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Breed, age, sex structure, uses, diseases and injuries of service dogs in the cynological centers of the National Police of Ukraine under martial law

R. K. Chumakov*, T. M. Suprovych*, M. P. Suprovych*,
R. V. Kolinchuk*, O. D. Stepanov*, V. A. Kolodii**, T. V. Zakharova*

*Podillia State University, Kamianets-Podilskyi, Ukraine
**Kamianets-Podilskyi National Ivan Ohienko University, Kamianets-Podilskyi, Ukraine

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Podillia State University, Shevchenko st., 12, Kamianets-Podilskyi, 32316, Ukraine. Tel.: +38-038-496-83-22. E-mail: suprovycht@gmail.com

Kamianets-Podilskyi National Ivan Ohienko University, Ohienko st., 61, Kamianets-Podilskyi, 32300, Ukraine. Tel. +38-067-687-06-71. E-mail: kolodiyva@ukr.net

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Service dogs can perform a number of functions not available to humans. They are a valuable asset to law enforcement agencies. In order to keep them healthy and ready for duty, it is necessary to have comprehensive statistics on medical problems and the various types of pathologies associated with them. We reviewed 922 records pertaining to disease and injuries, breed, age, gender, status, and areas of use for 819 service dogs that are handled by dog handlers at the National Police of Ukraine. Similar data from 2021 (853 animals and 866 records) were used for comparison. The average number of dogs in dog cynological centers increased from 34.1 in 2021 to 37.2 in 2023–2024. In the last three years the number of females and males has equalised. Changes in the composition of females were statistically significant. The weighted average age of animals increased from 4.90 to 4.97 years. A decrease in the number of dogs in the age range from 3 to 6 years was detected. German and Belgian shepherds were most common breeds. A significant increase in the number of Malinois should be noted. The share of search and special dogs decreased, while the number of reserve animals increased. Injury and disease incidents were formed as categorical variables with 15 levels. The number of records in 6 groups (gastrointestinal diseases, injuries, diseases of the eyes and ears, skin diseases, joint diseases, and parasitic diseases) exceeded 5% after a thorough analysis. Limb injuries most often occur during the liquidation of the consequences of the destruction of infrastructure facilities, when removing rubble and searching for people in areas of destroyed buildings, the presence of shrapnel fields after explosions and patrolling in unfamiliar terrain. The maximum number of 192 records of 13 diseases were found for the gastrointestinal tract. The largest increase was in cases of alimentary enteritis, enterocolitis and gastroenteritis. Among diseases of the eyes and ears, otitis media and cataracts clearly prevailed. Pathologies of the organs of vision and hearing in dogs in the near-front zone accounted for 13.5%, and 7.4% were treated in a hospital. Among skin diseases, the number of dermatitis cases decreased, but the number of sub- and allergic dermatitis cases increased. Among the pathologies of the musculoskeletal system, arthritis, bursitis, hip arthrosis and dysplasia were detected. For joints, arthritis was the biggest problem, and coxarthrosis showed the highest growth. The risk of parasitic diseases has decreased. Toxocariasis was the most commonly detected disease, and the maximum decrease was in babesiosis. The level of polymorbidity increased by 10.8%, indicating an increase in multiple pathology. For dogs on rotation, the average polymorbidity value was 1.77. The number of stress-related diseases, musculoskeletal disorders and trauma to the limbs increased significantly, which means that an important factor in the increase in multiple pathology was the performance of special service tasks by police dogs on the contact line and in the de-occupied territories.

Keywords: police dogs; dog handler center; dog injuries; dog sicknesses; breeds; gender and areas of application; polymorbidity.

Introduction

There are about 900 million dogs worldwide There are those who are kept as pets and others who live in wild packs or on their own (stray or feral). The modern urbanized environment has created a rather significant social niche for dogs, which is constantly deepening. This process has become particularly widespread in recent decades. For example, pet owners in the United States, a country of approximately 330 million people, keep the largest number of dogs in the world – more than 83 million. According to statistics, there are 5.1 million dogs in Australia for a population of 27 million. About 13 million dogs are kept in 33% of UK households (according to www.dogster.com). There are many reasons and explanations for the dog boom. Demographic changes, rising incomes, the expansion of the "middle class" in developing countries , the emergence of a new "pet culture" based on the increased status of pets, companionship, improved health of owners, and even the impact of the Covid-19 pandemic are just a few of the of reasons for such a boom (Levine et al., 2013; Bibbo et al., 2019; Amiot et al., 2022).

Despite their widespread distribution, there is a group of dogs that occupies a specific niche in human life. The dog was one of the first domesticated animals that humans adopted into their environment because of its special qualities and behavioral properties. Strength, endurance, speed, absolute sense of smell and hearing, loyalty, and the ability to train, along with animal instincts, have created a very useful assistant in everyday life. A dog is a creature that can significantly help a person in their work, especially in services and formations that protect the safety of citizens, such as the police, border guards or private security companies (Błaszczyk, 2019). A number of breeds have been created in which one or more of the traits have been perfected. As a result, special breeds have emerged that are capable of performing specific functions, such as guarding, protecting, patrolling, hunting, searching, etc. Guard dog is a common name for domestic dogs of various breeds that make up a separate group of domestic dogs. They have a high level of intelligence and a developed instinct to protect the owner and his belongings, moderate aggressiveness, are suspicious of strangers, but are well trained (Bezpalova et al., 2019).

Most often, service dogs are used in law enforcement agencies. Most countries in the world have special dog handler centers for the training and use of dogs that perform special tasks specific to these structures. The most famous of these are police K-9s (www.3dk9 detection.com/news/history-of-k9s-in-security). Similar units have been established in Ukraine (Bezpalova et al., 2019; Garmash, 2019). Service dogs often perform tasks with significant differences in the direction of increasing intensity and severity. (Suprovych et al., 2024).

Wars are a unique instance of unacceptable socio-political dangers with excessive risk. A war is currently taking place on the territory of Ukraine, and the National Police officers are actively involved in it. Since the beginning of the full-scale armed aggression of the Russian Federation against Ukraine, on 24 February 2022, dog handlers have been deployed 5,784 times at checkpoints, 12,192 times combat missions have been performed with service dogs to ensure public order and security, patrolling, inspecting belongings, vehicles, luggage and cargo, office premises and citizens' homes. Police dog handlers were called upon more than 26,500 times to assist in the evacuation of citizens. With the help of police dogs, 7,419 weapons and ammunition, 127,428 rounds of ammunition, and 157 kg of explosives were found and seized (Yusupov et al., 2023).

Dogs' health may be affected by additional factors during military operations under conditions of increased physical and stressful pressure (Toffoli & Rolfe, 2006; Kelly et al., 2008). The situation with injuries and morbidity, as well as the psychological state of dogs, is deteriorating (Kosenko, 2023). After military operations in Vietnam, Iraq, Afghanistan, Israel, and other countries, the scientific literature has provided extensive information and analysis of the condition of service dogs, which confirms the aforementioned opinion (Mey et al., 2020; Edwards et al., 2021).

The purpose of our study was to assess the breed, age and sex structure, areas of use, as well as the state of injuries and morbidity of police dogs in the dog cynological centers of the National Police of Ukraine in 2023–2024. The analysis was carried out taking into account the participation of dogs in special tasks in the de-occupied territories and work in the frontline area.

Material and methods

All animal manipulations were carried out in accordance with the rules adopted by the European Convention for the Protection of Vertebrate Animals Used for Experimental and Other Scientific Purposes (Strasbourg, 1986), the General Ethical Principles for Animal Experiments adopted by the First National Congress on Bioethics (Kyiv, 2001), and the Law of Ukraine "On the Protection of Animals from Cruelty" No. 3447-IV (2006). The research protocol was approved by the Commission for Bioethical Expertise and authorized by the Higher Education Institution "Podillia State University" (Protocol No. 3 of 18.10.2024).

The outcome of the analysis is determined by statistical reports from 22 cynological centers of the National Police of Ukraine for 2023–2024. In total information was provided on N = 819 animals and 929 pathologies (injuries and diseases). The study was conducted based on the methods of trivial statistics using a standard one-time observation plan. Statistical processing of the initial data and analysis of samples was performed on the basis of a unified variational method. In accordance with the main disease groups identified, 15 categorical variables were formed: skin diseases, traumatic injuries, surgical infection, tumors, joint diseases, diseases of the eyes, hearing, internal non-contagious diseases, respiratory diseases, gastrointestinal diseases, blood and cardiovascular diseases, renal and urinary tract diseases, metabolic diseases, obstetric, gynecological, infectious and parasitic diseases. Breeds were grouped into 5 variables: German Shepherd, Belgian Shepherd, Labrador, Spaniel, and others (including Rottweilers and Eastern European Shepherd). The age samples were divided into 8 levels: from dogs under 1 year old to over 7 years old. For the groups of service dogs, 4 levels were used depending on the destination: search, special, reserve and other.

To test for the normality of the distribution, the Shapiro-Wilk test was used, which is considered the most powerful criterion for small samples of 8 to 50 values and when there are differences in the skewness of the distribution. If it is necessary to clarify the conclusion, the Shapiro-Wilk test was duplicated by the Anderson-Darling test, which uses a specific distribution to calculate critical values and therefore has greater sensitivity (Shapiro & Wilk, 1965; Stephens, 1974). The null hypothesis of normality was rejected at a statistical significance level of $P < 0.05$ if it was found in both tests. To compare group means, a one-factor analysis of variance ANOVA was used at a critical value of $P = 0.05$. The final conclusion about the presence/absence of differences between samples was made on the basis of the Kruskal-Wallis test at $P = 0.05$. Calculations were performed in PAST 4.03 (PAST: Paleontological Statistics Software Package for Education and Data Analysis. Reference manual). The calculated indicators correspond to those accepted in the program.

Results

Dog training centers for the National Police of Ukraine are structured based on gender, breed, age, and areas of application for dogs.

A lot of statistical information has been derived from the research. For the convenience of analyzing the obtained indicators in accordance with the categorical variables, tables and diagrams were formed. Tables 1–5 show the number of records extracted from the reports of dog training centers. The assessment of the changes that occurred in dog training units during the military aggression was made by comparing the data of the current analysis and a similar study conducted in 2021. The results of the comparison are shown in the diagrams. A total of 853 service dogs from the previous study were included in the analysis. Therefore, for the correct interpretation of the results, the diagrams show the proportions according to the sample size. If there were less than 9 (<1%) dogs in a group, they were included in the "other" sample. The row «Number of dog training centers» contains data on the number of units where at least one record of an animal was found, according to the indicator given in the table title.

Data on the gender situation in dog training units are presented in Table 1. To compare, the number of males and females under martial law and before full-scale aggression is depicted.

Table 1
Distribution of service canines by gender
in dog handler centers of the National Police of Ukraine

Number of dogs	All	Male	Females
2024	819	413	406
2021	853	397	456

In 2021, the percentage of females in cynological centers was 53.5%. However, today the number of females and males has equalized. There is no significant differences between the medians of the two samples: the general group ($F = 0.407$; $P = 0.526$) and males ($F = 1.42$; $P = 0.239$). The statistical significance of the female composition change was weighty ($F = 32$; $P = 0.91*10^{-4}$). This result is confirmed by the Kruskal-Wallis's test: total group ($P = 0.388$); males ($P = 0.077$); bitches ($P = 0.77*10^{-5}$).

Data on the importance of service dogs in units according to their purpose are given in Table 2. In 2024, the number of search and special dogs slightly decreased (by 5.3% in total), but the number of reserve animals increased significantly (by 7.0%). According to the document "Instructions for Organizing the Activities of Dog Training Units of the National Police of Ukraine", a reserve dog is a dog aged 6 months and older until the end of the training course and exams, which is not temporarily assigned to a dog handler and is not used in official activities (https://zakon.rada.gov.ua/laws/show/z1544-16). The distribution of dogs in cynological centers showed no significant differences between 2021 and 2024 ($P = 0.79$). The increase in the number of reserve dogs in 2024 was due to two main factors: the work of kennels has improved, which has increased the supply of puppies to the dog training units, and some dogs are kept as reserves due to the lack of dog handlers.

Table 2
The number of service dogs (N = 819) in handler dog centers
of the National Police of Ukraine according to their role

Indicators	Investigative	Special	Reserves	Other
Number of dogs	304	313	111	91
Number of dog training centers	22	22	16	22

The percentage shares of the different groups shown in Fig. 1 are determined by the dogs' intended purpose and determine the actual

dynamics of the differences found. The "other" group includes animals whose purpose is specific. These are convoy dogs, guard dogs, patrol and search dogs, dogs belonging to the Rapid Action Corps and Explosive Service Department, and dogs whose use was not specified in the reports.

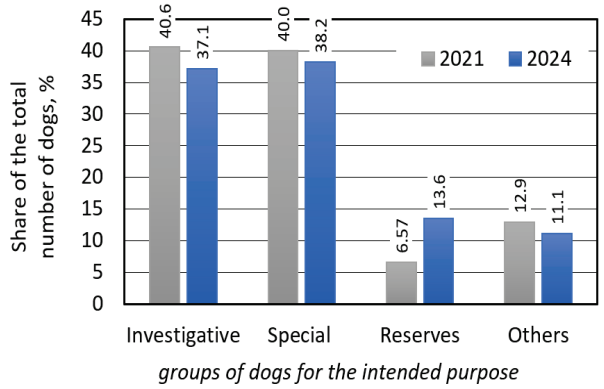

Fig. 1. Differentiation of canine dogs in handler dog centers National Police of Ukraine depending on the intended purpose

The indicators in Table 3 correspond to the format of the data in the reports from dog training centers, i.e., the division into eight age groups with a time interval of 1 year is preserved. A similar age differentiation is found in many published scientific reports (Kania-Gierdziewicz et al., 2018; Harvey, 2021), and the limit of differentiation depends on the effective service time of a police dog, which is usually limited to 8 years of age.

Table 3
Distribution of dog groups by age (N = 819)
in handler dog centers National Police of Ukraine, years

Indicators	< 1	1–2	2–3	3–4	4–5	5–6	6–7	> 7
Number of dogs	20	115	138**	105	81**	103***	95**	162**
Number of dog training centers	9	21	20	21	22	19	20	19

Note: ** – P < 0.01; *** – P < 0.001.

The distribution of 8 age categorical variables is shown in Figure 2. The current study revealed a 4.9% decrease in the number of service dogs in the range of 3 to 6 years old. The weighted average age of animals from 4.9 to 4.97 was increased slightly by the presence of younger dogs (under 3 years old) and older dogs (over 6 years old). The deviation found was significantly different from the sample medians (P = 0.012), which means that further growth in the number of young (under 3 years old) and older (over 6 years old) service dogs is likely to occur.

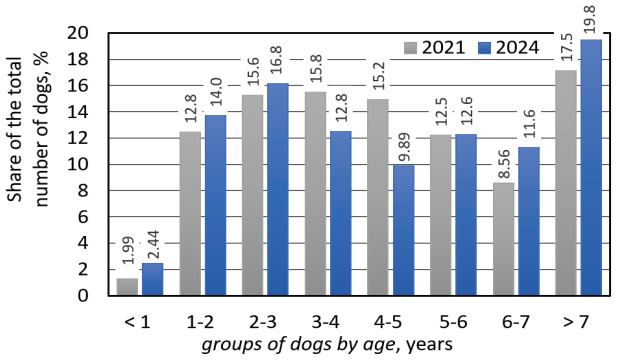

Fig. 2. Age differentiation of canines in handler dog centers of the National Police of Ukraine

The number of service dogs is depicted in Table 4 by the main breeds used in dog units. Breeds such as Rottweiler and Eastern European Shepherd were rarely reported. For example, for Rottweilers, only seven records were extracted in 6 dog training centers, and for Eastern European Shepherds, only three records were extracted, one for each of the 3 dog training units. There were also breeds with unspecified names. Similar to Table 2, these records are aggregated in the "other breeds" column.

Table 4
Breed-specific numbers for service dogs
in National Police of Ukraine's handler dog centers (N = 819)

Indicators	German Shepherd	Belgian Shepherd	Labrador	Spaniel	Other breeds+
Number of dogs	503***	203***	47	29**	37***
Number of dog training centers	22	22	16	10	22

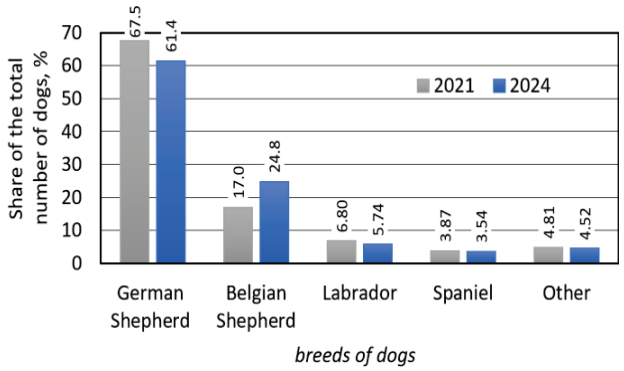

Fig. 3. Differentiation of canines in handler dog centers National Police of Ukraine by breed: ** – P < 0.01; *** – P < 0.001; + kept by <1% in Cynological Centers (Rottweiler, Eastern European Shepherd, breed name not specified)

Comparison of the overall total proportions showed that there were no statistically significant changes in the inter-breed distribution of dogs in the surveys compared (P = 0.793). Comparing individual breeds yielded similar outcomes. The main share belongs to two breeds: German and Belgian (Malinois) shepherds. The total share of these sheepdogs in the dog cynological centers of the National Police of Ukraine was 84.5%. The detected increase in Malinois by 7.8% compared to 2021 was statistically significant (P = 0.0049), which necessitates the search for factors influencing the detected shift.

The main groups of diseases were considered when compiling Table 5 according to statistical information on injuries and diseases of police dogs contained in the reports.

The 2021 study, with 866 records being identified, was compared to the changes in injuries and diseases. The initial data were combined into samples according to 15 categorical variables. Table 5 shows the total number of records of diseases and injuries for each group and the number of handler dog centers where they were detected. For ease of analysis, the groups are sorted from largest to smallest.

The diagram in Figure 4 shows the shares of each of the 15 groups in accordance with the names of the categorical variables.

Table 6 compares the frequencies of major diseases and injuries in the 6 groups with the maximum number of records identified in previous and current studies. In total, the number of these records was 77.9% (in 2021) and 77.2% (in 2024). The groups show the proportions of the most common pathologies. By analogy with the previous tables, the few cases identified with a frequency of less than 1% are combined in the "other" subgroups. Comparison of frequencies revealed no statistically significant difference between the groups (P = 0.99) and in individual samples.

The main groups include 6 with a detection rate of diseases and injuries of more than 5% in both studies (an exception was made for the group of joint diseases with a rate of 4.97% in 2021). Pathologies in the other 9 groups were rare. Because some of the most common diseases identified in them only occur 5–7 times (<1%), they have no impact on the epizootic situation. The data of records for these groups are given to reflect the correctness of the results obtained in the analysis of diseases and injuries. Theoretically, they may be influenced by the participation of dogs in combat operations and slightly change the final results.

Table 5
Number of service dogs by disease groups in National Police of Ukraine handler dog centers (N = 819)

Indicators	Diseases of gastrointestinal tract	Traumatic lesions	Diseases of vision and hearing	Diseases of skin	Diseases of joints	Parasitic diseases	Diseases of the respiratory system	Surgical infection	Kidney and urinary tract diseases	Tumors	Obstetric and gynecological diseases	Metabolic diseases	Diseases of metabolism	Internal non-communicable diseases	Diseases of blood and cardiovascular system system
Number of records	192**	145**	139**	132	63	52***	52**	24	24***	23***	23*	19	18	12	12***
Number of dog training centers	19	19	20	14	15	11	9	9	6	10	8	5	5	4	3

Note: * – P < 0.05; ** – P < 0.01; *** – P < 0.001.

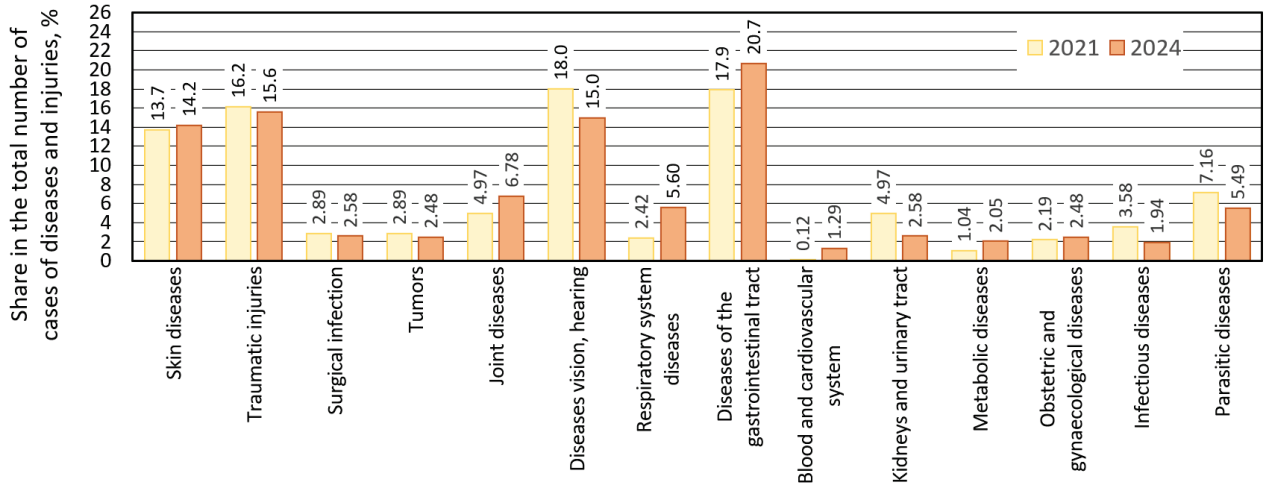

Fig.4. Disease and injuries in handler dog centers of the National Police of Ukraine are classified according to categorical variables

Table 6
The National Police of Ukraine cynological centers have a high percentage of injuries and diseases among groups with a share of more than 5%

Name of disease/injury	Skin diseases				Traumatic injuries					Diseases of joints				Diseases vision and hearing			Diseases of gastrointestinal tract							Parasitic diseases			
	eczema	dermatitis	al. dermatitis	other	wounds	stretching	contusion	paw injuries	other	arthritis	bursitis	coxarthrosis	dysplasia	otitis media	cataracts	others	gastritis	pancreatitis	dyspepsia	al. enteritis	gastroenteritis	enterocolitis	others	babesiosis	toxocarosis	otodectosis	others
2021	6.47	6.93	0.12	0.232	10.0	1.62	2.08	0.229	2.19	3.23	0.23	0.35	1.15	9.47	7.51	1.04	2.77	1.62	6.81	3.58	0.46	0.231	1.96	2.89	1.15	1.73	1.39
2024	5.92	4.84	2.58	0.858	10.1	1.61	1.08	2.48	0.33	3.01	1.51	2.05	0.22	7.09	6.35	1.51	2.15	1.61	3.98	4.84	1.72	3.23	2.81	1.72	2.37	0.971	0.432

Information on diseases and injuries was obtained from dog handlers who were with their animals in the de-occupied territories and the first military veterinary hospital. The hospital with a rehabilitation center was founded in 2018 in Khmelnytskyi. At the beginning of the war, it was reformed into a military veterinary center. The main task of the medical institution is to provide assistance to wounded and sick service dogs of law enforcement agencies that took part in special missions. In total, 29.7% of the dogs were deployed once, another 14.5% had two missions and 6.81% visited the frontline area more than twice. The most commonly used breeds were German Shepherds (55.6%), Malinois (30.4%) and Spaniels (6.67%). Service dogs were mainly used for demining 57.8% and for rescue work (clearing rubble, searching for the wounded and dead) 24.4%. Some dogs were used in canine-assisted therapy sessions (2.96%) in military hospitals for psychological rehabilitation of military personnel.

We received 155 records of service dogs treated in the hospital since 2022, of which one third were police dogs. According to the dog handlers, injuries accounted for 50.0% of the patients, 32.5% being contusions, 24.0% being wounds, including 18.8% inflicted by sharp objects (glass, vegetation, rebar, etc.), and 14.3% being sprains and bruises. The following information was received from the hospital: traumas accounted for 24.1% (contusions 18.5%), wounds 18.5%, including sharp objects (glass, vegetation, rebar, etc.) 14.8%, sprains and bruises 9.3%. Among the diseases, the most common were problems with the musculoskeletal system (dog handlers – 18.2%, hospital – 13.0%) ; gastrointestinal tract (14.9% and 7.4%); eyesight and hearing (13.5% and 7.4%); skin diseases (9.5% and 7.4%); kidney and urinary system pathologies (8.1% and 3.7%); parasitic diseases (8.1% and 3.7%); infectious diseases (12.8%); respiratory diseases (10.1%); and heart failure (4.7%). The last three groups were not registered at the hospital. Among other pathological conditions, the most common were mental disorders related to stressful situations (7.8% and 5.6%).

Discussion

The military operations have dramatically changed the organization of security, defense and law enforcement services. Since the first days of the war, Ukraine has been subjected to a wave of spontaneous movement of people and things across the country. The number of illegally moved items during this chaos has increased significantly, which has a negative impact on law and order and national security. After 2014, police sniffer dogs were used at checkpoints on the contact line in Luhansk and Donetsk regions. Their use has become more pertinent today. Numerous movements of people across the territory of Ukraine and the emergence of a large number of weapons, ammunition and explosives have led to an increase in the number of cases of their illegal use, including transportation, storage and use. In addition, drug trafficking has become widespread. The area of mined land has increased enormously, residential buildings are being destroyed by

hostile attacks, and sabotage groups are entering the territory of Ukraine, which significantly affects the priority areas of activity of the National Police of Ukraine. These phenomena pose a complex problem for the police, which is now complicated by martial law and the development of new technologies that allow for the concealment or 'whitewashing' of illegal activities (Seliukov, 2023). Among these problems, it is necessary to highlight those where there is a need to use service dogs. These include de-mining of territories and buildings, protection of public order and public safety, investigation of war crimes in active hostilities, psychological support of police activities under martial law, and provision of primary psychological assistance by police to various categories of citizens (Bezpalova et al., 2022). Ensuring the implementation of these roles in the activities of dog training centers is accompanied by structural changes.

Structural changes in the form of cynological centers under martial law.

Sending the most gifted animals to the frontline zone affects the structure of handler dog centers. Some dogs are retired due to injuries and diseases sustained during special missions, some die, and some are replaced by young animals to supplement the existing units. The average number of dogs in cynological centers in 2021 was 34.1 ,increasing to 37.2 in 2024. The growth was due to three main factors:

1) opening of a new kennel at the handler dog centers of National Police of Ukraine in Khmelnytskyi, where the third batch of reserve dogs is being prepared for release (https://projects.gazeta.ua/psy-u-politsiyi1144755);

2) reduction in the number of dog units due to the occupation of the eastern regions;

3) assistance to law enforcement agencies from abroad; in particular, at the initiative of the Howard Buffett Foundation, 100 German and Belgian Shepherd dogs were transferred to Ukraine from different European countries (https://socportal.info/ua/news/chetverta-partiya-sluzhbovikh-sobak-pribula-z-evropi-v-ukrainu).

The trend towards an increase in the number of males should be regarded as positive, because in cynological centers in other countries, the prevalence of service males is significant. Most K9 dogs are male. Male dogs are more aggressive and stronger, usually more dominant, active and independent. Also, a working dog is an intact male. The combination of these behavioral, character and physical characteristics causes gender disparity in the number of dogs in the police. In combat situations, male dogs can potentially perform more tasks than females. However, some females with outstanding abilities are used as special purpose dogs to detect explosives, drugs, contraband, etc. (Scandurra et al., 2018).

The age range of 4 to 6 years is quite common for law enforcement dogs. This has been reported in a number of studies. For example, the average age of 4.58 ± 2.95 years was found for 1220 combatant dogs in Iraq (Tamimi & Wali, 2019). A similar figure for military dogs participating in humanitarian missions in Afghanistan was 4.4 years (Spinella et al., 2022).

There have been changes in the breed composition of service dogs. The choice of a dog to serve in law enforcement agencies imposes special requirements on applicants. That is why only about a dozen breeds are adapted to perform tasks in the police. Two breeds are mainly used in K-9 units: the German and Belgian Shepherd. For example, in the Polish police, the main breed is the German Shepherd (73.4%). Belgian Shepherds are in second place in terms of distribution, but in much smaller numbers (14.9%) (Gąsiorowski, 2019). The situation is similar in domestic law enforcement agencies. A recent study (Pavlenko et al., 2023) points to several factors that determine the advantage of the Belgian Shepherd in law enforcement agencies. Firstly, 100% of Belgian Shepherd dogs were tied to their handler, and older Malinois were preferred for this trait. Secondly, all Belgian Shepherds were actively defensive, that is, they had a better defensive reaction to irritation. Now, when manning the canine units of the National Police of Ukraine, the specifics of dog use are taken into account and breeds are used with the most desirable qualities of the higher nervous system for special-purpose training. In recent years, dogs that work effectively in the search for narcotics and in anti-terrorism groups (Malinois) and that search for explosives (Labrador, Retriever) have become more common. Changes in the staffing of cynological centers with dogs depending on the purpose were identified. Similar to our results, the structure of K-9s was found in a study of 151 animals in Egyptian police dogs (Haithem et al., 2011). Among them, there were only 30 females (19.9%), German Shepherds (72.2%), Malinois (11.3%), Labradors (8.61%), search (66.2%) and reserve (15.9%). Among the 774 young, non-deployed, active service dogs in the US Army, the majority were male (74%), German (39%) or Belgian Shepherds (31%) (Schuh-Renner et al., 2021).

In 2024, traumatic injuries in dogs accounted for 15.6%, and their share decreased by 0.6% over three years. In total, there were 8 traumatic pathologies in the sample: sprains, wounds, hernias, bruises, paw injuries, hematomas, corneal wounds and foreign bodies. Wounds were clearly the most common, with problems with them, affecting every tenth case, but their proportion has not changed over the three years. There was also no statistically significant difference in the results of the two studies ($P = 0.796$). The largest increase was found for paw injuries from 0.231% in 2021 to 2.48% (18 dogs) in 2024. This type of injury most often occurs when dealing with the consequences of damage to infrastructure facilities, when clearing rubble and searching for people in areas of building destruction, the presence of shrapnel fields after explosions and patrolling in unfamiliar terrain. Obviously, the conditions of martial law did not significantly change the distribution of pathologies in the group. Data from a military hospital showed that the difference in the proportion of dogs injured and referred for treatment was only 4% following rotations to the frontline areas.

For dogs that have been in the de-occupied areas, contusion-related injuries are of particular concern. The international classification of diseases does not include the diagnosis of contusion, and instead usually refers to different types of injuries. Most dog handlers who have been with their animals in the frontline zone interpret injuries not by the consequences of the injury, but by the cause of their occurrence, bringing them into a general group called "contusion". Cases with minor consequences of injuries, which rather affect the neuropsychological state of the dog (fright, inadequate behavior, nervous excitement, etc.), prevail. These include 32.5% of injuries, after which almost all dogs recover on their own and return to full performance of tasks after a while. Serious injuries with contusions were not very common. In fact, 18.5% of dogs were admitted to the hospital for surgical treatment.

There is limited literature on the types of injuries dogs experience in deployment and combat zones. One study collected status and medical data for 794 U.S. Army service dogs deployed to Iraq from 2003 to 2007. During this time, 62% of them had medical consultations. The majority of the population were German Shepherds (56%) and intact males (49%) and were certified for patrol and explosives detection. During their first deployment, 20% were injured. Risk factors were analyzed by breed, age, and professional assignment. Compared to German Shepherds, Belgian Shepherds ($P = 0.04$) and Labradors ($P = 0.02$) had a higher chance of being injured. Among older dogs, this risk was about 50% higher than among younger dogs ($P = 0.01$). This was especially true for musculoskeletal injuries and animals with specialized search certification ($P = 0.02$) (Mey et al., 2020).

Gastrointestinal pathologies are among the most common diseases in law enforcement dogs. Park et al. (2023) found that gastrointestinal disorders (25.3%) were more frequently diagnosed in military dogs at the South Korean Armed Forces Medical Research Institute, based on medical data from 553 animals. Similar problems (17.1% of diseases) were quite common in Egyptian police service dogs (Takara & Harrell, 2014). An analysis of non-combat-related illnesses and injuries and lost days of service over 24 months among 126 US Army Special Operations dogs showed that among 143 events that resulted in the loss of 4130 (70.9%) working days, pathologies of the gastrointestinal tract accounted for 13 cases and 296 days (95%, CI) (Harroun-White et al., 2024).

The extracted records indicate that there were 192 cases of gastrointestinal diseases in our study, which is 37 more (2.77%) than in 2021. In total, this sample contained data on 13 diseases. There was

no significant difference between the medians of the samples (P = 0.292). The largest increase was found for alimentary enteritis (14 cases), enterocolitis (28 cases), and gastroenteritis (12 cases). Transport stress, temporary change of habitat, fires, explosions negatively affect the immune system of dogs, which leads to disruption of the digestive system and increases the risk of infection with viruses, pathogenic and opportunistic bacteria (Didukh et al., 2014). The use of dogs in the rotation zone can lead to negative factors that are widespread. Negative factors are prevalent when dogs are used in the rotation area.

The proportion of dogs with gastrointestinal problems after rotations was 14.8%, and 7.44% were treated. Therefore, the analysis should take into account the possible impact of combat stressors on the increase in gastrointestinal pathologies. Among other problems, attention should be paid to dyspepsia, which is a typical symptom of digestive disorders, especially problems with the large or small intestine. In the previously cited work (Haithem et al., 2011), the incidence of diarrhea among Egyptian police dogs was in 4th place (9.1%). Alves et al. (2021) analyzed the prevalence of diarrhea in 188 police dogs and its relationship to feeding and activity levels. According to the Bristol Stool Form Scale, the prevalence of diarrhea was 10.6%, with 4% of dogs having liquid form and an increase in the frequency of defecation (12%). Several studies have pointed to stress as an important cause of diarrhea. The intestinal tract is very susceptible to stress and clinical signs can develop rapidly and last for a long time (Simpson, 1998; Gareau et al., 2008).

Records of 6 pathologies were found among the diseases of the organs of vision and hearing: otitis media, cataracts, conjunctivitis, eyelid rolling, keratitis, and blepharitis. There was no statistically significant difference between the results of the two studies (P = 0.748). The last 4 diseases were extremely rare: 9 cases in 2021 and 14 in the current study. The main prevalence is otitis media and cataracts. There was a decrease in otitis media by 16 and cataracts by 6 cases. Comparison of the frequencies using Fisher's exact test indicates that the differences found are not significant (P = 0.628). The number of these pathologies for dogs in the combat zone was 13.5%, and 7.4% were treated in the hospital.

Almost 300,000 Japanese dogs were tested and it was found that 16.4% of females and 17.2% of males had hearing loss (Inoue et al., 2015). In 1220 Iraqi police dogs sent to the Baghdad Veterinary Hospital, 36 cases of otitis media and 1 case each of deafness and hearing loss were detected among the diseases of the hearing aid. Eight cases of blindness, 5 cases of dry keratoconjunctivitis, 2 episodes of visual impairment, and one case each of cataract and telesiosis were the only eye diseases that were present, making the number of eye diseases significantly less (Tamimi & Wali, 2019). Eye diseases were found to be low (0.49%) among police dogs in Egypt. However, 10.7% of the animals studied had hearing problems, and 8.54% were infected. (Haithem et al., 2011). In a retrospective study of dogs in veterinary hospitals in North America, the prevalence of cataracts ranged from 0.95% in the 1970s to 3.5% between 1994 and 2003 (Gelatt & Mackay, 2005). Ophthalmological abnormalities and refractive errors in Brazilian police dogs assessed on the basis of an examination of 61 animals showed that the main pathology was primary cataract and myopia, and the most common abnormality was myopia (de Oliveira et al., 2020). Otitis media was more common among military dogs. A Technical report by Butler et al. (2021) found that the majority of visits were for four pathology categories, and 25% of them were for otitis externa.

In both of our studies, the percentage of skin diseases among the total cases of disease and injury was within 14%. There was no statistically significant difference between the frequency and number of cases in 2021 and 2024. In the latter study, the number of dermatitis decreased by 2.09% and eczema by 0.55%, but the number of sub- and allergic dermatitis cases increased by 0.63% and 2.46%, respectively. The chronic allergic skin condition known as eczema or atopic dermatitis is often accompanied by inflammation. The disease is genetic and is the second most common in dogs (Griffin & DeBoer, 2001). Pododermatitis is an inflammatory process that occurs on the animal's limbs: paw pads, interdigital space, nail bed, and other similar areas. In an extensive study of 3,864 dogs (Rakha et al., 2015), dermatological problems were detected in 662 cases, of which 17.1% of patients were sick. The annual prevalence of diseases in 18 diagnostic categories among insured dogs in Japan was highest for dermatological disorders (22.6% for females and 23.3% for males) (Inoue et al., 2015). In 25% of military dogs after military deployment, the most common diseases or injuries were related to the dermatological system (Takara & Harrell, 2014).

The physical health of a service dog is greatly impacted by the musculoskeletal system, as even minor conditions can lead to the animal's unfitness to perform its duties and the potential for early retirement. In our analysis, four pathologies were significant: arthritis, bursitis (hygroma), hip (balloon) osteoarthritis and dysplasia. A total of 63 cases were detected compared to 43 in 2021. Comparison of the frequencies of the two studies using Fisher's exact test shows no significant differences between them: p (no assoc.) = 0.524. Around 3% of joint diseases are caused by arthritis. In the 2024 study, the maximum increase in coxarthrosis was found from 0.24 to 2.05%.

In other studies ,up to 69% of police dog cases are attributed to lameness (Evans et al., 2007; Worth et al., 2013). The prevalence of osteoarthritis in the UK dog population over a one-year period was 2.5% (CI_{95} – 2.4–2.5%). The literature reports conflicting estimates of the prevalence of this disease. Based on primary care data, estimates range from 6.6% to 20.0%. Radiographic and clinical findings from North American studies have shown age-specific prevalence rates ranging from 20% in dogs over one year of age to 80% in dogs over eight years of age (Anderson et al., 2018). Osteoarthritis of the hip is very common in large police dog breeds such as German Shepherd and Labrador and is not only seen in older animals (Alves et al., 2020). According to a study on 123 young dogs, 39.8% had osteoarthritis in their joints, and 16.3% and 23.6% had a moderate or mild condition, respectively, depending on their pain threshold (Enomoto et al., 2024). A study of 203 police German Shepherds in the emergency department of the University of Pennsylvania Veterinary Hospital showed that orthopedic problems were significantly more common than in domestic shepherds (Parr & Otto, 2011). These studies are important because they point to an important problem in the formation of the contingent of dogs in handler dog centers, where today the majority of animals are German Shepherds and the main activity is associated with constant movement.

Parasitic disease risk decreased by 2.67% even though there was an increase in negative factors related to using police dogs under martial law. Among the pathologies, toxocariasis was the most commonly detected disease (2.37% (+1.22% by 2021), and the maximum reduction was in babesiosis (–1.12%). Other diseases (demodicosis, otodectosis and dirofilariasis) had a prevalence of up to 1%, and lice were not recorded at all. The Kruskal-Wallis test for comparison of medians shows no statistically significant differences between the samples (P = 0.855).

Protozoan parasites, such as *Babesia canis*, *Hepatozoon canis*, and *Ehrlichia canis*, transmit tick-borne infection, which is one of the most common diseases in dogs. Studies conducted in China have shown that the prevalence of *Babesia* spp. in dogs ranged from 1.2% to 11.3% (Xu et al., 2015), in India from 10.9% to 19.1% (Mittal et al., 2019) and in Nigeria 61.1% (Adebayo et al., 2016). Parasitic pathologies are quite common among police and military dogs. The results of screening 242 blood samples from police dogs in Egypt showed that 62 were positive for *B. vogeli* infection, of which 51 cases were German Shepherds and 10 cases were Malinois. Of these, 54 were male dogs and 36 cases were classified as severe. Of the 62 positive *Babesia* blood samples, 45.2% were positive for *E. canis* infection (Zaki et al., 2021). Military working dogs face a greater risk of being infected with vector-borne pathogens due to their kenneling and regular contact with vectors of infectious disease. To assess the level of infectious disease centrioles in clinically healthy dogs of the Austrian Armed Forces, 94 animals were examined. *Babesia canis* DNA was detected in six animals. The prevalence of *B. canis* in this study was only 6.4%, which can be considered low to moderate compared to other European countries (Solano-Gallego et al., 2016; Sonnberger et al., 2021). For example, in Poland, a prevalence of *B. canis* of 25.3% was found in 82 sled dogs that were also kept out-

doors (Welc-Faleciak et al., 2009). Military dogs in Portugal had a seroprevalence of 7% out of one hundred tested (Alho et al., 2016). Seropositive dogs (19.8% of 197 dogs tested) without any clinical signs were found in a study in Romania. The sampling area was found to have a high prevalence of *B. canis* infection, which is a significant pathogen for the local dog population (Imre et al., 2013).

The other 9 categorical variables were analyzed through a basic statistical analysis, which only determined the average and maximum values. In these groups, 207 records were found for 28 diseases. In 2024, there was no record of diseases like paraproctitis, obesity, skin staphylococci, and ehrlichiosis, and they were detected only once in the previous study. In 2021, the following indicators were obtained: 191 records of 32 pathologies . Among the most common pathologies in 2024 were tumors and bronchitis – 23 cases each. Compared to 2021, the largest increase was found: for bronchitis 12, heart failure 11, laryngitis 10 and vitamin deficiency 6 cases. The largest reduction in the number of pathologies was recorded: urolithiasis 10, cystitis and adenovirus – 9 each, and allergy 7 cases. In total, the largest increase of 22 cases in 2024 was recorded for the group of respiratory system diseases, and the largest decrease of 19 cases was recorded for the group of kidney and urinary tract diseases.

It should be pointed out that there is another aspect of the morbidity analysis that needs to be considered. During the reporting period, 929 cases of diseases were detected in 819 dogs. This means that at least 103 cases were repeated or some animals had two or more pathologies at the same time. In the initial case, we encounter two or more diseases that occur sequentially within a short period of time, typically with distinct etiologies and pathogenesis. In the second case, we are talking about multimorbidity. Polymorbidity is the presence in an individual of several diseases that have a synchronous course in different phases and stages of their development, both related and unrelated to each other by pathogenesis and genetics (Jakovljević & Ostojić, 2013; Chiang et al., 2018). The presence of such pathological conditions has serious negative consequences. Firstly, the duration of work of such dogs is reduced due to the increased time for treatment; secondly, they require additional care and veterinary services; thirdly, their physical and psychological condition does not allow them to fully perform their duties. As a rule, such animals are retired from service. A study conducted by Levchenko & Fasolja (2008) revealed that service dogs at the Interregional Center of Cynology (Zhytomyr) have a high prevalence of multiple internal pathologies. Multiple internal pathology is registered in 12–48.5% of dogs of working breeds. It is especially evident in elderly dogs, when the following pathologies can be combined: non-inflammatory skin diseases, cardiopathies, chronic diseases of the respiratory tract, oral cavity, liver, kidneys and urinary tract, central nervous system diseases, tumors, etc.

To assess polymorbidity, we used an indicator that shows the number of diseases per dog: I = nincidence/ndog. The value of I24 in our study was 929/819 = 1.13, while the value of I21 in the previous study was 866/853 = 1.02. The proportion of animals older than 5 years increased from 38.6 to 44%. For dogs that were on rotation, these indicators had the following values: 24.2 and 23%, respectively, and there were 1.45 to 2.50 pathologies per dog (mean 1.77), which significantly exceeded the I24 indicator. The number of diseases associated with stress, musculoskeletal disorders (arthritis) and limb injuries increased significantly, i.e. the reasons for the increase in multiple pathologies and polymorbidity were two factors: the age of the dogs and participation in special tasks in the de-occupied territories.

Conclusion

The National Police of Ukraine's dog training centers had an average of 37.2 dogs per center in 2024, up from 34.1 in 2021. The two most dominant breeds of shepherds were German and Belgian, with 84.5% of the population. The number of search and special dogs decreased by 5.3%, but the number of reserve animals increased by 7%.

Traumatic injuries were responsible for 15.6% of all dog injuries, and their share decreased by 0.6% in three years. In this group, every tenth case was related to wounds, among which paw injuries increased from 0.231% to 2.48%. Among the diseases, the most common were lesions of the gastrointestinal tract (20.8%). Cataracts and otitis media were the most common among diseases of the eyes and ears. Skin diseases had a declining trend: the number of dermatitis decreased by 2.09% and eczema by 0.55%. In the category of diseases of the musculoskeletal system, arthritis was the most common, and the maximum increase was recorded for coxarthrosis and bursitis. Toxacarosis and babesiosis were the most common parasitic diseases. A 10.8% increase was observed in polymorbidity and multiple pathologies due to the presence of service dogs on the contact line and in de-occupied territories.

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