

Hands-on Science

Science Education and Sustainability

ISBN 978-84-8158-971-9

Edited by

Manuel Filipe Pereira da Cunha Martins Costa, University of Minho, Portugal

José Benito Vázquez Dorrío, University of Vigo, Spain

Salmon Landi Jr., Instituto Federal Goiano, Brazil



Universidade do Minho

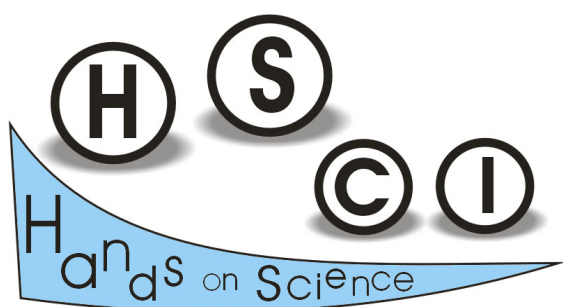
Universidade de Vigo



INSTITUTO
FEDERAL
Goiano

The Hands-on Science Network





Copyright © 2024 HSCI

ISBN: 978-84-8158-971-9
Legal Deposit: VG 366-2024

Printed by: Copissaurio Repro – Centro Imp. Unip. Lda. Campus de Gualtar, Reprografia Complexo II, 4710-057 Braga, Portugal
Number of copies: 400
First printing: September 2024
Distributed worldwide by the *Associação Hands-on Science Network* - contact@hsci.info
Full text available online (open access) at <http://www.hsci.info>
The papers/chapters published in this book are exclusive responsibility of the authors.

Please use the following format to cite material from this book:

Author(s). Title of Chapter. Hands-on Science. Science Education and Sustainability. Costa MF, Dorrió BV, Landi Jr S, (Eds.); Hands-on Science Network, 2024, Page numbers.

The authors of this book and the Hands-on Science Network, none of them, accept any responsibility for any use of the information contained in this book.

All rights reserved.

Permission to use is granted if appropriate reference to this source is made, the use is for educational purposes and no fees or other income is charged.

Acknowledgments:

The HSci2024 conference was financed in part by the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior - Brasil (CAPES) - Finance Code 001

The HSci2024 conference was financed in part by the Fundação de Amparo à Pesquisa do Estado de Goiás (FAPEG)

The HSci2024 conference was financed in part by the Conselho Nacional de Desenvolvimento Científico e Tecnológico (CNPq) - Processo: 441323/2024-3

The War vs. COVID-19 Lockdown: Compare of Impact on Foreign Students' Performance in Studding of Medical Informatics in TNMU

A Semenets, D Vakulenko
I. Ya. Horbachevsky Ternopil National
Medical University, Ternopil, Ukraine
semteacher@tdmu.edu.ua

Abstract. The current challenges to the system of medical education in Ukraine are noted. The process of development and deploying of distance learning components in educational process at the I. Horbachevsky National Medical University in Ternopil (TNMU) is shown. The key elements of implementation of full-scale distance education workflow at TNMU during the COVID-19 lockdown as well as since 2022 full-scale military invasion in Ukraine are presented. The distance education features of teaching of Medical Informatics and Biostatistics course at TNMU are noted. The experience gained during both latest implementation of full-scale distance education at TNMU is presented. The comparative analysis of students' performance in studding of Medical Informatics and Biostatistics course during both latest fully distance educational periods are presented. Contributions of real-time online communication together with safe environment in better students' learning results under distance education mode are shown.

Keywords. Medical Education, War Threats, COVID Lockdown, Distance Education, Comparative Analysis, Medical Informatics, Students' Performance.

1. Introduction

The system of medical education in Ukrainian is combine high quality and relative affordability comparatively to high-developed countries, and therefore attracts thousands of native and foreign medical students each year [1]. The I. Horbachevsky National Medical University in Ternopil has a fair reputation as educational institution with high quality and prominent reliability of educational services [2]. For years, there was a strong tendency for the number of international students in TNMU to increase, due

to factors such as the development of academic mobility and exchange programs, the optimization of enrollment procedures and wide spread of information on overall education quality.

Unfortunately, steady development on medical education process in Ukraine as well as in TNMU has been disrupted twice in recent years. Like in the most other countries, for substantial portions of 2020 and 2021 educational process in Ukraine had been delivered in fully Distance Education (DE) mode because of lockdown measures, caused by SARS-CoV-2 pandemic [3-4].

The beginning of the military aggression by the Russian Federation on February 24th, 2022, cause even bigger disruption for educational process, because the direct conduct of hostilities, and the launching of missile strikes on the Ukrainian territory induced the introduction of martial law and the temporary suspension of tuition at all levels of education. Nevertheless, tuition has been resumed since March 14, 2022 in online format to Ukrainian and foreign students. Although all medical universities had the experience of the full DE learning mode due to the SARS-CoV-2 pandemic, teaching under war conditions revealed specific features: clinical encounters and formal assessments have been largely suspended or cancelled entirely and most of the international students have returned to their home countries [5-7].

The aim of paper is to present results of comparative analysis of performance of international students in learning of Medical Informatics using DE technologies during COVID-19 pandemic lockdown and after full-scale Russian invasion begins respectively.

2. Organization of distance education process at TNMU

Distance Education technologies were used in TNMU since 2006 when LMS Moodle was introduced to evaluate the results of students' self-preparation for practical classes. Scope of the DE usage were constantly extended during next years with employing of more advanced communication technologies services and frameworks, especially Microsoft Office 365 and Google Workspace for Education [3-4, 8-10]. Up to now, Google Suite platform provides

corporate e-mail service for TNMU and being used as a centralized user authentication tool for all TNMU information services.

During the COVID-19 lockdown of 2020 in Ukraine and late in 2021 under constant COVID-19 pandemic restrictions, all available in the TNMU distance learning services and capabilities have been used on a full scale [3-4] to implement combined synchronous and asynchronous components of distance learning environment and give students abilities to:

- use training materials posted on the LMS Moodle platform web-site (<https://moodle.tdmu.edu.ua>) for training;
- submit their assignments in electronic form through Moodle activities like “workshop”, “assignment”, etc.;
- watch educational videos and video-lectures on teachers’ YouTube channels (as per example <https://bit.ly/2Mzj7j3>).
- communicate with teachers through Google services (texting via Gmail / Chat, and having video-conversations via MS Teams).

Synchronous DE activities additionally have included online MS Teams meetings for each scheduled classes to facilitate students productivity. MS Teams meetings were also used for implementing an “oral” part of exams in addition of test assessment using Moodle quizzes.

3. Teaching the Medical Informatics course at TNMU

The “Medical Informatics” (MI) course at TNMU was introduced in 1997. For two decades, MI course at TNMU was offered to the 2nd year students of the medical faculty. The amount of educational hours as well as an exact content was constantly adjusted accordingly to the official requirements as well as experience of faculty teachers. Since 2021 it has been taught to the 1st year students under the title “Medical Informatics and ” and includes 14 hours of lectures, 32 hours of practical classes and about 60 hours assigned to self-guided work as before. It is important to mention that the MI course has been designed as a “blended” course since LMS Moodle inception at TNMU (<https://moodle.tdmu.edu.ua/course/view.php?id=403>). Some experience of teaching of the MI course in both “blended” and fully distance

modes as well as important course details has been presented already [3-4, 11].

It is important to admit that TNMU uses a common Ukrainian academic grading system with 12 levels of students’ achievements, where “4” is a minimal positive grade. According to TNMU’s rules, each student must be graded for each practical class. In case of absence of an exam – an average for all grades has been calculated and used as a final grade for course.

4. An analysis of foreign students’ performance in MIB course studding

The analysis of results of teaching the Medical Informatics and Biostatistics course to foreign students is used to asses a possible difference practical outcomes of migrating from the blended education model to full scale DE workflow under the following circumstances:

- enforcing of the national lockdown caused by COVID-19 pandemic since March 20, of 2020 which mostly affects students of 2019/20 academic year;
- introduction of martial law caused by the military aggression of the Russian Federation since February 24th, 2022 which affects all students since 2021/22 academic year.

The beginning of the military aggression by the Russia on February 24th, 2022, the direct conduct of hostilities, induced the introduction of martial law and the temporary suspension of tuition at all levels of education. After a two-week break, starting from March 14th, the training has continued in a DE format. Although previous experience of DE during SARS-CoV-2 pandemic, teaching in war conditions revealed its own features. Despite the provisions of the Geneva Convention, healthcare as well as educational facilities remain a separate military target, which causes casualties among staff [12]. Such as the safety of students is the top priority, most foreign students in Ukraine had returned to their home countries and continued studding in online mode.

4.1. Collected data

During the 2019/20 academic year 184 foreign students in 14 groups were taught of MI course. The average scores achieved by students during the blended part (topics 1 to 10)

of the MIB course is shown on Fig. 1. Fig. 2 presents the average scores for the full scale DE part of MIB course during March / May of 2020 (6 topics). Finally (Fig. 3) - the total MIB course average scores is shown.

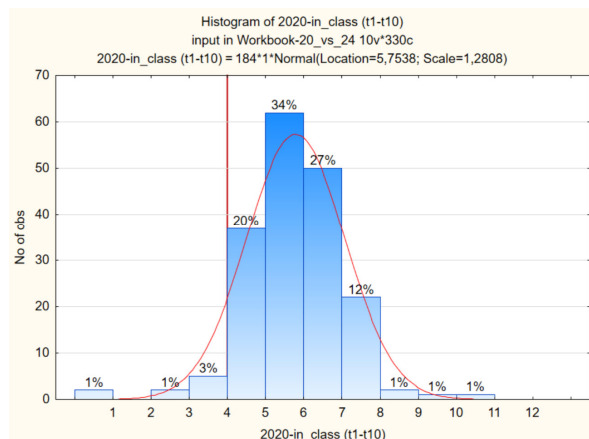


Figure 1. Students' average score for the blended part of the MIB 2019/20 course (topics 1-10)

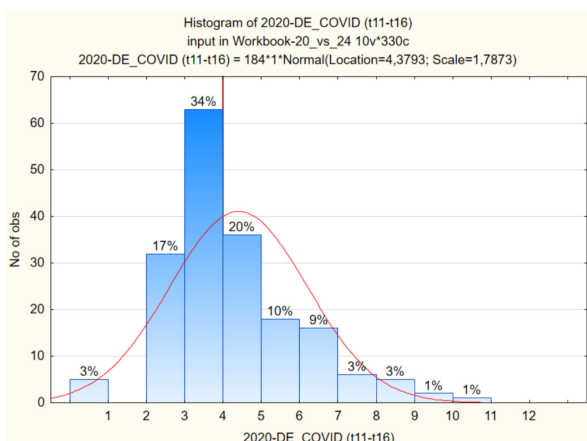


Figure 2. Students' average score for the DE part of the MIB 2019/20 course (topics 11-16)

During the 2021/22 academic year 330 foreign students in 26 groups were taught to MI course by the authors. By the date of starting of military invasion most of students have completed 8 topics of the MIB course. Therefore, the following charts (Fig. 4 - Fig. 6) presents average scores achieved by students during the blended and full DE parts of the MIB course as well as the course total average scores respectively.

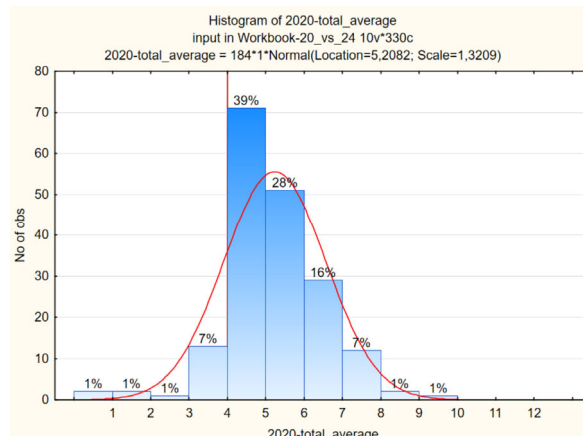


Figure 3. Students' total average score for the total MIB 2019/20 course (adjusted)

4.2. Comparative analysis

Initial assessment of the above charts shows a significant difference in students' performance after transition to the full DE mode, especially for 2019/20 academic year case. To visualize this assumption more clearly, tree combined distribution plots were built (Fig. 7-Fig. 9).

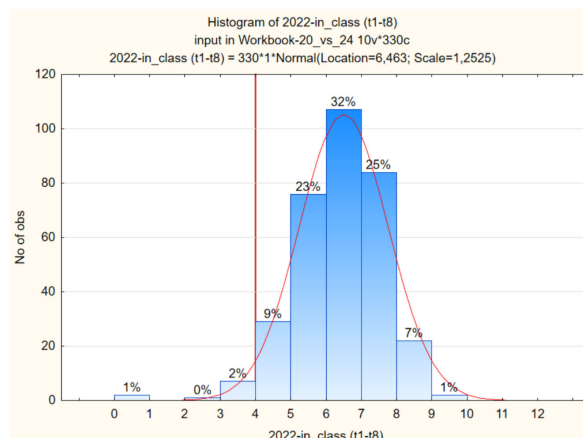


Figure 4. Students' average score for the blended part of the MIB 2021/22 course (topics 1-8)

All distribution plots confirms difference in students' average scores with most notable positive skew in the students' performance in 2021/22 academic year during DE part leaning (Fig. 8). Statistical hypothesis testing was employed to prove that observed differences are significant. Non-parametric statistic methods were used because samples' composed by grade scores represents an ordinal variable type. Authors decided to use both Mann-Whitney U Test (Table 1) and Wald-Wolfowitz

Runs Test (Table 2) at the same time expecting more reliable result.

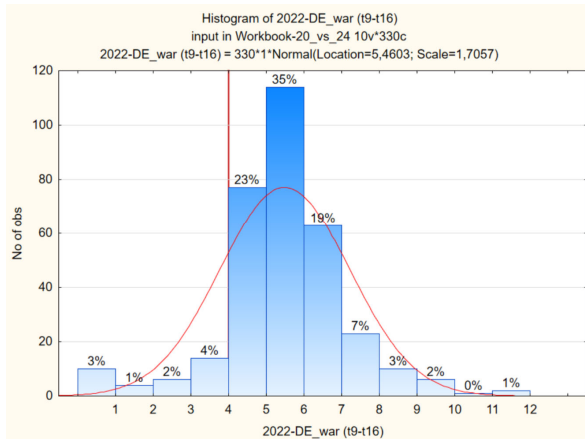


Figure 5. Students' average score for the DE part of the MIB 2021/22 course (topics 9-16)

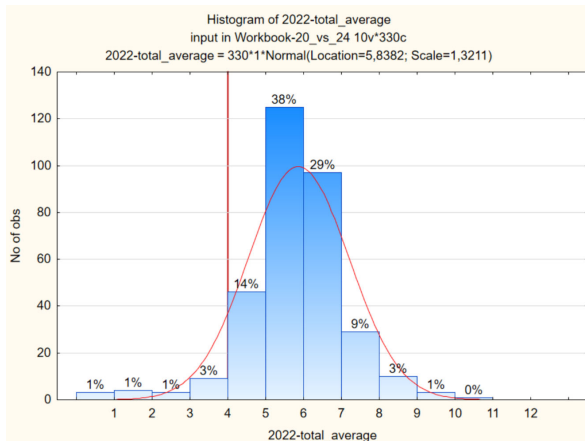


Figure 6. Students' total average score for the entire MIB 2021/22 course

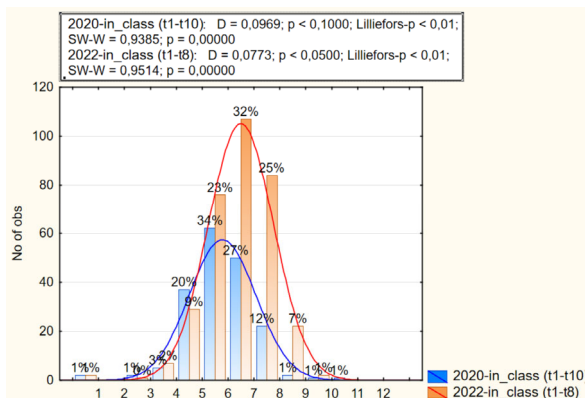


Figure 7. Comparing of distributions of students' scores for the blended part of the MIB course during 2019/20 and 2021/22 academic years

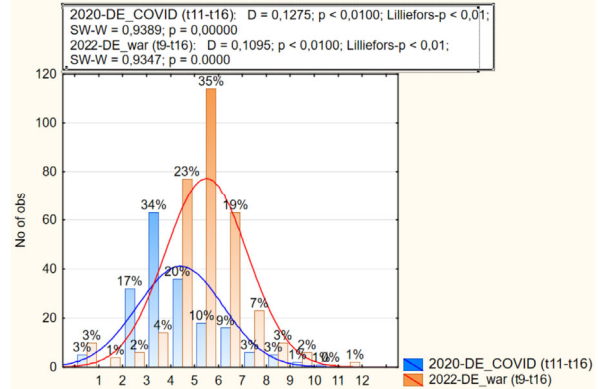


Figure 8. Comparing of distributions of students' scores for the DE part of the MIB course during 2019/20 and 2021/22 academic years

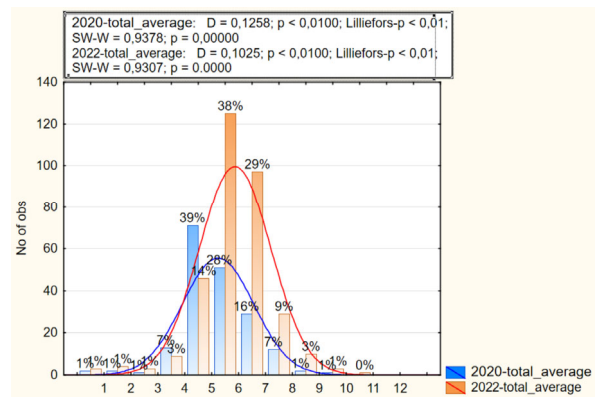


Figure 9. Comparing of distributions of students' total average scores on the MIB course during 2019/20 and 2021/22 academic years

Table 1. The results of the Mann-Whitney U test for statistical hypothesis

Variable	DE
Rank Sum (Group 1)	33853,50
Rank Sum (Group 2)	98501,50
U	16833,50
Z	-8,37897
p-value	0,000000
Z (adjusted)	-8,38152
p-value	0,000000
Valid N (Group 1)	184
Valid N (Group 2)	330

The values of Z-scores from both tests were used to make a conclusion. Obtained values are less than critical ($Z_c = 1,65$) for both methods, so H_0 (states of no difference between samples' means) has to be rejected in favor of H_1 which indicates presence of significant differences in samples' means. All tests proven to be significant with p well below 0,05.

Table 2. The results of the Wald-Wolfowitz Runs test for statistical hypothesis

Variable	DE
Valid N (Group 1)	184
Valid N (Group 2)	330
Mean (Group 1)	4,3793
Mean (Group 2)	5,46030
Z	-7,71090
p-value	0,000000
Z adjstd	7,662866
p-value	0,000000
No. of (Runs)	157
No. of (ties)	117

4.3. Discussion

The following main outcomes are found after the source data and the corresponded charts (Fig. 2-Fig. 9) and results of statistical hypothesis testing have been studied:

- migration from the blended mode to the full-scale DE workflow in 2019/20 academic year was a very difficult process: grades fell down for all students significantly (Fig. 1, Fig. 2). About half of students (85 of 184 or 48%) failed to earn even a minimal positive average grade (“4”) for topics were taught during DE part of course;
- consequently, general performance of students in the MIB course was quite low in 2019/20 (42% of them barely managed to earn credits with grades just above a minimal positive);
- by contrast, migration the full-scale DE workflow in 2021/22 academic year looks better. Day-to-day students’ performance (Fig. 4, Fig. 5) becomes closer to values were recorded in the past during blended mode (Fig. 2);
- general performance of students in the MIB course was better in 2021/22 as well. Only 14% Number of those who earned credits with grades just above a minimal positive dropped to only 14% (compare to 39% in 2019/20);
- finally, number of successful students (with average grade above “8”) grown significantly form 2% in 2019/20 to 4% in 2021/22.

It is important to admit, that detailed analysis of students’ performance in the MIB course

under COVID-19 lockdown measures was conducted by authors and published [3-4].

Obtained outcomes with better performance of international students in 2021/22 academic year compare to those in under COVID-19 lockdown in 2019/20 are considered as correct and had been expected by authors. There are few factors, which contribute to it:

- although war conditions are extremely devastating for Ukrainians, international students in 2021/22 academic year were given comfortable DE environment upon returning to their home countries or being evacuated to safe locations in EU countries. Factor of safety played a key role in success of DE part on learning process;
- introduction of regular online videoconferences as mandatory component of process of DE in TNMU since 2020/21 academic year boost educational outcomes significantly for such mostly theoretical disciplines like Medical Informatics and Biostatistics;
- finally, continuous usage of DE components in educational process since 2020 stimulates students to develop and improve necessary self-education, computer and communication skills to be able to deal with online educational environment.

5. Conclusion

The importance of readiness for comprehensive distance learning processes in high medical education is admitted. This is illustrated by the current challenges to the system of medical education in Ukraine are noted. The process of development and deploying of distance learning components in educational process at the I. Horbachevsky National Medical University in Ternopil (TNMU) is shown. The key elements of implementation of full-scale distance education workflow at TNMU during the COVID-19 lockdown as well as since 2022 full-scale military invasion in Ukraine are presented. The distance education features of teaching of Medical Informatics and Biostatistics course at TNMU are noted. The experience gained during both latest implementation of full-scale distance education at TNMU is presented. The analysis of students’ performance in studding of Medical Informatics and Biostatistics course during latest fully

distance educational period caused by war threats in compare to previous one induced by COVID-19 pandemic are presented. Contributions of real-time online communication together with safe environment in better students' learning results under distance education mode are shown.

6. References

- [1] Ukrainian Medical Council. Medical Education in Ukraine. Available from: <https://mcu.org.ua/medicinskoe-obrazovanie-v-ukraine/?lang=en>
- [2] Ternopil National Medical University leads the Ukrainian and world rankings of higher education institutions (in Ukrainian). <https://moz.gov.ua/uk/ternopilskij-nacionalnij-medichnij-universitet-lidirue-v-ukrainskih-i-svitovih-rejtingah-zvo>
- [3] Semenets, A., & Vakulenko, D. A Year of the COVID-19 Lockdown: Comparative Analysis of Distance Learning Approaches in TNMU. Hands-on Science. Science Education. Challenges and Opportunities of Distant and Online Teaching and Learning. Costa MFM, Dorrío BV (Eds.), 106-110, Braga, Portugal, 2021.
- [4] Semenets, A., Vakulenko, D., & Berezovska, I. Education during the COVID-19 Lockdown: Does the Pandemic Extend the Scope of Distance Learning? Hands-on Science. Science Education. Discovering and understanding the wonders of Nature. Costa MFM, Dorrío BV (Eds.), 165-169, Vila Verde, Portugal, 2020.
- [5] Dobiesz, V. A., Schwid, M., Dias, R. D., Aiwonodagbon, B., Tayeb, B., Fricke, A., ... & Erickson, T. B. (2022). Maintaining health professional education during war: A scoping review. *Medical Education*, 56(8), 793-804.
- [6] Fontanarosa, P. B., Flanagan, A., & Golub, R. M. (2022). Catastrophic health consequences of the war in Ukraine. *Jama*, 327(16), 1549-1550.
- [7] Sarkar, S. (2022). *Medical students escape war torn Ukraine but face limbo*. *BMJ* 377 (pp. 908).
- [8] Semenets A. (2017). On the LMS Moodle configuration for the "Higher Mathematic», course assessment. *Medical Education*, 2017, 1, 112-117 (in Ukrainian).
- [9] Semenets, A. V., Vakulenko, D. V., Martsenyuk, V. P., Kravets, N. O., Sverstyuk, A. S., Klymuk, N. J., Kuchvara, A., & Kutakova, O. V. (2018). LMS Moodle capabilities for preparation of educational materials for chemical and pharmaceutical courses. *Medical Education*, 4, 172-177 (in Ukrainian).
- [10] Semenets, A., Martsenyuk, V., Vakulenko, D., & Berezovska, I. The Experience of Using the Moodle LMS Scheduler Plugin to Control the Appointment Management. Hands-on Science. Innovative Education in Science and Technology. Costa MFM, Dorrío BV, Minakova K (Eds.), 58-61, National Technical University "Kharkiv Polytechnic Institute", Kharkiv, Ukraine, 2019.
- [11] Semenets, A. V., Martsenyuk, V. P., Vakulenko, D. V., Kravets, N. O., Sverstiuk, A. S., Klymuk, N. J., & Kuchvara, O. M. (2016). On the usage of the EMR MIS for the Medical Informatics course studying. *Medical Education*, 1, 94-100.
- [12] Insecurity Insight. Violence Against Health Care in Ukraine, 24 February-18June 2022. <https://data.humdata.org/dataset/ukraine-data-on-attacks-on-aid-operations-education-health-and-protection>