2.4% to 2.0%, the cause-specific mortality rate

increased progressively from 4.2 to 5.8 per 1,000,000 people. The percentage of deaths where the cause could not be determined increased from 0.2% to 14.2%, and the cause-specific mortality rate increased progressively from 0.4 to 41.7 per 1,000,000 people. The cause-specific mortality rates for deaths due to blunt traumatic injuries, work accidents, and chemical poisoning also increased over the years (Table 3).

Of the 21,411 deaths due to traffic accidents recorded in Turkey’s MH death statistics for the years 2018-2021, we determined that 16,698 (78%) of the cases were sent to CFM. Additionally, death certificates were issued for 29.8%, 25%, 19.5% and 10.8% deaths due to traffic accidents in 2018, 2019, 2020, and 2021, respectively, following an external examination not conducted at the CFM.

According to the TSI data for 2013-2022, more males committed suicide than females. In 2022, suicides by consumption of chemical substances predominantly involved females (59.2%). The most common suicide methods were hanging, use of firearms, jumping from heights, and consuming chemicals. This ranking is also true for men, with 46-50% committing suicide by hanging, 29-32% by using firearms, 7-10% by jumping from heights, and 3-5% by consuming chemicals. However, in females, the most common methods of suicide were ranked as follows: hanging (41-49%), jumping from heights (17-25%), use of firearms (9-16%), and chemical consumption (7-20%). The cause-specific mortality rates among the suicide methods, varied over the years (approximately 4-5 per 100,000) (Table 4).

The most common cause of suicide was “illness”, followed by economic problems, family discord, and emotional relationship and not marrying the person they wanted to, educational failure, and business failure. Economic problems and business failure were the most common causes of suicide among “males. However, illness” was the most common cause of suicide among females (Table 5). The cause-specific mortality rates due to homicide between 2013 and 2022 decreased from 1.8 to 0.9 per 100,000 people. Furthermore, the homicide-specific mortality rate modestly decreased (from 0.3 to 0.2 per 100,000 people) in females and moderately decreased (from 1.4 to 0.7 per 100,000 people) in males (Table 6).

**TABLE 1.** Deaths and Forensic Death Examinations Performed in Turkey Between 2013 and 2021

Year	Population	Total deaths	Deaths per 1,000 inhabitants	Forensic death examinations (n)	Forensic death examinations rate (%)
2013	76,667,864	372,094	4.9	13,406	3.6
2014	77,695,904	390,121	5.1	15,873	4.1
2015	78,741,053	405,218	5.2	15,582	3,8
2016	79,814,871	422,135	5.3	16,803	4.0
2017	80,810,525	425,781	5.3	17,125	4.0
2018	82,003,882	426,106	5.2	19,932	4.7
2019	83,154,997	435,941	5.3	20,713	4.8
2020	83,614,362	507,938	6.1	22,147	4.4
2021	84,680,273	565,594	6.7	24,900	4.4

**TABLE 2.** Forensic Death Examinations Conducted by the Council of Forensic Medicine in Turkey Between the Years 2013 and 2021, Categorized According to the Cause of death.

Cause of death	2013	2014	2015	2016	2017	2018	2019	2020	2021
Road accidents	3,443 25.7%	3,692 2.3%	3,893 25.0%	3,820 22.7%	4,047 23.6%	4,498 22.6%	4,091 19.8%	3,729 16.8%	4,380 17.6%
Undetermined	29 0.2%	308 1.9%	303 1.9%	571 3.4%	974 5.7%	1,409 7.1%	1,816 8.8%	2,639 11.9%	3,530 14.2%
Preexisting disease	843 6.3%	919 5.8%	1,115 7.2%	1,630 9.7%	1,528 8.9%	1,919 9.6%	2,523 12.2%	2,962 13.4%	2,874 11.5%
Firearms	1,948 14.5%	2,218 14%	2,139 13.7%	2,677 15.9%	1,935 11.3%	1,890 9.5%	1,940 9.4%	2,013 9.1%	2,206 8.9%
Blunt trauma (falling, assault, etc.)	910 6.8%	1,143 7.2%	1,205 7.7%	1,141 6.8%	1,216 7.1%	1,519 7.6%	1,750 8.5%	1,906 8.6%	1,842 7.4%
Asphyxia	673 5.0%	931 5.9%	866 5.6%	758 4.5%	1,069 6.2%	1,149 5.8%	1,091 5.3%	1,000 4.5%	874 3.5%
Sharp objects	324 2.4%	387 2.4%	357 2.3%	388 2.3%	416 2.4%	398 2.0%	438 2.1%	442 2.0%	487 2.0%
Others	3,880 28.9%	4,949 31.2%	4,158 26.7%	3,931 23.4%	4,499 26.2%	5,641 28.3%	5,565 26.9%	5,850 26.4%	7,126 28.6%
Occupational accidents	224 1.7%	249 1.6%	245 1.6%	282 1.7%	321 1.8%	367 1.8%	352 1.7%	338 1.5%	376 1.5%
Burn	49 33.7%	454 2.9%	356 2.3%	323 1.9%	337 2.0%	277 1.4%	294 1.4%	248 1.1%	316 1.3%
Chemical intoxication	64 0.5%	62 0.4%	59 0.4%	155 0.9%	162 1.0%	170 0.9%	171 0.8%	196 0.9%	303 1.2%
Electric shock	140 1.0%	155 1.0%	124 0.8%	125 0.7%	137 0.8%	145 0.7%	135 0.7%	179 0.8%	154 0.6%
Explosions	79 0.6%	50 0.3%	242 1.6%	632 3.8%	221 1.3%	199 1.0%	220 1.1%	256 1.2%	133 0.5%
Gas intoxication	79 0.6%	112 0.7%	101 0.7%	89 0.5%	88 0.5%	103 0.5%	117 0.6%	139 0.6%	119 0.5%
Drug intoxication	92 0.7%	113 0.7%	116 0.7%	63 0.4%	65 0.4%	102 0.5%	66 0.3%	74 0.3%	92 0.4%
Caved in	53 0.4%	33 0.2%	39 0.3%	68 0.4%	37 0.2%	47 0.2%	37 0.2%	52 0.2%	24 0.1%
During delivery	67 0.5%	81 0.5%	104 0.7%	43 0.3%	21 0.1%	49 0.3%	20 0.1%	25 0.1%	28 0.1%
Infection	46 0.3%	0 0.0%	20 0.1%	11 0.1%	15 0.1%	33 0.2%	17 0.1%	19 0.1%	15 0.1%
Hypothermia	17 0.1%	5 0.0%	35 0.2%	3 0.0%	13 0.1%	2 0.0%	51 0.3%	68 0.3%	11 0.0%
Anaphylaxis	1 0.0%	6 0.0%	95 0.6%	89 0.5%	14 0.1%	14 0.1%	16 0.1%	8 0.0%	6 0.0%
Maltreatment and torture	1 0.0%	6 0.0%	10 0.1%	4 0.0%	10 0.1%	1 0.0%	3 0.0%	4 0.0%	4 0.0%
Total	13,406 100.0%	15,873 100.0%	15,582 100.0%	16,803 100.0%	17,125 100.0%	19,932 100.0%	20,713 100.0%	22,147 100.0%	24,900 100.0%

All data are presented as numbers and percentages

**TABLE 3.** Cause-specific Mortality Rates (per 1,000,000) in Turkey between 2013 and 2021, Categorized According to the Cause of Death.

Death rate	2013	2014	2015	2016	2017	2018	2019	2020	2021
<b>Increasing</b>									
Sharp objects	4.2	5.0	4.5	4.9	5.2	4.9	5.3	5.3	5.8
Blunt trauma (falling, assault, etc.)	11.9	14.7	15.3	14.3	15.1	18.5	21.1	22.8	21.8
Occupational accidents	2.9	3.2	3.1	3.5	4.0	4.5	4.2	4.0	4.4
Chemical intoxication	0.8	0.8	0.8	1.9	2.0	2.1	2.1	2.3	3.6
Preexisting disease	11.0	11.8	14.2	20.4	18.9	23.4	30.3	35.4	33.9
Undetermined	0.4	4.0	3.9	7.2	12.1	17.2	21.8	31.6	41.7
Others	50.6	63.7	52.8	49.3	55.7	68.8	66.9	70.0	84.2
<b>Decreasing</b>									
Burn	6.4	5.8	4.5	4.1	4.2	3.4	3.5	3.0	3.7
<b>Volatile</b>									
Firearms	25.4	28.6	27.2	33.5	23.9	23.1	23.3	24.1	26.1
Asphyxia	8.8	12.0	11.0	9.5	13.2	14.0	13.1	12.0	10.3
Road accidents	44.9	47.5	49.4	47.9	50.1	54.9	49.2	44.6	51.7
Electric shock	1.8	2.0	1.6	1.6	1.7	1.8	1.6	2.1	1.8
Hypothermia	0.2	0.1	0.4	0.0	0.2	0.0	0.6	0.8	0.1
Anaphylaxis	0.0	0.1	1.2	1.1	0.2	0.2	0.2	0.1	0.1
Infection	0.6	0.0	0.3	0.1	0.2	0.4	0.2	0.2	0.2
Drug intoxication	1.2	1.5	1.5	0.8	0.8	1.2	0.8	0.9	1.1
Gas intoxication	1.0	1.4	1.3	1.1	1.1	1.3	1.4	1.7	1.4
Caved in	0.7	0.4	0.5	0.9	0.5	0.6	0.4	0.6	0.3
Explosions	1.0	0.6	3.1	7.9	2.7	2.4	2.7	3.1	1.6
Maltreatment and torture	0.0	0.9	0.1	0.1	0.1	0.0	0.0	0.1	0.1
During delivery	0.9	1.0	1.3	0.5	0.3	0.6	0.2	0.3	0.3
<b>Total cause-specific mortality rates</b>	<b>174.9</b>	<b>204.3</b>	<b>197.9</b>	<b>210.5</b>	<b>211.9</b>	<b>243.1</b>	<b>249.1</b>	<b>264.9</b>	<b>294.1</b>

## DISCUSSION

In the present study, we determined that the crude death rate in Turkey increased from 4.9 to 6.7 per 1,000 people between 2013 and 2021. The sudden increase in death numbers from 5.3 in 2019 to 6.1 in 2020 and 6.7 in 2021 was probably due to coronavirus disease-related deaths. Although the number of forensic death examinations has steadily increased due to the steadily rising population over the years, there was a slight increase in the volatile trend (3.6-4.8%) of forensic death examination rates (Table 1). Turkey's forensic medicine institution's statistics reflect the number of death examinations. Although there is no data on how many cases have undergone forensic autopsy, every case brought to the central organization and group presidencies, that meet the needs of 60% of Turkey's population, have undergone postmortem examination. Additionally, autopsies have been performed in a large part of the cases brought to the branches. In routine practice, the body is initially evaluated by a general practitioner and the prosecution. Subsequently, it is sent to the CFM for an autopsy and to identify the cause of death (Figure 1). Rarely, in traffic accident

deaths with eyewitnesses or/and camera recordings that are brought the branches, if an external examination reveals the cause of death, no additional examinations may be requested if jointly decided by the CFM and the prosecutor's office. Furthermore, the findings of an external examination in some cases of burns and traffic accident cases with a long hospital stay and a certain cause of death are considered final, if there is no claim of medical malpractice. Thus, the forensic death examination data according to Turkey's forensic medicine institution's statistics approximately reflects the number of autopsies performed.

Autopsies are practically not performed in Turkey except for medicolegal and perinatal autopsies,<sup>5</sup> even though there are no legal obstacles. Therefore, the forensic death examinations analyzed in this study reflect forensic autopsies. The number of forensic death examinations at the CFM increased from 175/1,000,000 in 2013 to 294/1,000,000 in 2021, indicating that the forensic autopsy rates have increased over time. This may be attributed to the increased public and juridical awareness regarding the necessity of legal autopsies and the expansion of the CFM throughout the country.

**TABLE 4.** Number of Suicides in Turkey between 2013 and 2022 According to the Method and Sex of the Deceased.

Method of suicide		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022*
Hanging	Male	1,206	1,098	1,099	1,126	1,134	1,222	1,273	1,331	1,604	1,517
	Female	426	393	429	369	358	368	386	405	441	425
	<b>Total</b>	<b>1,632</b>	<b>1,491</b>	<b>1,528</b>	<b>1,495</b>	<b>1,492</b>	<b>1,590</b>	<b>1,659</b>	<b>1,736</b>	<b>2,045</b>	<b>1,942</b>
Firearms use	Male	719	689	729	774	874	810	856	847	984	939
	Female	139	127	144	106	116	107	100	101	118	97
	<b>Total</b>	<b>858</b>	<b>816</b>	<b>873</b>	<b>880</b>	<b>990</b>	<b>917</b>	<b>956</b>	<b>948</b>	<b>1,102</b>	1,036
Falling from a height	Male	157	191	232	234	191	205	240	301	309	327
	Female	147	161	181	146	126	177	187	220	209	238
	<b>Total</b>	<b>304</b>	<b>352</b>	<b>413</b>	<b>380</b>	<b>317</b>	<b>387</b>	<b>427</b>	<b>521</b>	<b>518</b>	<b>565</b>
Consumption of a chemical	Male	78	122	118	90	88	79	67	114	110	144
	Female	116	67	90	84	68	66	56	61	89	209
	<b>Total</b>	<b>194</b>	<b>189</b>	<b>208</b>	<b>174</b>	<b>156</b>	<b>145</b>	<b>123</b>	<b>175</b>	<b>199</b>	<b>353</b>
Sharp instrument use	Male	23	66	51	34	40	29	36	30	50	67
	Female	5	4	5	5	7	10	6	4	7	14
	<b>Total</b>	<b>28</b>	<b>70</b>	<b>56</b>	<b>39</b>	<b>47</b>	<b>39</b>	<b>42</b>	<b>34</b>	<b>57</b>	<b>81</b>
Drowning	Male	47	45	49	37	21	22	39	41	44	25
	Female	24	19	15	20	14	15	10	20	11	12
	<b>Total</b>	<b>71</b>	<b>64</b>	<b>64</b>	<b>57</b>	<b>35</b>	<b>37</b>	<b>49</b>	<b>61</b>	<b>55</b>	<b>37</b>
Burns	Male	14	11	8	15	7	10	10	15	12	7
	Female	5	2	3	5	2	2	1	1	1	2
	<b>Total</b>	<b>19</b>	<b>13</b>	<b>11</b>	<b>20</b>	<b>9</b>	<b>12</b>	<b>11</b>	<b>16</b>	<b>13</b>	<b>9</b>
Use of natural gas, LPG, etc.	Male	12	5	11	19	5	14	15	10	14	11
	Female	2	-	3	1	-	1	2	2	1	3
	<b>Total</b>	<b>14</b>	<b>5</b>	<b>14</b>	<b>20</b>	<b>5</b>	<b>15</b>	<b>17</b>	<b>12</b>	<b>15</b>	<b>14</b>
Jumping in front of a vehicle	Male	9	11	11	13	6	7	13	11	10	5
	Female	2	2	3	4	1	1	1	2	3	1
	<b>Total</b>	<b>11</b>	<b>13</b>	<b>14</b>	<b>17</b>	<b>7</b>	<b>8</b>	<b>14</b>	<b>13</b>	<b>13</b>	<b>6</b>
Others		121	156	65	111	110	197	178	194	177	103
Total number	Male	2,382	2,352	2,358	2,426	2,445	2,529	2,684	2,845	3,263	3,111
	Female	870	817	888	767	723	813	792	865	931	1,035
	<b>Total</b>	<b>3,252</b>	<b>3,169</b>	<b>3,246</b>	<b>3,193</b>	<b>3,168</b>	<b>3,342</b>	<b>3,476</b>	<b>3,710</b>	<b>4,194</b>	<b>4,146</b>
		<b>24.3%</b>	<b>20.0%</b>	<b>20.8%</b>	<b>19.0%</b>	<b>18.5%</b>	<b>16.8%</b>	<b>16.8%</b>	<b>16.8%</b>	<b>16.8%</b>	-
Suicide-specific mortality rate (per 100,000)	Male	6.3	6.1	6.0	6.1	6.1	6.2	6.5	6.8	7.7	7.3
	Female	2.3	2.1	2.3	1.9	1.8	2.0	1.9	2.1	2.2	2.4
	<b>Total</b>	<b>4.3</b>	<b>4.1</b>	<b>4.2</b>	<b>4.0</b>	<b>3.9</b>	<b>4.1</b>	<b>4.2</b>	<b>4.5</b>	<b>5.0</b>	<b>4.9</b>

\*As the data for the year 2022 was not revised, the numbers may have slightly increased.

%: Rate in forensic deaths

According to the World Health Organization data, Turkey was among the countries with the lowest autopsy rates < 6% (Croatia, Israel, Bulgaria, Cyprus, Denmark, Georgia, Kyrgyzstan, Netherlands, Serbia, Luxembourg, Romania, North Macedonia, Switzerland, Tajikistan, and Turkmenistan) during 2013 to 2020.<sup>6</sup> The total autopsy rate in Korea reportedly increased from 2.16% in 2001 to 2.60% in 2015.<sup>7</sup> The analysis of autopsy rates reported in several studies revealed a decline in the clinical autopsy rates and slight increase in the legal autopsy rates.<sup>7</sup> However, the forensic autopsy rates have decreased in the Netherlands and Norway.<sup>8,9</sup> Hasselqvist and Rammer found that 7.5% of the homicides in Sweden were not discovered until an autopsy was performed, which highlights the importance of autopsies.<sup>10</sup> The perceived cause of death is the most crucial determinant of whether the

examining physician and judicial authorities decide on the necessity of an autopsy. Because the initial assessment of a body is conducted by a general practitioner and the conclusion is based solely on an external examination, the death may be determined to be natural; however, these cases might require an autopsy. It is common to conclude a death is natural, albeit wrong, by an external examination alone in the absence of any suspicious circumstances around the death. When in doubt, a forensic specialist is summoned for the autopsy. We believe that the main reason for the low autopsy rates in Turkey is the tendency of general practitioners to conduct the initial assessment and determine a natural cause of death. Forensic medicine specialists tend to perform autopsies in all cases, including those of murder, suicide, work-related accidents, and suspicious deaths. The significant increase in “undetermined”

**TABLE 5.** Number of Suicides in Turkey between 2013 and 2022 According to the Cause and Sex of the Deceased.

Cause of suicide		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022*
Illness	Male	16.0	16.0	27.5	19.5	19.6	19.1	19.4	24.1	24.1	24.9
	Female	16.3	21.2	34.5	27.0	23.7	23.2	28.7	33.2	32.1	32.7
	<b>Total</b>	<b>16.1</b>	<b>17.3</b>	<b>29.4</b>	<b>21.3</b>	<b>20.5</b>	<b>20.1</b>	<b>21.5</b>	<b>26.2</b>	<b>25.9</b>	<b>26.8</b>
Economic issues	Male	8.6	10.4	12.0	10.6	9.1	9.3	11.4	9.7	9.5	9.0
	Female	1.8	1.5	1.7	2.2	1.2	1.2	1.8	1.5	1.5	1.8
	<b>Total</b>	<b>6.8</b>	<b>8.1</b>	<b>9.2</b>	<b>8.8</b>	<b>7.3</b>	<b>7.2</b>	<b>9.2</b>	<b>7.8</b>	<b>7.7</b>	<b>7.2</b>
Family discord	Male	8.6	8.4	7.2	3.5	3.9	3.8	3.6	3.8	4.6	4.4
	Female	11.1	9.4	9.9	5.2	4.6	3.9	3.8	3.4	4.5	5.0
	<b>Total</b>	<b>9.3</b>	<b>8.7</b>	<b>7.9</b>	<b>3.9</b>	<b>4.0</b>	<b>3.8</b>	<b>3.7</b>	<b>3.7</b>	<b>4.6</b>	<b>4.6</b>
Emotional relationship and not marrying the person they wanted	Male	3.4	3.1	2.3	3.1	2.7	2.4	2.5	2.4	2.4	2.9
	Female	3.2	2.7	2.0	1.3	2.6	3.0	3.0	2.9	1.7	2.2
	<b>Total</b>	<b>3.4</b>	<b>3.0</b>	<b>2.2</b>	<b>2.6</b>	<b>2.7</b>	<b>2.5</b>	<b>2.6</b>	<b>2.5</b>	<b>2.3</b>	<b>2.7</b>
Educational failure	Male	0.4	0.2	0.1	0.2	0.1	-	0.1	0.1	0.1	0.3
	Female	0.8	0.5	0.3	0.8	0.1	0.0	0.3	0.3	0.2	0.3
	<b>Total</b>	<b>0.5</b>	<b>0.3</b>	<b>0.2</b>	<b>0.4</b>	<b>0.1</b>	<b>0.1</b>	<b>0.2</b>	<b>0.2</b>	<b>0.1</b>	<b>0.3</b>
Business failure	Male	2.5	1.7	0.3	0.3	0.2	0.2	0.3	0.2	0.2	0.1
	Female	0.3	0.1	-	-	-	-	-	-	-	0.1
	<b>Total</b>	<b>1.9</b>	<b>1.3</b>	<b>0.2</b>	<b>0.2</b>	<b>0.2</b>	<b>0.2</b>	<b>0.2</b>	<b>0.2</b>	<b>0.1</b>	<b>0.1</b>
Other and unknown	<b>Total</b>	<b>62.1</b>	<b>61.3</b>	<b>50.8</b>	<b>62.9</b>	<b>65.1</b>	<b>67.0</b>	<b>62.7</b>	<b>59.4</b>	<b>59.4</b>	<b>58.2</b>

\*As the data for the year 2022 was not revised, the numbers may have slightly increased.

**TABLE 6.** Number and Rates of Homicide in Turkey between 2013 and 2022 According to the Sex.

		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022*
Number of homicides	Male	1,100	991	869	1,180	1,180	942	817	847	655	630
	Female	242	209	213	256	273	195	222	167	184	137
	<b>Total</b>	<b>1,342</b>	<b>1,200</b>	<b>1,082</b>	<b>1,436</b>	<b>1,453</b>	<b>1,137</b>	<b>1,039</b>	<b>1,014</b>	<b>839</b>	<b>767</b>
		<b>10.0%</b>	<b>7.6%</b>	<b>6.9%</b>	<b>8.6%</b>	<b>8.5%</b>	<b>5.7%</b>	<b>5.0%</b>	<b>4.6%</b>	<b>3.4%</b>	-
Homicide-specific mortality rate (per 100,000)	Male	1.4	1.3	1.1	1.5	1.5	1.2	1.0	1.0	0.8	0.7
	Female	0.3	0.3	0.3	0.3	0.3	0.2	0.3	0.2	0.2	0.2
	<b>Total</b>	<b>1.8</b>	<b>1.6</b>	<b>1.4</b>	<b>1.8</b>	<b>1.8</b>	<b>1.4</b>	<b>1.3</b>	<b>1.2</b>	<b>1.0</b>	<b>0.9</b>

\*As the data for the year 2022 was not revised, the numbers may have slightly increased.

%: Rate in forensic deaths

and “natural preexisting disease” as the cause of death in the CFM statistics over the years indicates a rise in the number of deaths classified as suspicious, which demonstrates the growing awareness and importance of forensic autopsies. Increasing the competence of general practitioners who primarily conduct the initial assessment in death cases would contribute to achieving the desired levels of autopsy rates.

In a study conducted in Norway, the autopsy rates for unnatural deaths decreased from 40% to 30% between 2007 and 2017; this low rate is insufficient and incompatible with the national legislation. Not performing autopsy in cases of unnatural deaths may result in accidents, homicides, or suicides being overlooked. Additionally, not performing an autopsy in traffic accident cases may result in overlooking findings that may help prevent death.<sup>9</sup> Even experienced forensic pathologists can produce inaccurate death certificates for cases where autopsies are not conducted.<sup>11</sup> A forensic or clinical autopsy should be performed in every case to be clearly determine the cause, mechanism and manner of death, especially when there is even a slight reasonable doubt.<sup>12</sup>

A study in 2005 determined that issuance of burial permit for deaths due to traffic accidents without an autopsy is common in Turkey.<sup>13</sup> Performing autopsies in traffic accident deaths is important to respond to objections, claims, and legal issues that may arise in the future. Thus, as of 2020, it has become mandatory to perform autopsies for all traffic accident cases in Norway.<sup>14</sup> Our study results indicate that 78% of the death cases due to traffic accidents between 2018 and 2021 were sent to the CFM. Furthermore, the number of death cases due to traffic accidents cases that were evaluated by specialists affiliated to CFM gradually increased from 70.2% in 2018 to 89.2% in 2021. This indicates an improvement in assessment. To prevent grievances arising from legal processes, making autopsies mandatory in Turkey for every death occurring due to a traffic accident, as it is in some countries, seems appropriate.

Although the rate of not determining the cause of death by macroscopic examination alone is approximately 10% worldwide, it reportedly decreased to 1-5% when other aspects, such as those of the crime scene and the story of the deceased, were evaluated.<sup>15</sup>

In the present study, the rates of cases of unknown deaths increased progressively from 0.2% in 2013 to 14.2% in 2021. These rates reflect the negative autopsy rates in Turkey, which indicate the increasing awareness of negative autopsies and its more frequent use.

Hanging is reportedly the predominant method of suicide in most countries. The highest proportions were approximately 90% in males and 80% in females in Eastern Europe (i.e., Estonia, Latvia, Lithuania, Poland, and Romania).<sup>16</sup> The male predominance and prevalence of suicide methods in our study were consistent with those in previous studies on suicides in Turkey. We found that approximately half of both sexes committed suicide by hanging. Additionally, more females committed suicide by jumping from a height or consuming chemicals than males did (Table 4). From 2013 to 2020, the suicide-specific mortality rates in the European Union countries varied between 10.15 and 12.25 per 100,000 population<sup>17</sup>, which is approximately twice the rate in Turkey.

During 2018-2021, 16.8% of the forensic deaths were suicides. Considering the slight increase in suicide-specific mortality rates over the years (Table 4), it is evident that there are no adequate protocols for preventing suicides due to the most common causes such as mental illnesses (e.g., depression), economic problems, and family discord (Table 5).

In the present study, the homicide-specific mortality rate decreased from 1.8 to 0.9 per 100,000 people; there was a slight decrease (from 0.3 to 0.2) in females and a moderate decrease (from 1.4 to 0.7) in males. Males made up 79-83% of the victims (Table 6). Considering the volatile and horizontal course of firearm-specific mortality rates and the increase in death rates due to sharp force and blunt traumas over the years, we cannot explain the decrease in homicide rates, despite the slight increase in suicide rates. Is the increase in social awareness effective in reducing homicide rates despite the absence of significant protective legal measures regarding individual armament? Or are the specialists avoiding entering “homicide” in the death notification system?<sup>18</sup> In its study analyzing the publicly available sources in Turkey related to homicides, including cause of death statistics, police statistics, prosecutor and court statistics, and prison statistics, Akdeniz found that there is a higher number of homicide cases reported in indictments compared to police statistics, and in police statistics compared to the cause of death statistics provided by the Turkish Statistical Institute<sup>19</sup>. According to a report by the Umut Foundation based on news coverage in national and local media, it has been reported that 2,145 people were killed in incidents of violence involving firearms and sharp force injuries in the year 2021<sup>20</sup>. It is clear that there is a non-negligible difference between the death statistics data and the Umut Foundation data, which is stated more than 2.5 times. However, more details of the MH homicide statistics and CFM statistics are required to better interpret our study results.

Although an upward trend is currently evident in line with the steadily rising population of Turkey, the rate of autopsies is not at pace with it. Furthermore, the number of forensic autopsies being performed (which is approximately 3.6-4.8%) will inevitably

continue to increase if we are to prevent criminal death cases from being overlooked. The purpose of forensic autopsies is not only to uncover crimes but also to address public health aspects, such as identifying the mechanisms of death in accidents to prevent its recurrence. Furthermore, these statistics need to be shared with the public to plan measures for decreasing preventable deaths. Although it is more developed than it was in the past, the death investigation system in Turkey requires further reforms.

The interpretation of forensic death statistics by comparing statistics from different databases has its challenges and limitations. To develop effective policies, statistical data, including data regarding the cause of death, sex, and age, should be shared with an appropriate classification that aligns with that in literature.

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**Ethics Committee Approval:** Based on the Turkish Statistical Law No. 5429, it is possible to reuse the data obtained from publications or databases within the scope of the Official Statistics Portal without the need for any permission by showing the source. The principles outlined in the Declaration of Helsinki were followed in our study, and since this was an internet research and based on the law, no ethics committee approval was not obtained.

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