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STANDARDIZATION OF THE NUMBERS OF WORK ACCIDENTS, OCCUPATIONAL DISEASES AND MORTALITY RATES ACCORDING TO SOCIAL SECURITY INSTITUTION'S 2010-2015 YEARS DATA BASED UPON CITIES

TÜRKİYE SOSYAL GÜVENLİK KURUMU 2010-2015 YILLARI İŞ KAZASI, MESLEK HASTALIĞI VE MORTALİTE SAYILARININ İLLERE GÖRE STANDARDİZASYONU

Osman Faruk BAYRAMLAR[1], Elif EZİRMİK[1], Halim İŞSEVER[1], Zeynep BAYRAMLAR[2]

[1]Istanbul University, Istanbul Faculty of Medicine, Department of Public Health, Istanbul, Turkey
[2]Istanbul Medeniyet University, Faculty of Medicine, Department of Physiology, Istanbul, Turkey

ORCID IDs of the authors: O.F.B. 0000-0001-7311-3258; E.E. 0000-0001-6828-4378; H.İ. 0000-0002-5435-706X; Z.B. 0000-0002-4408-4870

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ABSTRACT

Objective: To evaluate Turkey according to the number of work accidents, occupational diseases and related mortality rates, insured workers, establishments and cities, which are important issues in terms of showing countries' situation.

Material and Method: The data of 2010-2015 years according to the numbers of insured labourers and workplaces based upon cities were obtained, plotted and interpreted from Republic of Turkey Social Security Institution (RTSSI)'s statistical yearbooks. Indirect standardization technique was used to check the effects of mixed variables when interpreting. This study is an epidemiological, observational and descriptive research. The results were compared to national occupational health and safety targets.

Results: Bilecik, Zonguldak and Manisa, which mining is the frontline, take the top in the standardization of work accidents and occupational diseases. In the standardization of occupational diseases, it has been evaluated that Kutahya has risen to the top in recent years, and in the standardization of mortality, Southeastern Anatolian Regions are at the top.

Conclusion: The results of mining accidents in Soma / Manisa and Ermenek / Karaman affected the data of 2014 standardization of mortality. We investigated the standardization of work accidents, occupational diseases and their associated mortality rates in Turkey from 2010 to 2015 and it constitutes a benchmark for further studies on this issue. For better evaluation and analysis of notifications, it is important to keep records more systematically and comprehensively.

Keywords: Republic of Turkey Social Security Institution, standardization, insured labourer, work accident, occupational disease, mortality

ÖZET

Amaç: Ülkelerin durumunu göstermesi bakımından önemli konulardan olan iş kazaları, meslek hastalıkları ve buna bağlı ölüm hızları verilerini; Türkiye'de sigortalı işçiler ve işyerleri sayısına göre şehirler bazında değerlendirmeyi amaçladık.

Gereç ve Yöntem: 2010-2015 yılları arasında, Türkiye Cumhuriyeti (T.C.) Sosyal Güvenlik Kurumu (SGK) istatistik yıllıklarından, şehirler bazında sigortalı işçi ve işyerleri verileri çizilmiş ve yorumlanmıştır. Karıştırıcı etkenlerin etkilerini yorumlarken kontrol edebilmek amaçlı dolaylı (indirekt) standardizasyon tekniği kullanılmıştır. Çalışma epidemiyolojik bir araştırma olup, gözlemsel-tanımlayıcı tiptedir. Sonuçlar Ulusal Mesleki Sağlık ve Güvenlik Hedefleri ile karşılaştırılmıştır.

Bulgular: Madenciliğin ön planda olduğu Bilecik, Zonguldak ve Manisa illerinin iş kazaları ve meslek hastalıklarının standardizasyonunda ilk sırayı aldıkları görülmektedir. Meslek hastalıklarının standardizasyonunda özellikle son yıllarda Kütahya ve mortalitede de Güneydoğu Anadolu Bölgeleri en üst basamaklardadır.

Sonuç: Soma / Manisa ve Ermenek / Karaman'daki madencilik iş kazası sonuçlarının, 2014'deki mortalite standardizasyon verilerine etki ettiği gözlenebilmektedir. Türkiye'de 2010 yılından 2015'e kadar gerçekleşen iş kazalarının, meslek hastalıklarının ve buna bağlı ölüm hızlarının standardize edilmesi işini yürütüyoruz ve bu konuda daha ileri çalışmalar yapılabilmesi için kriterler oluşturuyoruz. Daha iyi bir değerlendirme ve analiz için bildirimlerin daha sistematik ve kapsamlı tutulmasının önemli olduğu görülmektedir.

Anahtar Kelimeler: Sosyal Güvenlik Kurumu, standardizasyon, sigortalı işçi, iş kazası, meslek hastalıkları, mortalite

İletişim kurulacak yazar/Corresponding author: obayramlar@gmail.com

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BACKGROUND AND OBJECTIVES

In globalizing world, circumstances that seems to belong to any country are, in fact, matters for the whole world. The countries are affecting each other in a way (1, 2). In this respect, it seems that the significance of data, which seemed to be only of itself in Turkey, is actually much greater when looking at the bigger picture (3). Therefore, we think that the findings obtained by comparing Turkish cities could be related to a large mass of people around the world.

Work accidents, occupational diseases and the mortality that results from them are becoming increasingly important every day. In 2003, 360,000 fatal accidents occurred around the world and in 2002 about 2 million people died of work-related diseases (4). It is estimated that more than 960,000 people are injured due to a work accident every day, and 5,330 employees lose their life due to occupational diseases (5).

Work accidents can be defined as unplanned events that occur due to insecure motions & conditions. These endanger the safety of employees, cause injuries and do damage to machines and equipment. In addition, these conditions can lead to a setback in production (6). Today, it is possible to see work accidents in almost every business sector, and there is a risk inversely proportional to the level of development of the country (1, 5).

Occupational diseases as well as work accidents are serious problems in all countries of the world, which include temporary or permanent illnesses, disabilities or psychological malfunctions due to repeated reasons depending on the nature of the work or due to the conditions of execution of the work (7). Unfortunately, many people are not even aware that they have an occupational disease. Occupational diseases are often not recognized by employees and doctors because they have emerged after leaving work, and people do not foresee that a recognized occupational disease may be present. This shifts occupational diseases to a position different to the work accident.

Mortality rates resulting in work accidents or occupational diseases include those who die during the course of their treatment and who die permanently incapacitated because they lose more than 50% of their vocational power (8).

According to the Acts 5510 and 6331 in Turkey, the employer owns responsibility for reporting all work incidents of insured employees to RTSSI. These notifications are compiled annually by the RTSSI based on International Labour Organization (ILO) definitions and European Union (EU) statistical methodology and are also shared with related parties (9). However, sources indicate that the scope of occupational health and safety in 33 countries, including Turkey, is insufficient or information is lacking (4). Statistical Yearbooks of the RTSSI are the sole official source of data on work accidents and occupational diseases (10).

In the measurement and evaluation system, standardization techniques have an important place and present a different viewpoint on the database as well. When detailed reviews are made, apart from what is already known, extraordinary findings can be obtained, and existing results may need to be reinterpreted. Standardization techniques, which are the statistical processes aiming to control the effects of confounding variables, are divided into two subgroups: Direct and indirect (11-13). Techniques include many details about direct or indirect standardization such as Rate Comparison Factor, Index Rates, Standardization Factor (14, 15). One of the most important differences in choosing between the two is whether there is age-specific rate (16).

In this study, it was aimed to standardize, evaluate, interpret and plot work accidents, occupational diseases and mortality rates with statistical data of number of work places and number of insured workers in 2010-2015. We think that we can set an example for further studies on this topic. It is also one of our aims to be able to set an example of further research on this topic.

MATERIALS AND METHODS

Research method

This study is an epidemiological, observational and descriptive research.

Standardization method

The data categorized according to the cities were standardized first as "active insured workers (Article 4-1/a of Act 5510)", and then standardized according to the number of work places. Active insured persons include "Compulsorily Insured", "Apprenticies", "Insured in Agricultural Sector", "Partial Duration Insured", "Collective Insured" workers. When determining the standardization technique, consideration was given to the absence of confounding factors such as age-specific rate, and the indirect standardization technique was chosen for this study.

Tables

We could show the application of the above criteria by creating 6 tables. Tables 1-6, which are prepared in Microsoft Word 2016, compare the numbers of work accidents, occupational diseases and deaths caused by illnesses in the years 2010-2015 according to insured worker - workplace numbers.

Figures

We think that the most effective way to embody the data is to address visual memory, and that this can be done by way of the best mapping. That's why we mapped the last year's data. Figures 1-6, which are prepared in Microsoft

Excel 2016, is the distribution maps of standardization percentages of the year 2015 and the top 10 cities are listed.

Policy targets
We looked at the relevant policy objectives in order to be able to interpret the current situation. We had a table with which we compared our results. Table 7 shows the comparison of data for the years 2010-2015 with the National Occupational Health Safety Policy Targets.

Patient approval
Patient approval was not necessary because there were no patients in this study.

Ethical approval
Ethical approval was not necessary. The study was performed in compliance with the tenets of the Declaration of Helsinki.

Statistical analyses
The "Standardized Ratio Formula", which is the last point that these details instead of details, has been taken as the basis. For example, work accidents, one of our study categories, have been standardized using the following formulas:

- General Work Accident Rate in Turkey = Number of Work Accidents (Observed) / Number of Active Insured Workers (4-1/a)
- Expected Number = Population Surveyed (Number of Active Insured Workers) × General Work Accident Rate in Turkey
- Standardized Ratio = (Observed / Expected) × 100

Standard Error = (Standardized Ratio) / √Observed Number

RESULTS AND DISCUSSION

This study is the first country report on the subject. It was not possible to compare it with other studies and we thought that it would be distracting if results were written as a repetition from the tables. So we assessed the possibility that the discussion under a separate section might cause disconnection. For these reasons, we tried to deal with the results and the discussion together.

Insured worker - work accident
In table 1, when the standardization results of work accidents are compared according to the number of workers in Turkey between 2010 and 2015, Bilecik and Zonguldak share the highest rank. Zonguldak, Karabuk, and Manisa have always been in the top five for six years. Bilecik has always been in the top except for 2012 and has not landed the summit for the last three years. Kocaeli, known for its developing industry, is not listed for the first three years and has been ranked fifth in the 2015 rankings, increasingly in the last three years. Kayseri also entered the list in 2011 and last year for five years, with the declining rates in the list of the top ten. The cities of Bartin and Denizli also list in the early years, but they were not listed afterwards. Eskisehir has always been in the top 10 ranking except for 2012. It is noteworthy that no city on the east side of Turkey is listed in the top 10 list.

Table 1: Standardization percentages of "insured worker - work accident", according to cities

Cities	2015 (%)	2014 (%)	2013 (%)	2012 (%)	2011 (%)	2010 (%)
Bilecik	322	355	366	245	513	502
Zonguldak	276	289	327	675	649	725
Karabuk	254	253	265	444	578	579
Manisa	237	316	342	591	491	533
Kocaeli	222	208	198			
Karaman	203	222	209			
Kayseri	187	207	217	218	229	
Eskisehir	184	183	207		294	273
Tekirdag	169			238		
Bursa	161			265		251
Bartin					319	311
Denizli			177	253	248	237
Bolu						208
Izmir						196
Kutahya		180		264	305	
Kirklareli					228	
Kirklareli				231		
Duzce			172			
Kirsehir		189				
	1.	2.	3.	4.	5.	

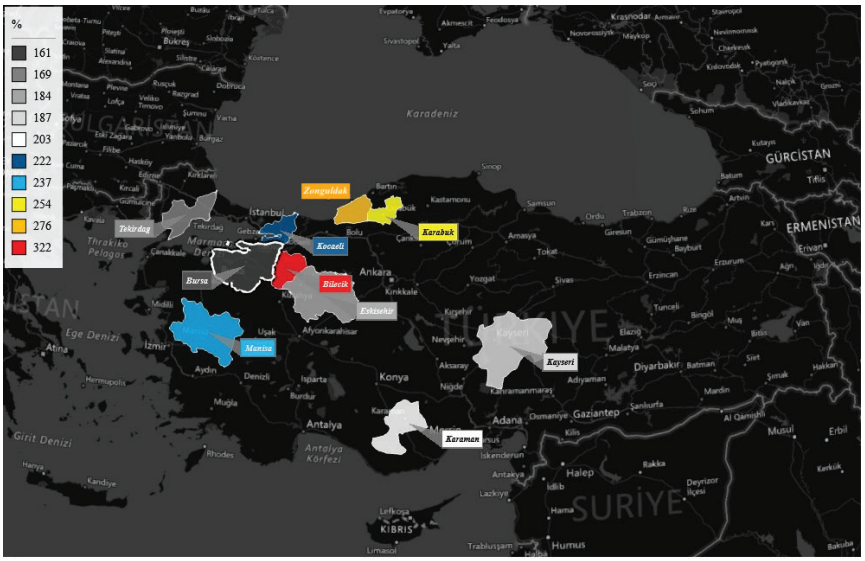

Figure 1: Distribution map of standardization percentages of "insured worker - work accident", according to cities in 2015

Table 2: Standardization percentages of "insured worker - occupational disesases", according to cities

Cities	2015 (%)	2014 (%)	2013 (%)	2012 (%)	2011 (%)	2010 (%)
Zonguldak	2725	652	1838	7219	2601	1645
Bartin	375	98		454		
Kocaeli	338	201	86			131
Kutahya	270	205	90	269	5860	
Corum	178					
Canakkale	138	185				
Bilecik	131	2045	531		169	55
Cankiri	108		505	271		101
Ankara	96			181	257	418
Usak	89		67			
Izmir						461
Manisa						224
Kirikkale		162	486		60	79
Karabuk			100		50	65
Kirklareli					95	
Sakarya					95	
Eskisehir					80	
Kastamonu			91		43	
Erzurum				266		
Nigde				198		
Kahramanmaras				157		
Sivas				146		
Artvin				134		
Osmaniye			74			
Mardin		195				
Aydin		97				
Bolu		98				
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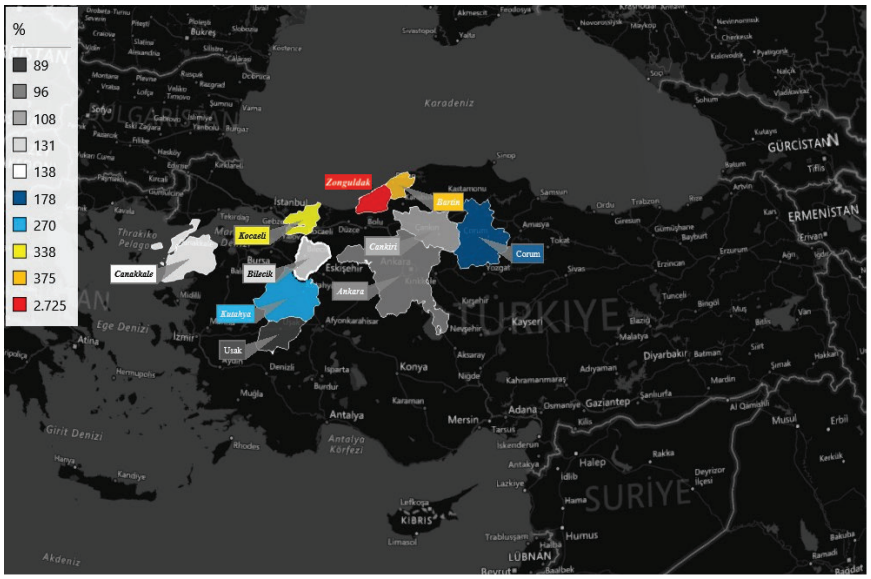

Figure 2: Distribution map of standardization percentages of "insured worker - occupational diseases", according to cities in 2015

Insured worker - occupational diseases

Table 2 shows the rates of occupational diseases standardized according to the number of insured workers examined. It is seen that almost every year a different city takes place at the summit. However, the common feature of these cities is that they are all frontline to the mining sector. Zonguldak is the top with 2725 (%) in 2015. Bartin and Kocaeli cities are listed in the top three in 2015. Bilecik is peaking in the 2014 order but not the top in 2015. In 2011, Kutahya was able to bring its ratios to a relatively low level in the years following the peak of 5860 (%). Nevertheless, it was always in the top 10.

Insured worker - mortality

When table 3, in which standardized mortality rates are included according to the number of insured workers, is examined, it is seen that there are different orders almost every year. When this table is compared with the above tables, the high count of the cities in the top 10 list may indicate that deaths are not as localized as work accidents or occupational diseases, instead they are widespread throughout the country. It is important to note that almost 60% of these cities are located in the Eastern and Southeastern Anatolian Regions. Batman in 2011, Hakkari in 2012, Nevşehir in 2013, ranks first, but these cities are not in the top 10 in any of the tables above. It can also be emphasized that Zonguldak and Bilecik, which are always on the top in other tables, are hardly listed in this list. We see that the miners' accidents, which resulted in death of 301 workers in Soma / Manisa in 2014, 18 workers in Ermenek / Karaman and 4 workers in Dagkonak - Kemerli / Sirnak, directly determined the top three in the sequence of standardization results for cities. In 2015, Manisa and Karaman did not enter the top 10 list; Sirnak is the top with a rate of 1086 (%).

Workplace - work accident

Table 4 shows the Zonguldak and Bilecik leads in the standardization of work accident numbers according to the number of workplaces in existing cities. It is known that work accidents, especially in the mining sector, have increased the rates in these cities. It is noteworthy that Karabuk, known for its iron and steel factory, has entered the top 10 in all years and has not been in the top five rankings in the last three years. While Bartin ranked as fifth in 2010-2011, it did not take place in the top 10 list in the following years. Unlike previous years, it is remarkable that Kocaeli, where the chemical industry is the frontline, and Karaman, which is the frontline of mining, have been included in the top five in the last three years. In Tekirdag and Kayseri, it is known that the organized industry business line accidents are at the foreground. It is noteworthy that no city on the east side of Turkey is listed in the top 10 list again.

Workplace - occupational diseases

When table 5, where occupational diseases rates are standardized according to workplace numbers, is examined, Zonguldak, Bilecik and Kutahya rank at the top. In particular, Zonguldak, of which the mining sector is the frontline, has always been listed in the top two with 675 - 8827 (%). Kutahya and Bilecik, with the same sector as the frontline, have the highest standardization rate of occupational diseases in 2011 and 2014, respectively. The standardization rates of Kocaeli and Bartin cities have increased year by year, and in 2015, the top three were ranked with 450 and 339 (%), respectively.

Table 3: Standardization percentages of "insured worker - mortality", according to cities

Cities	2015 (%)	2014 (%)	2013 (%)	2012 (%)	2011 (%)	2010 (%)
Sirnak	1086	444	348		464	527
Sinop	405			280		
Burdur	302				260	
Bolu	297					
Mardin	277				222	289
Bitlis	245				225	
Aksaray	242					
Igdir	232	310	365			412
Bingol	224			366	346	
Gumushane	223					
Zonguldak			221			468
Tunceli						385
Hakkari				433		383
Nevsehir			380			310
Van						299
Artvin		256	352	354		253
Balikesir						240
Batman				316	480	
Siirt				348	421	
Sivas					267	
Elazig			215	342	230	
Kahramanmaras					222	
Erzurum				376		
Amasya				349		
Erzincan				317		
Karabuk			311			
Ardahan		227	272			
Bilecik			251			
Kars		292	250			
Manisa		1245				
Karaman		613				
Agri		293				
Isparta		278				
Mus		215				
	1.	2.	3.	4.	5.	

Workplace - mortality

When table 6 where standardized mortality rates are included according to workplace numbers, is examined, it is seen that there are different rankings every year. Sirnak, which ranks top three in previous years, is at the top with the highest rate of 1875 (%) in in 2015. However, it is noteworthy that they are not listed in 2012. When compared to the above tables, the excess of cities in the top 10 lists may indicate at first sight that mortalities are not as localized as work accidents or occupational diseases, it is widespread throughout the country. It is important to note that more than 60% of these cities are located in the Eastern and Southeastern Anatolian Regions. We see that the miners' accidents, which took place in 2014, which resulted in the death of 301 workers in Soma / Manisa, 18 workers in Ermenek / Karaman and 4 workers in Dagkonak– Kemerli / Sirnak, directly determined the top three in the standardization sequence for cities. It should be considered carefully that the rates of these cities are even higher than the highest rates.

National Policy Documents and Action Plan on Safety and Health at Work (NPDAPSHW)

The Republic of Turkey has national targets on occupational health and safety. The comparison of the results obtained with these targets is important in terms of guidance

Figure 3: Distribution map of standardization percentages of "insured worker - mortality", according to cities in 2015

Table 4: Standardization percentages of "workplace - work accident", according to cities

Cities	2015 (%)	2014 (%)	2013 (%)	2012 (%)	2011 (%)	2010 (%)
Bilecik	373	420	443	301	627	612
Kocaeli	296	287	273		287	214
Zonguldak	286	299	339	783	813	1034
Karaman	257	286	274	234		
Manisa	252	339	359	608	508	555
Karabuk	238	231	251	412	541	522
Tekirdag	232	235	222	333		
Eskisehir	195	198	226		312	286
Bursa	179			305		298
Kayseri	173	196	208		224	
Bartin					338	352
Denizli				245	240	241
Bolu						205
Kutahya				272	322	
Duzce		203	220	249		
	1.	2.	3.	4.	5.	

(17). When we look at NPDAPSHW-II targets which includes 2009-2013 years, there are two objectives to which we can identify the situation of our work with our data:

- Reduce work accident rate by 20% in 100,000 workers
- Increase the expected number of undetected occupational disease cases by 500%

When we look at NPDAPSHW-III targets which includes 2014-2018 years, we have an annual performance indicator that we can use to identify the situation with our data:

- Between 2014 and 2018, the number of occupational diseases preliminary diagnosis (100,000 workers) should be 12,5 / 25 / 50 / 80 / 100 respectively.

Figure 4: Distribution map of standardization percentages of "workplace - work accident", according to cities in 2015

Table 5: Standardization percentages of "insured worker - occupational diseases", according to cities

Cities	2015 (%)	2014 (%)	2013 (%)	2012 (%)	2011 (%)	2010 (%)
Zonguldak	2826	675	1904	8371	3257	2347
Kocaeli	450	277	119			181
Bartin	339	88		460		
Kutahya	267	204	92	277	6197	
Corum	166					
Bilecik	152	2419	641		207	67
Cankiri	117		506	293		98
Ankara	114			203	280	450
Canakkale	101	133				
Duzce	93					
Izmir						415
Manisa				128		234
Kirikkale		153	435		55	70
Konya						63
Karabuk			95		47	58
Sakarya					98	
Kirklareli		91			89	
Eskisehir					85	
Kastamonu			73		35	
Erzurum				279		
Kahramanmaras				205		
Nigde				164		
Sivas				149		
Sanliurfa			89			
Osmaniye			80			
Mardin		278				
Bolu		100				
	1.	2.	3.	4.	5.	

Figure 5: Distribution map of standardization percentages of "workplace - occupational diseases", according to cities in 2015

Table 6: Standardization percentages of "insured worker - mortality", according to cities

Cities	2015 (%)	2014 (%)	2013 (%)	2012 (%)	2011 (%)	2010 (%)
Sirnak	1875	783	644		876	1116
Mardin	413	253			332	452
Bingol	329			547	481	
Sinop	322					
Bolu	295					
Bitlis	277					
Siirt	276		246	478	525	
Igdir	249	310	372			454
Burdur	240					
Agri	232	317				
Zonguldak					276	667
Hakkari				607	268	507
Van			268	329		402
Tunceli						327
Batman		271		526	757	311
Nevsehir			332			285
Karaman		793				277
Sanliurfa			252		289	
Kahramanmaras					289	
Elazig			240	404	270	
Erzurum				395		
Erzincan				339		
Artvin			324	329		
Amasya				321		
Bilecik			303			
Karabuk			294			
Manisa		1336				
Mus		276				
Kars		275				
Isparta		240				
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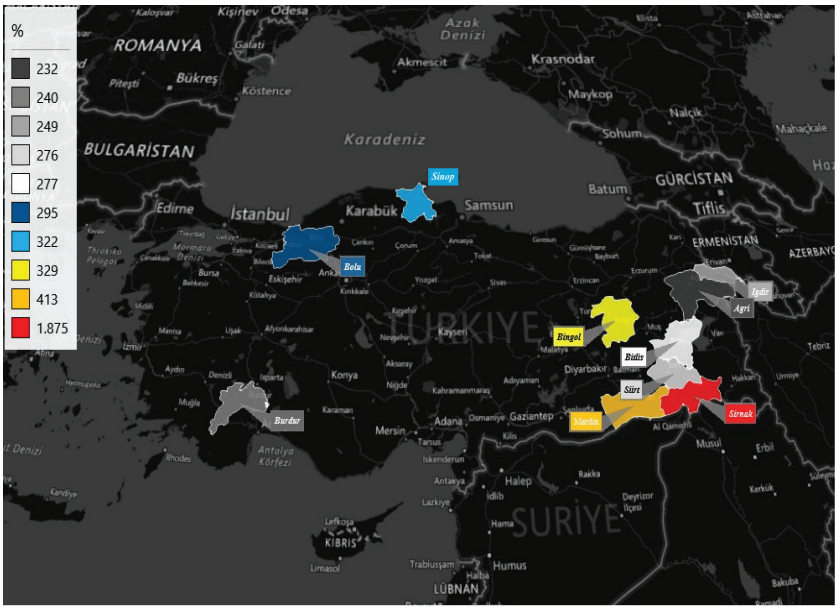

Figure 6: Distribution map of standardization percentages of "workplace - mortality", according to cities in 2015

Table 7: National Policy Documents and Action Plan on Safety and Health at Work (NPDAPSHW) targets

Years	Number of work accidents	Number of work accidents (per 100,000 labourers)	Work accidents by 2010 (%)	Number of occupational diseases	Occupational diseases by 2010 (%)	Occupational diseases (per 100,000 labourers)	Target of NPDAPSHW-III
2010	62903	595	100	533	100%		
2011	69227	600	100,8	697	131%	NPDAPSHW-II	
2012	74871	598	100,5	395	57%		
2013	191389	1457	245	351	89%		
2014	221366	1672	NPDAPSHW-III	494	NPDAPSHW-III	3,73	12,5
2015	241547	1725		510		3,64	25

When we evaluate NPDAPSHW targets as given in table 7; it is not possible to fully assess NPDAPSHW-II since 2009 is not available in the time range of our work. However, in 2010-2013, it is observed that "work accidents" increased by 145% and the number of "anticipated but undetected" occupational diseases cases decreased by 34.1%. When the rates of occupational diseases in 100,000 workers were examined in NPDAPSHW-III Targets in 2014, the target of 12.5 out of 100,000 workers was 3.73; in 2015, it was observed that the target of 25 out of 100,000 workers was not reached with 3.64 results. The number of preliminary diagnoses for the 2016 target occupational disease was 50 in 100,000 workers.

CONCLUSION

According to the results of the six years examined, it is seen that the rates of work accidents and occupational diseases are highest in Zonguldak, Bilecik and Karabuk, where the mining sector is in the forefront. When mortality rates are examined, especially Eastern and Southeastern Anatolian Cities such as Sirnak, Batman and Igdir have been in the frontline. This shows that, in addition to the measures to be taken nationwide in order to prevent mortal work accidents, various measures must be taken locally.

The fact that only those who have been diagnosed with occupational disease after the insurance has been included in the statistics for the years 2013-2014 show how important it is to watch one's health after retirement. It was also removed from the tables again in 2015. What affects the results on a one-to-one basis are the records that are kept incomplete / inadequate. These data must be recorded in a healthy manner.

In this study, the years 2010-2015 were studied. Future work could be done in 2005-2010 or 2015-2020 and so on. If the years are studied in such 6-year periods, it may be useful to make period comparisons.

The inadequacy of the records is the biggest obstacle in determining the actual dimensions of the problem of work security. On the other hand, with the enactment of the Law No. 6331 on Occupational Health and Safety, it is expected that the number of notifications from public institutions to RTSSI will increase. For better evaluation and analysis of notifications, it is important to keep records more systematically and comprehensively.

Ethics Commitee Approval: Ethical issues including plagiarism, data fabrication and/or falsification, double publication and/or submission, redundancy, etc. have been completely observed by the authors. Ethical approval was not necessary. The study was performed in compliance with the tenets of the Declaration of Helsinki.

I**nformed Consent:** Informed consent was not received due to the retrospective nature of the study.

Peer Review: Externally peer-reviewed.

Author Contributions: Conception/Design of Study- O.F.B., E.E., H.I., Z.B.; Data Acquisition- O.F.B., E.E., H.I., Z.B.; Data Analysis/Interpretation- O.F.B., E.E., H.I., Z.B.; Drafting Manuscript- O.F.B., E.E., Z.B.; Critical Revision of Manuscript- O.F.B., E.E., H.I., Z.B.; Final Approval and Accountability- O.F.B., E.E., H.I., Z.B.; Technical or Material Support- O.F.B., E.E., H.I., Z.B.

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