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## Difficulties in Accessing the List and Full Text of the Defended PhD Theses from Medical Schools: a Retrospective Case Study from Croatia

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### Abstract

**Objective.** To conduct scientometric studies on PhD (“Doctor of Philosophy”) theses (i.e., doctoral theses), researchers should be able to access the theses. We aimed to explore how to obtain a list and full text of the defended PhD theses from medical schools in Croatia over 30 years (from the beginning of 1992 to the end of 2021). **Methods.** We tried to obtain information from the Croatian Bureau of Statistics, the National and University Library in Zagreb (NSK), universities, medical schools and online repositories. **Results.** We could not find a single list (source) of all PhD theses. Based on 4 different sources (website of the University of Zagreb and Medical School in Rijeka; school administrator from Split; library catalog from Osijek), we gathered information that from the beginning of 1992 to the end of 2021, there were 2955 PhD theses defended at medical schools in Croatia – 357 in Osijek, 550 in Rijeka, 337 in Split and 1711 in Zagreb. In May 2022, the online Croatian Digital Dissertations Repository contained 631 (22%) of full-text theses in Portable Document Format (PDF). University of Zagreb School of Medicine has its own repository that holds the full text of 834 (49%) of their PhD theses. One of the three PhD programs of the University of Split School of Medicine, namely Translational Research in Biomedicine (TRIBE), published full texts of all PhD theses defended at that program on its website. NSK held 2650 (90%) of the theses in a printed version. **Conclusion.** It was extremely challenging to access the list and full texts of doctoral theses defended in Croatia. Making PhD theses publicly available would ensure transparency and enable analyses that should improve scientific policy.

**Key Words:** Theses ▪ PhD ▪ Doctorates ▪ Medical Education ▪ Scientometrics.

### Introduction

Completion rates and time-to-degree of PhD (“Doctor of Philosophy”) programs (i.e., doctoral programs) are crucial metrics for tracking the supply and demand of researchers in the academic labor market and assessing the efficacy and efficiency of PhD education (1-3). High attrition, low completion rates, and a lengthy time-to-degree have a detrimental impact on the return on investment in PhD education (4), from a cost-effective economic point of view of funders, institutions, and supervisors and an effective career path perspective of a student (5). Time-to-degree and completion rates

have been the conventional metrics for evaluating the effectiveness of PhD education programs. However, it is difficult to find data on the topic, particularly for European PhD programs, because such information is rarely disclosed, whether at the institutional, discipline, or national level (6).

Beyond analyses of PhD completion rates, time to degree, and factors influencing them (6, 7), the PhD theses can be the subject of various scientific analyses. Examples of such studies include assessing the PhD thesis’ quality of writing (8), bibliometric profile (9), research methodology (10), publication output, article/journal impact of the manuscripts published from the theses (11), and theses submission rules (12, 13), among other topics.

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However, to conduct any studies on PhD theses, researchers should have easy access to the list of defended theses from the targeted institution(s) and access to the full text of the thesis. In 1991, Breimer and Mikhailidis proposed that PhD theses should be made publically and easily available [quote]: “to allow audience participation, the theses must be freely available to the scientific community” (14). Breimer and Mikhailidis proposed that a free International Thesis Journal should be established (14). In 1989, a British scientist, Tim Berners-Lee, invented the World Wide Web (WWW), while working at the European Organization for Nuclear Research (CERN). On 30 April 1993, CERN made the source code of WWW available on a royalty-free basis, making it free software and thus creating the world’s first web browser and editor. This emerging information network developed into the Internet as we know it today (15). In 1995, Lars H. Breimer and Douwe D. Breimer observed that doctoral theses represent a largely inaccessible mine of useful information and suggested that doctoral theses should be made freely available through the Internet (16). One would expect that nowadays, all PhD theses would be easily retrievable online.

As researchers, we were interested in conducting bibliometric studies on biomedical PhD theses defended in medical schools in Croatia. However, we were not aware of whether there are repositories or similar sources where one could easily find a full list and full texts of such PhD theses.

In this study, we aimed to explore how to obtain a list and full text of the defended PhD theses from medical schools in Croatia.

## Methods

### *Study Design*

This was a retrospective study.

### *Ethics*

The study protocol was approved by the Ethics Committee of the University of Split School of Medicine. The study was conducted in line with all the applicable ethical codes and laws.

### *Data Collected*

We searched for a list and full texts of defended PhD theses in medical schools in Croatia (in Osijek, Rijeka, Split, and Zagreb) over 30 years (from the beginning of 1992 to the end of 2021).

### *Information Sources*

To obtain the list of targeted PhD theses, we contacted the Croatian Bureau of Statistics, the National and University Library in Zagreb, universities and medical schools. To access full texts of defended PhD theses, we searched the online Croatian Digital Dissertations Repository (<https://dr.nsk.hr/en>; last accessed February 12, 2024) of the National and University Library in Zagreb (NSK), which publishes Master of Science (MSc) and PhD theses uploaded by institutions. The Repository has the English version of the website and various search functionalities, including the option to search for the type of thesis (MSc vs PhD thesis), search per author, per institution, etc. We also analyzed the websites of universities and medical schools. The search for information was conducted from May to December of 2022.

### *The Croatian Bureau of Statistics Does Not Share Any Data due to Personal Data Protection*

The first logical place to look for information about the defended PhD theses was the Croatian Bureau of Statistics because each student completing any kind of thesis needs to fill out a detailed statistical form that needs to be sent to the Bureau. The information available on the website of the Croatian Bureau of Statistics was not helpful for our aim. Namely, the Croatian Bureau of Statistics publishes annually on its website the number of PhD students enrolled in each school and an aggregate number of defended PhD theses for each university. The Bureau’s decision to publish just the number of enrolled students per school and the number of defended PhD theses per university prevents any estimates about the PhD completion rates of individual schools. When we contacted the

Croatian Bureau of Statistics via email to ask for data, they responded that they are unable to share any data about defended theses with us due to personal data protection issues, i.e., GDPR (General Data Protection Regulation).

### *National and University Library in Zagreb Does Not Have All PhD Theses Defended in Croatia*

NSK is the national bibliographic center of Croatia, and when students defend their PhD thesis, they used to be obliged to print one copy to be sent to the NSK. However, by searching the NSK catalogue (<https://katalog.nsk.hr/F?RN=233152322>; last accessed February 12, 2024) we were unable to retrieve the information we were looking for. Namely, their catalog does not allow user-friendly search for PhD theses. There is a drop-down menu available in the online search of the NSK catalogue, but it does not offer any type of thesis to be chosen as an information source. When contacted via e-mail, NSK responded that they do not have a systematized list of all defended theses in medical schools in Croatia. They also indicated that they could not guarantee that their catalog of PhD theses contains all PhD theses defended because the institutions were legally obliged to deliver one copy of a PhD thesis to the NSK only from 2013. They indicated that the most complete and relevant results should be obtained from universities and schools themselves. When we asked NSK to export for us the list of the PhD theses that they have received from medical schools, we received information that this is a paid service that costs 13.20 EUR per hour, but that they can send us instructions on how to search their catalog by ourselves. One of the authors (MT) went personally to the NSK to be trained in searching their online catalog.

We considered analyzing PhD theses stored as printed copies in the NSK. The information on the NSK website indicated that a maximum of 10 records could be borrowed to be studied at once, and for each one, the reader needs to fill out the request form. This means that it would be an extremely burdensome and long-term process to try

to analyze full texts of theses deposited in NSK if one can borrow only 10 theses per day and fill out a paper form for each of the thesis analyzed.

### *Searching Institutional Websites*

Institutional websites of the School of Medicine in Osijek published a series of Portable Document Format (PDF) files for each academic year from 2010/2011 onwards (<https://www.mefos.unios.hr/index.php/hr/doktorski-radovi-u-postupku>; last accessed February 12, 2024). For each defended thesis, the list includes the name of the PhD holder, date of defense, thesis title and the name of the mentor. Medical School in Rijeka publishes a list of defended PhD theses divided into sections per decade and years (<https://medri.uniri.hr/znanost/obranjeni-doktorati/>; last accessed February 12, 2024). The information provided includes the name of the PhD holder, date of defense and thesis title. However, the website did not allow for a simple download of the information.

At the time when the study was conducted, the University of Split School of Medicine had three PhD programs, whereas each published a full or partial list of defended PhD theses. Those programs were: Biology of Neoplasms (<https://mefst.unist.hr/studiji/doktorska-skola/biologija-novotvorina/bn-doktorati/4833>), Evidence-Based Medicine (<https://mefst.unist.hr/studiji/doktorska-skola/ebm-98/ebm-doktorati/4791>) and Translational Research in Biomedicine – TRIBE (<https://mefst.unist.hr/studies/graduate-school/tribe/defended-theses/1812>). All three websites were last accessed on February 12, 2024. For each thesis, those websites publish information about the name of the PhD holder, date of defense, thesis title, name of the mentor, and list of published articles that were published to qualify for thesis defense.

The University of Split School of Medicine contained only a partial list of defended PhD theses on their website. The School currently has three PhD programs. One of the programs, namely Translational Research in Biomedicine (TRIBE), contained the full list of PhD theses defended in that program. The other two PhD programs

contained a partial list of PhD theses defended at those programs. Furthermore, the University of Split School of Medicine has had in the past another PhD program, which was closed in the meantime, and some students defended their PhD theses based on publications, without the need to enroll in the PhD program at the University of Split School of Medicine. Thus, even if all three current PhD programs at the University of Split School of Medicine had published on their website a full list of defended PhD theses, that list would not be complete for that School.

When we contacted the administrator of the Postgraduate Education office to obtain the full list of the PhD theses defended at the School, the administrator would only release the list with the permission of the Ethics Committee. Thus, we submitted the study protocol to the Ethics Committee of the University of Split School of Medicine and received its approval.

Subsequently, the administrator from the Postgraduate Education office provided a list of doctoral theses, which contained a full list of PhD holder names, but with a partial list of mentors and without the names of the defended theses.

When the study was conducted, the University of Zagreb had a searchable list of PhD theses defended at the entire university on its website (<https://www.unizg.hr/istrazivanje/doktorski-studiji/promocija-doktora-znanosti/promovirani-na-sveucilistu-u-zagrebu-pretrazivanje/>). This web site was last accessed on May 7, 2022. That website contained a full list of PhD theses defended at all schools of that university. However, that list did not allow for the filtering of theses defended per school. Thus, we first had to retrieve the full list of all PhD theses of the University of Zagreb, and then filter those belonging to the University of Zagreb School of Medicine.

However, at the time of the manuscript writing, that searchable database was no longer available. The only available information that remained on the University of Zagreb website were PDF files listing “books” with the list of PhD theses that were promoted at the University convocation

ceremonies (<https://www.unizg.hr/istrazivanje/doktorski-studiji/promocija-doktora-znanosti/knjige-doktora-znanosti/>). Those “books” contain the following information for each defended PhD theses: a photograph of the PhD holder, name of the PhD holder, thesis title, language of the thesis, research area, short CV of the PhD holder, School name, mentor’s name, names of the thesis defense committee, date of defense, a summary of the thesis in the Croatian language and in the English language.

We also explored the University of Zagreb School of Medicine’s institutional online repository (<http://medlib.mef.hr/>; last accessed February 12, 2024) to see how many full-text theses can be found there. This Repository can be searched in the English language. There is an option to search for a thesis among the literature types; however, it does not allow searching based on the thesis type (<http://medlib.mef.hr/cgi/search/advanced>; last accessed February 12, 2024).

### *Data Analysis*

Descriptive statistics was conducted and data were shown as frequencies and percentages.

### *Raw Data*

All raw data collected within the study are available on Open Science Framework (link: <https://osf.io/hz52g/>).

## **Results**

### *A Single List of Defended Phd Theses in Croatia Does Not Exist*

We were unable to find a single source of information about PhD theses defended in all four Croatian medical schools, neither at the Croatian Bureau of Statistics nor NSK. We had to search multiple information sources to obtain the list of PhD theses (Table 1).

Table 1. Results of Searching Various Information Sources for the List and Full Text of PhD Theses Defended at Medical Schools in Croatia from the Beginning of 1992 to the End of 2021

Information source	Number of PhD theses found via this source	Availability of full-text theses
Croatian Bureau of Statistics	0	Full-text of theses not available in this source
National and University Library in Zagreb (NSK)	2650 theses from all four targeted medical schools (90% of all defended theses)	Paper copies available in the NSK; one can borrow a maximum of 10 thesis per day
Croatian Digital Dissertations Repository	631 theses from all four targeted medical schools (21% of all defended theses)	Portable Document File (PDF) version of the theses available in the repository
Medical School in Osijek website	308 theses defended at Medical School in Osijek from 2010 onwards (86% of theses defended at that School)	Full-text of theses not available on the website
Medical School in Osijek Library Catalogue	232 theses defended before 2015 (65% of theses defended at that School)	Paper copies available in the School Library
Medical School in Rijeka website	550 (all theses defended at Medical School in Rijeka)	Paper copies available in the School Library
University of Split School of Medicine Postgraduate Office	337 (all theses defended at the University of Split School of Medicine)	Paper copies available in the School Library
University of Zagreb website	1711 (all theses defended at the University of Zagreb School of Medicine)	Paper copies available in the School Library
University of Zagreb School of Medicine online repository	834 theses defended at the University of Zagreb School of Medicine (49% of theses defended at that school)	PDF version of the theses available in the repository

### ***National and University Library in Zagreb***

Upon training, our search indicated that NSK has 4616 records for PhD and MSc theses from medical schools in Croatia in their catalog. Some of those records are printed versions of PhD theses, and some records denote CDs containing theses. The catalog lists 2650 printed PhD theses from medical schools in Croatia in the targeted period (from the beginning of 1992 to the end of 2021).

### ***Medical School in Osijek Published a Partial List of Defended Phd Theses on Its Website***

Medical School in Osijek published most PhD theses defended from 2015 onwards in their online repositories. On the School's website, a list of PhD theses published from 2010 onwards was published, and this list includes 308 PhD theses. We manually searched the School's library catalog to extract data about the PhD theses of that school that were deposited in the library before 2015. There were 232 PhD theses in the library catalog that were defended before 2015. By considering all these sources of information, we concluded

that 357 PhD theses were defended at the Medical School in Osijek during the targeted period.

### ***Medical School in Rijeka Published a Full List of Defended Phd Theses on Its Website***

Medical School in Rijeka has a commendable website as it contains the full list of PhD theses defended at that school, from the school's inception to the present time. There were 550 PhD theses defended at the Medical School in Rijeka during the targeted period.

### ***University of Split School of Medicine Published a Partial List of Defended Phd Theses on Its Website***

Since the University of Split School of Medicine published a partial list of defended PhD theses on its website, we obtained the full list of defended theses from the administrator of the Postgraduate Education office. There were 337 PhD theses defended at the University of Split School of Medicine during the targeted period. Upon multiple reminders, we got

the complete information about the doctoral theses defended only at one PhD program.

#### ***University of Zagreb Had a Downloadable List of Theses***

By filtering offline downloaded theses from the searchable database of the University of Zagreb, we isolated the number of 1711 PhD theses defended at the Medical School in Zagreb during the targeted period.

#### ***Medical School in Zagreb Has a Partial Online Repository***

The online repository of the University of Zagreb School of Medicine held PDFs of 834 theses, all defended between 2003 and 2020 (49% of their PhD theses defended between 1992 and 2021).

#### ***Using Multiple Sources to Get to the List and Number of Theses Defended***

Finally, based on the information from the website of the University of Zagreb, the website of the Medical School in Rijeka, the administrator from the University of Split School of Medicine and the library catalog of the Medical School in Osijek, we concluded that from the beginning of the 1992 to the end of 2021, there were 2955 PhD theses defended at medical schools in Croatia – 357 in Osijek, 550 in Rijeka, 337 in Split and 1711 in Zagreb.

#### ***The Online Phd Theses Repository Contains Only 22% of the Targeted Theses***

The online Croatian Digital Dissertations Repository contained 631 (21%) theses defended at medical schools in Croatia from 1992-2021.

#### ***NSK Holds 94% of the Targeted Theses***

The most complete source of targeted theses was NSK, which held 2650 (90%) of all theses.

## **Discussion**

Our case study shows that accessing the list and full texts of PhD theses defended in medical schools in Croatia is very challenging. Using four different sources of information, we came to the number of 2955 PhD theses defended at medical schools in Croatia from 1992 to 2021. However, only one of the Schools had the list of all defended PhD theses available on its website. For the remaining three schools, laborious methods had to be employed to access the list of defended theses, sometimes with partial information. The national online repository of Doctoral and MSc theses contained only 21% of all the targeted theses. Thus, accessing the majority of those theses would involve visiting school or NSK libraries and using laborious manual searching of the theses. It has been posited that academic theses must be publicly accessible for scientific, economic, and ethical reasons (14, 16, 17). Open access (OA) publication of defended theses online has multiple benefits.

Ferreras-Fernández et al. have shown that the OA publication of theses increases their visibility and use and also produces a significant citation rate (18). This is also important for transparency and the prevention of plagiarism. The case study of Ocholla showed that plagiarism could be significantly reduced in academic theses if students were aware that text similarity would be used to verify their work and if they knew that their work would appear on an online OA space/platform (19). The current situation in Croatia with accessing the list of defended PhD theses in medical schools between 1992 and 2021 is troubling.

It is concerning that there is not a single list on the national level of the PhD theses defended and that obtaining this information required so many sources and effort. In October 2022, a new law, the *Scientific Activity and Higher Education Act*, was adopted in Croatia. According to this law, “The holder of the doctoral study is obliged to publish the doctoral thesis within 30 days from the day of the defense in the national repository or the repository of the higher education institution.” It is anticipated that this new legislation will enable

public access to all the future doctoral theses defended in Croatia (20).

Of note, publishing full theses is just the first step towards transparency. The importance of sharing data collected within the theses is also important, as well as meta-data. There is still a long way to go before accepting open data sharing in biomedical research (21, 22). One way to solve it at the level of a doctoral thesis is to require open data sharing concurrent with the thesis, whenever feasible. Furthermore, an important issue is the format in which theses were openly published. For example, PDFs could be searchable or not. Thus, it would be important to ensure the availability of searchable digital formats of doctoral theses.

We would like to emphasize that we spent months trying to obtain data on the defended theses. We experienced similar difficulties earlier when we wanted to study the success rates of PhD programs in medical schools in Croatia. However, the other schools did not want to share those data. Thus, we eventually focused only on the results of the University of Split School of Medicine (6). To our best knowledge, few PhD programs in Croatia have shown a willingness to be transparent about their results (7).

When looking into the published data of the Croatian Bureau of Statistics available on their website, which publishes the number of enrolled students per individual school and the number of defended PhD theses per university, the approximate calculation is that 20% of enrolled PhD students in Croatia have graduated (23, 24). Considering this low success rate, it is possible that Croatian educational institutions are not transparent about their defended PhD theses precisely because they do not want to advertise their subpar results in this segment. Institutions such as the Agency for Science and Higher Education (ASHE), which accredits educational programs in Croatian higher education institutions, could impose rules requiring transparency of success rates and details about the defended theses on publicly available institutional websites.

### *Limitations of the Study*

A limitation of our study is reliance on multiple heterogeneous sources of information that could be possibly incomplete. Thus, we may have missed some PhD theses in our final counts. Furthermore, a limitation of the study could be the subjectivity of the access effort; namely, accessing one or a few doctoral theses on a topic would probably be much less effort than obtaining the entire catalogue or a full-text collection. Also, we aimed to cover the large observation period, which began in the 1990s when digitisation was in its infancy.

### **Conclusion**

Accessing the list and full texts of defended PhD theses in medical schools in Croatia was an extremely challenging and laborious task. More transparency is needed about the defended PhD theses. It is of paramount importance to publish all PhD theses in open access in easily accessible repositories. This is important to align research policies with the demands for excellence that are expected from PhD programs and for understanding systematic errors in this field.

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#### **What Is Already Known on This Topic:**

*PhD theses should contain an original contribution to scholarship. Thus, they are essential part of new knowledge. Also, they can be the subject of various scientific analyses. Various studies have assessed, for example, the PhD thesis' quality of writing, bibliometric profile, research methodology, publication output, article/journal impact of the manuscripts published from the theses, and theses submission rules, among other topics. Accessibility of PhD theses is, thus, extremely important for enabling transparency and scrutiny.*

#### **What This Study Adds:**

*This study describes difficulties encountered when trying to access a list and full text of PhD theses defended in medical schools in Croatia. After contacting multiple sources of information, ranging from the National Bureau of Statistics, the National Library, and individual universities, institutions, and their websites, we could not find a single list of PhD theses. Obtaining a list of PhD theses required a month-long investigation. A central national list of PhD theses defended at state universities and freely available full-text theses would enable insight and transparency of defended PhD theses.*

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