

Wikidata Projects in Times of COVID-19: IUPUI Libraries' Engagement in Open Knowledge

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Abstract: Wikidata provides a space of collaboration to create and modify open information for the public good. It can be a key tool for global public health promotion where universities and academic libraries can play an important role in advocating for the contribution and integration of data that promotes open public access to knowledge. In this paper, the authors share details of a collaboration among employees from two IUPUI (Indiana University-Purdue University Indianapolis) campus libraries who joined forces to work in three Wikidata projects related to the COVID-19 pandemic. The authors provide a short history of IUPUI University Library's (UL) engagement in open knowledge initiatives, describe the projects and their experience working on them, and finalize with a discussion and next steps.

Introduction

Cultural heritage institutions have been engaging with projects that are part of the Wikimedia ecosystem for many years now. The most widely known of these projects is Wikipedia, the online encyclopedia that anyone can edit. Many institutions/organizations have engaged in Wikipedia-related projects to expand coverage of underrepresented subjects in the encyclopedia. As the 6th most accessed website in the world ("Top Websites - Website Ranking by Traffic," n.d.), Wikipedia's reach is undeniable—the daily pageviews of the English language Wikipedia surpassed 257 million views in a 1-year period ("Siteview Analysis," n.d.). While serving a different purpose, Wikidata, the linked data knowledge base that supports all Wikimedia projects, including Wikipedia, has also gained popularity among cultural heritage institutions and beyond. The structured data stored in Wikidata can be used to bring more consistency across different language versions of Wikipedia. The data is published under a Creative Commons (CC0) license, which has enabled its reuse—for instance, in the Google knowledge graphs, digital assistant tools, and library catalogues. The knowledge base offers a freely accessible linked open data environment that facilitates contributions from a global community of users. The notion of linked data is not new to libraries but has been out of reach for most institutions. This is due, in part, to their lack of resources to develop the infrastructure, as well as the steep learning curve to understand its mechanics. Wikidata offers the low-barrier linked data environment that libraries have been eagerly awaiting for while also enabling users to engage in multilingual, multidisciplinary collaborations.

Background

As the pandemic emerged in early 2020, researchers and other groups from around the world began developing different strategies with the ultimate goal of improving the accessibility of COVID-related data. Many of these projects aim to facilitate access to the volume of scholarship being produced by researchers around the globe and allowing for more collaboration on the subject. For instance, the project *Covid-on-the-Web* was conceived to facilitate the access and retrieval of literature related to COVID-19 as linked data. This project started off with the analysis of the *COVID-19 Open Research Dataset* (CORD-19). This corpus was enhanced using other sources and disambiguated against Wikidata, among other linked open data resources (Michel, et al., 2020). Another effort leaning on the CORD-19 dataset is the [COVID-19 Open Research Dataset \(CORD-19\) on FHIR](#) (Fast Healthcare Interoperability Resources) project, which has made the dataset available as linked data facilitating the accessibility and linkability with other sources. In addition, [outbreak.info](#) is another effort that aggregates resources and epidemiology data related to COVID-19 and SARS-CoV-2 facilitating the findability and reusability of the data.

Wikidata, as an openly accessible and free to use structured linked data knowledge base, fulfills the requirements of the FAIR (Findable, Accessible, Interoperable, Reusable) data principles (FAIR Principles, n.d.). As such, it has been used not only to help disambiguate COVID-19 related data, but also as an important source for facilitating access to timely data related to the pandemic. Efforts to move this idea forward can be seen in various Wikidata-related projects taking shape across the globe. For instance, the *Wikidata:WikiProject India/COVID-19 task force*, which focuses on keeping up-to-date information in Wikidata related to the COVID-19 pandemic in India (2020); the *Wikidata:WikiCuarentena*, a project focusing on the creation and/or enhancement of Wikidata entities representing health organizations in Mexico; and the *Wikidata:WikiProject COVID-19*, a project collecting Wikidata resources related to COVID-19, SARS-CoV-2, and COVID-19 pandemic (2020). Turki et al. (2020) emphasized the value of Wikidata in the representation and integration of data related to COVID-19. These efforts have facilitated the exploration and reuse of COVID-related data stored in Wikidata for a multilingual audience.

The IUPUI University Library (UL), with its commitment to contributing to the development of open-source solutions and the advancement of open knowledge (“IUPUI University Library Commitment to Open Knowledge,” 2020), has also joined ongoing efforts to ensure proper representation in Wikidata of COVID-related entities. Contributing to projects that offer a community-driven approach to knowledge creation aligns with UL’s open values statement (“Open Values,” 2019), which is why since 2017 [the library has been coordinating and hosting Wikimedia events](#) covering different topics, both in person and online. The emphasis on these events has been in engaging library employees and other library professionals from across the State of Indiana in three major projects under the umbrella of the Wikimedia Foundation: Wikipedia (the online encyclopedia), Wikimedia Commons (the media repository for all Wikimedia projects), and Wikidata (the data repository for all Wikimedia projects). An account of all Wiki-related activities is documented in a series of reports published every two years (Lemus-Rojas, 2019). The development of training

sessions and collaborative, hands-on activities are an essential component of this initiative in order to provide participants with the necessary skills and encourage them to continue their journey advancing open knowledge projects. These events have also served as a way of forging a stronger collaboration among employees from IUPUI University Library (UL) and the Ruth Lilly Medical Library (RLML).

Building on this collaboration and in response to the imminent need to have COVID-related data represented in Wikidata, employees from both libraries worked toward advancing three main projects: the *Hospitals in Indiana*, the *COVID-19 Articles Project*, and the *COVID-19 IUPUI Faculty Publications*. The goals of these projects were to help address the identified knowledge gaps in the representation of health organizations in the State of Indiana, ensure that authors of COVID-related literature—regardless of their affiliation—were represented in Wikidata and linked to their publications, and focus on the representation in the knowledge base of COVID-related scholarship authored by IUPUI affiliates as well as the authors themselves. The *COVID-19 Articles Project* served as the inspiration to develop the *COVID-19 IUPUI Faculty Publications* project, as a way of making its data more readily available to consumers. The successful completion of these projects was driven by our interest in helping bridge knowledge gaps in an effort to build a more balanced knowledge base.

Wikidata Projects

Hospitals in Indiana

As the pandemic surged and hospital admissions began increasing in early March 2020, the need to have up-to-date information about these health organizations became apparent. The *Hospitals in Indiana* project was conceived to support the representation in Wikidata of hospitals located in the State of Indiana. Making this information available in the Wikidata knowledge base allows for search engines and digital assistant tools, such as Siri and Alexa, to use the data in order to facilitate the findability of these health organizations.

The initial assessment of the data in Wikidata revealed that only 35 Indiana-based hospitals were represented in the knowledge base. This included one hospital attributed to Indiana, which was actually located in Iowa. The existing hospital entries found in Wikidata included the information shown in Table 1.

Property	Number of Items
<i>description</i>	35*
<i>country</i> (P17)	35
<i>located in the administrative territorial entity</i> (P131)	35
<i>coordinate location</i> (P625)	35

<i>official website</i> (P856)	15
<i>number of hospital beds</i> (P6801)	3

Table 1. Properties found in existing Wikidata items to describe Indiana-based hospitals with number of occurrences (*mostly indicating they were located in Indiana, but missing specific city location)

The next step included identifying data sources of hospitals in the United States, and limiting them to the State of Indiana. Using the [Homeland Infrastructure Foundation-Level Data](#) database, 151 additional records of hospitals were identified. This database included information that could be used to add the following information: *descriptions*, *country* (P17), *located in the administrative territorial entity* (P131), *postal code* (P281), *phone number* (P1329), *official website* (P856), and *number of hospital beds* (P6801), as available. The [OpenRefine](#) Wikidata reconciliation feature was used to work on this dataset. Data was reconciled against Wikidata and a schema created before exporting the file to [QuickStatements](#)—a tool used to make contributions to Wikidata.

After contributions were made to Wikidata, a review of the entries revealed that some of the information used from the Homeland Infrastructure Foundation-Level Data database was outdated. For instance, some phone numbers were no longer valid, some websites belonged to the network that the hospital is part of but not the specific hospital, there were variations in the names of the hospitals, and discrepancies were found on the number of hospital beds recorded. These findings served as an opportunity to not only get others involved in the data curation process, but to also perform a more thorough search for additional hospitals to add. In preparation for this work, an info session was held virtually, and documentation was created and shared with participants. A group composed of librarians and student employees collaborated asynchronously on a Google Sheet to identify potential additions and correct existing data. As part of this work, hospitals’ websites were consulted where it was sometimes possible to find some of the hospitals’ inception dates. Other datasets used to support this work included the [American Hospital Directory](#), the [Indiana Hospital Directory](#), and the [Indiana Hospital Association Member Directory](#).

With the new information entered on the Google Sheet, 37 new items were added to Wikidata to represent the hospitals and many of the existing entries were enhanced to reflect the most current information available about them. Figure 1 is an example of one of the hospital entries created for this project. The current coverage of hospitals in Indiana (see Figure 2) as of January 15, 2021 is 216 entries; these are all the entries that contain the Wikidata property *coordinate location* which indicates where they are physically located.

(Q101243457) Download PDF Watch

English

Lutheran Health Network Lutheran Hospital

hospital in Fort Wayne, Indiana, United States

In more languages

Statements

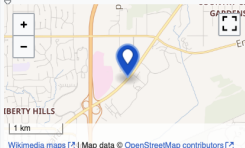
instance of hospital 1 reference reference URL https://www.lutheranhospital.com/ retrieved 7 November 2020	coordinate location  Wikimedia maps Map data © OpenStreetMap contributors 41°2'18.787"N, 85°14'39.822"W 0 references	phone number +1-260-435-7001 1 reference reference URL https://www.lutheranhospital.com/ retrieved 7 November 2020
inception 1904 1 reference reference URL https://www.lutheranhospital.com/ retrieved 7 November 2020	street address 7950 W Jefferson, Fort Wayne, IN 46804 (English) 1 reference reference URL https://www.lutheranhospital.com/ retrieved 7 November 2020	official website https://www.lutheranhospital.com/ language of work or name English 0 references
country United States of America 1 reference reference URL https://www.lutheranhospital.com/ retrieved 7 November 2020	number of hospital beds 396 1 reference reference URL https://www.lutheranhospital.com/ retrieved 7 November 2020	
located in the administrative territorial entity Indiana 1 reference reference URL https://www.lutheranhospital.com/ retrieved 7 November 2020	postal code 46804 1 reference reference URL https://www.lutheranhospital.com/ retrieved 7 November 2020	

Figure 1. Example of a [hospital entry created in Wikidata](#) as part of the project

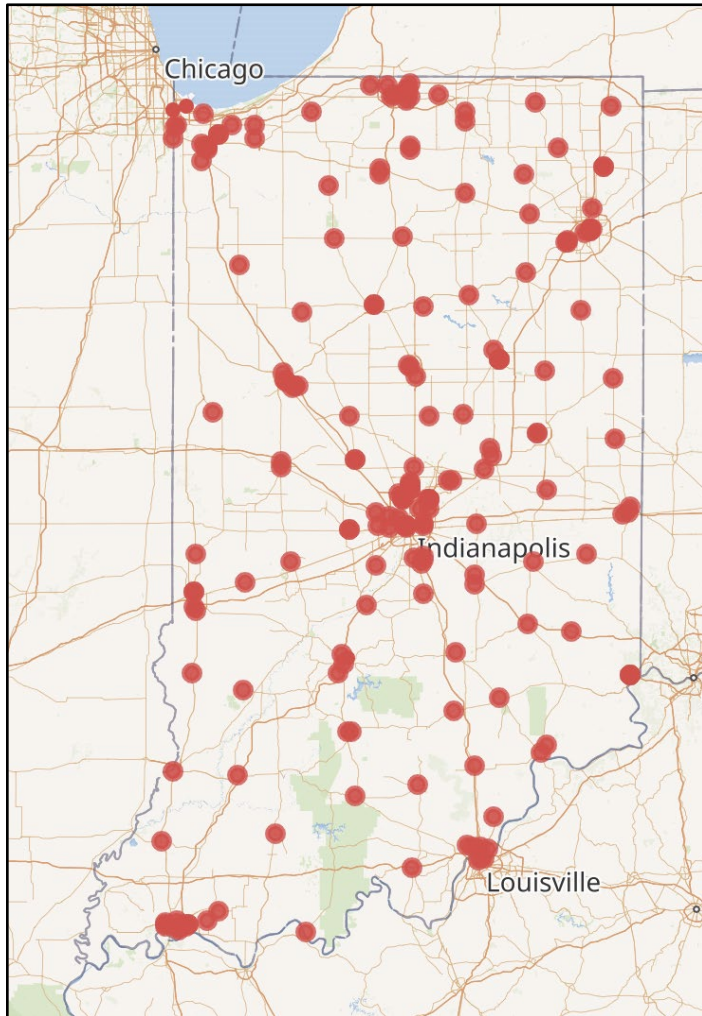


Figure 2. [Map of Indiana with current hospital locations](#)

COVID-19 Articles Project

The *COVID-19 Articles Project* at IUPUI materialized as a response to an emergent need to have proper representation in Wikidata of the public health crisis beginning to unfold in early March 2020. This project was directly inspired by the *Wikidata WikiProject COVID-19*—a global effort created in early March as a way to collect resources related to the pandemic and provide documentation for Wiki-users to follow when collecting data to share in the knowledge base. One of the tasks listed on this project page called for the curation of publications related to the subject. The work required for this project was something that librarians from both UL and RLML were familiar with and could lend their expertise to. Curating the scholarship produced by IUPUI-affiliated faculty members in Wikidata, and ensuring the representation of the faculty as it connects to their work, has been part of UL's agenda for advancing open knowledge. These kinds of initiatives support the UL's newly created and implemented [Scholarly Profiles as Service \(SPaS\)](#) model which aims to provide

proper representation in Wikidata for all IUPUI-based faculty and the scholarship they produce. With this expertise at hand, the authors of this paper decided to make a small contribution toward curating publication data in Wikidata related to COVID-19. As of March 24, 2020, there were 243 articles in Wikidata for the subject authored by researchers around the world. However, most of these publications had not yet been linked to their corresponding authors. Instead, the authors' names were listed under the *author name string* (P2093) property, which means that these publications would not come up under the name of the author until the connection is made between their names and their publications. The goal of this project was to either link existing authors to their publications, or create new entries in Wikidata to represent missing authors to later link them to their articles.

Step-by-step instructions were created to document the procedure and shared with participants during an info session held virtually (see Appendix A). A Google Sheet containing the list of articles and authors, as found in Wikidata, was also shared. These steps can be easily followed by other institutions wishing to undertake a similar project. While the objective of this project was to ensure that authors were connected to their publications, there was also interest in recording the author's affiliation to IUPUI. With that in mind, columns were created in the spreadsheet where participants could indicate if:

- the authors were affiliated with IUPUI
- the authors were already present in Wikidata and were linked to the article as part of the project
- a new entry was created for the author and then linked to the article

As a result of this work, two authors were identified as being affiliated with IUPUI, 32 distinctive authors that were already in Wikidata were linked to their corresponding articles (for a total of 47 connections), and 12 new author entries were created and linked to their works. Seeing the scholarship contributions of IUPUI-affiliated faculty on the COVID-19 pandemic served as a motivator to undertake the *COVID-19 IUPUI Faculty Publications* project—a local effort to improve access to the scholarship produced on this topic by the campus faculty.

COVID-19 IUPUI Faculty Publications

The goal of the *COVID-19 IUPUI Faculty Publications* project was to ensure that both publications (articles, working papers, pre-prints) and IUPUI-affiliated authors were represented in Wikidata. The project leaned on an ongoing effort by UL to compile COVID-19-related articles published by IUPUI faculty in order to make them available under the [Open Access Coronavirus-Related Works](#) collection in [ScholarWorks](#)—IUPUI's institutional repository.

Publications' Work

The work started with a dataset of 347 publications (see Figure 3) that had already been added to the Open Access Coronavirus-Related Works collection during the period of April 2020 to November of the same year. Of those articles, 299 had DOIs (Digital Object Identifier). This allowed us to use [SourceMD](#)—a tool that makes automatic edits in Wikidata. As a result, 44 new articles were added to the knowledge base and 255 publications were

identified as being already in Wikidata, of which 185 were enhanced using QuickStatements. With the use of this tool, values were added for the following properties: *language of work or name* (P407), *volume* (P478), *issue* (P433), *page(s)* (P304), *PMCID* (P932), *PubMed ID* (P698), and *main subject* (P921), as available, making the metadata for these entries more robust.

From a total of 48 articles missing DOIs, 7 were identified as being out of scope as we were focusing on providing access to articles, working papers, and pre-prints. Blog post entries and presentation slides were excluded from this project. OpenRefine was used for this group of 41 publications. Titles were reconciled against Wikidata and 17 publications were matched to existing entries in the knowledge base. For the remaining 24 works, entries were accessed in ScholarWorks using the handles provided in the initial spreadsheet. In some instances, DOIs were found either in ScholarWorks—even though they were not present in the spreadsheet—or in the articles’ source pages. Finding DOIs for these publications facilitated the creation of their items in Wikidata with the use of the SourceMD tool. A handful of publications for which DOIs were not found were created manually following the [Table of Properties for Describing Publications](#) from the [WikiProject IUPUI University Library’s project page](#).

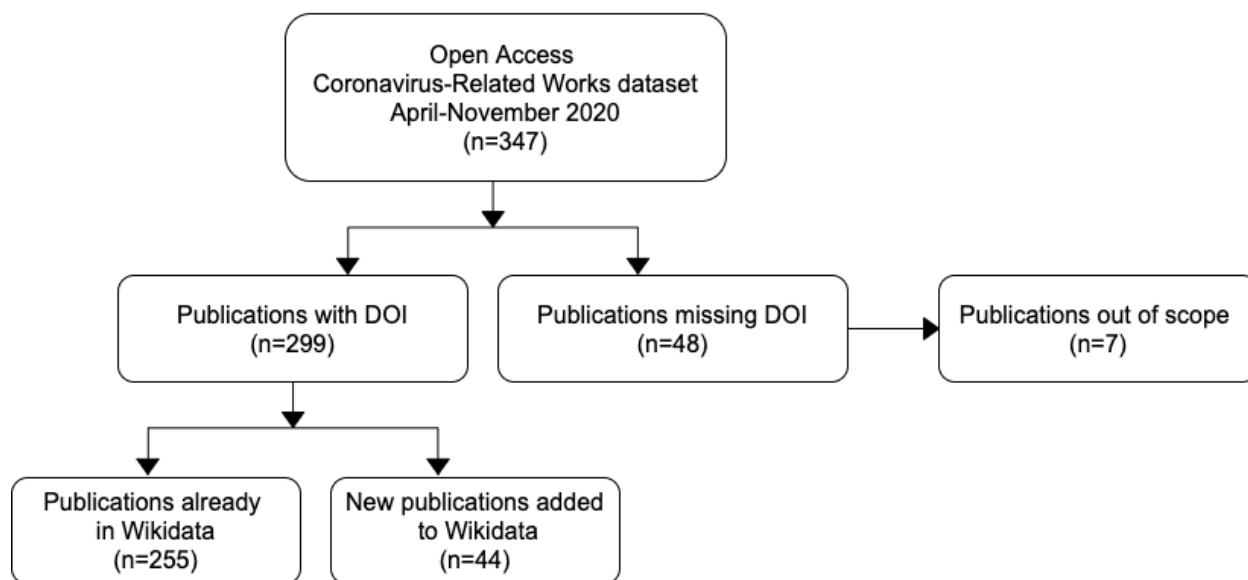


Figure 3. Diagram showing the publications’ work

Authors’ Work

The next phase of this project centered on the representation and linkage of the IUPUI-affiliated authors to their corresponding publications. This stage of the process presented a new challenge as the authors of publications not only included faculty—who for the most part have a profile page containing biographical information—but also retired faculty/researchers, staff members, fellows, post-doc, and students—who wouldn’t normally have a presence on their affiliated schools’ websites.

A spreadsheet containing the list of author names was used to record the necessary information needed to create their entries. For instance, the school's affiliation was verified by searching for the author's name in their respective school's website which provided an opportunity to gather some additional information such as job title, the URL for their official website, gender, and their names—if different from what was already in the spreadsheet. For authors with no profiles in any of the IUPUI campus schools, general searches for their names were performed. In many cases, a LinkedIn profile was found for them, which helped in confirming their affiliations to the IUPUI campus.

A total of 460 author names affiliated with IUPUI were identified from the publications for this project. Using the Wikidata reconciliation service in OpenRefine, 170 authors were matched with existing Wikidata entries; of this amount, 156 were enhanced (see Table 2). The enhancements were performed through the use of the QuickStatements tool, and included the following properties, as applicable: *languages spoken, written or signed* (P1412), *work location* (P937), *affiliation* (P1416), *official website* (P856), *sex or gender* (P21), and *employer* (P108). In addition, 232 new author entries were created.

Total IUPUI-affiliated authors (n=460)	
<i>Existing author entries</i>	170
<i>Enhanced author entries</i>	156
<i>New author entries created</i>	232

Table 2. Record of existing, enhanced, and created authors' entries in Wikidata

Linking/Connecting Authors to Publications

The last step consisted of linking (connecting) each author entry with their corresponding article in Wikidata. The linking process was completed using one of the following methods:

- a) using the [Author Disambiguator tool](#) to search for the author and link it to the specific publication selected for this project
- b) searching by article title directly in Wikidata, adding the name of the faculty under the *author* (P50) property with the qualifier *series ordinal* (P1545) together with its corresponding value, copying the reference (if present) from the *author name string* (P2093) property, and finally removing the author's name from the *author name string* property.

Linking publications to their corresponding authors enhances and solidifies their entries in Wikidata. It also benefits the global community as it contributes toward the ever-growing network of citation data that can be explored using external tools and web applications. An example of such application is [Scholia](#), which has an interface that enables the browsing of works and it also generates scholarly profiles.

Challenges

Despite the fact that external tools can play a significant role in facilitating the contribution of data to Wikidata—whether it is for enhancing existing data or creating new entities—the authors experienced some challenges worth mentioning while utilizing such tools. In the case of the SourceMD tool, there were instances where the tool encountered errors during the CrossRef lookup which resulted in not being able to utilize the tool to add those entries. Besides, in some instances, the metadata pulled by this tool to describe the publications included the same assertion for all publication types. The statements would read *instance of* (P31) with value *scholarly article* (Q13442814), even when the entry was either a *working paper* (Q1228945) or a *preprint* (Q580922). These entries required manual adjustments to reflect the correct type of publication. With the QuickStatements tool, the challenge faced had to do with the limitations set by Wikidata. While neither names (labels) nor descriptions need to be unique in Wikidata, there can never be more than one item with both the same name and description. Because of this, the tool skipped the creation of items that were found in Wikidata meeting these criteria, which resulted in the need to make manual corrections in the data to then resubmit the job.

The other challenge encountered was during the data collection process. [ORCID](#) profiles play a critical role in helping verify and confirm author information. However, this was not always possible given that many of them didn't have any public information available (see Figure 3), making it difficult to disambiguate the authors' names and/or determine their affiliations. Non-public profiles in ORCID cause a cascading effect. There are bots that use ORCID's data to populate new entries in Wikidata for the authors, even when there isn't any information available about them, resulting in very minimal Wikidata entries (see Figure 4). As a result, new entries had to be created for these instances. In order to determine the affiliation of those who had an ORCID profile but were lacking this information, the list of author's works was checked, when available. For instance, the most recent work listed in the profile was accessed using its DOI in an effort to determine the author's affiliation. However, this approach also had its disadvantages given that not all journals include affiliation information.

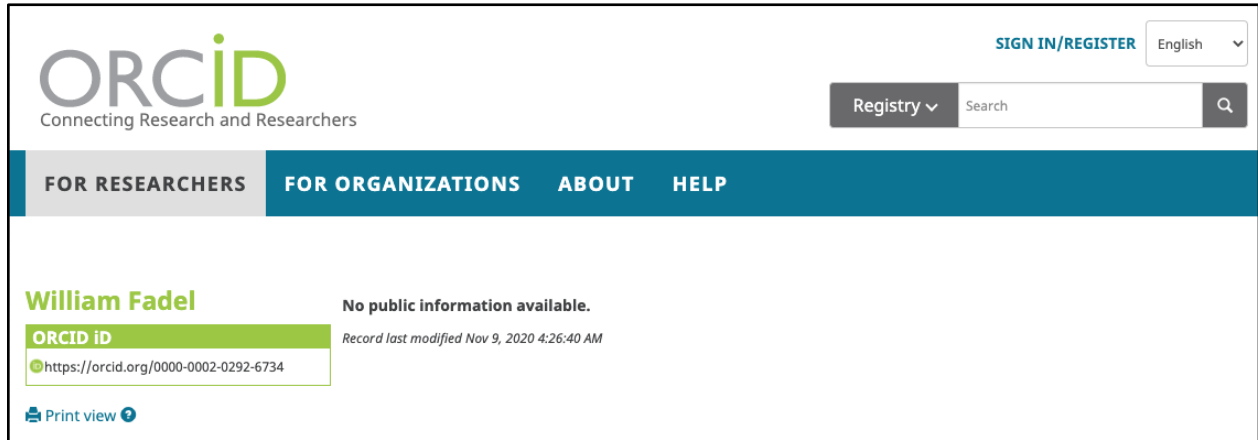


Figure 3. Example of a non-public author profile in ORCID

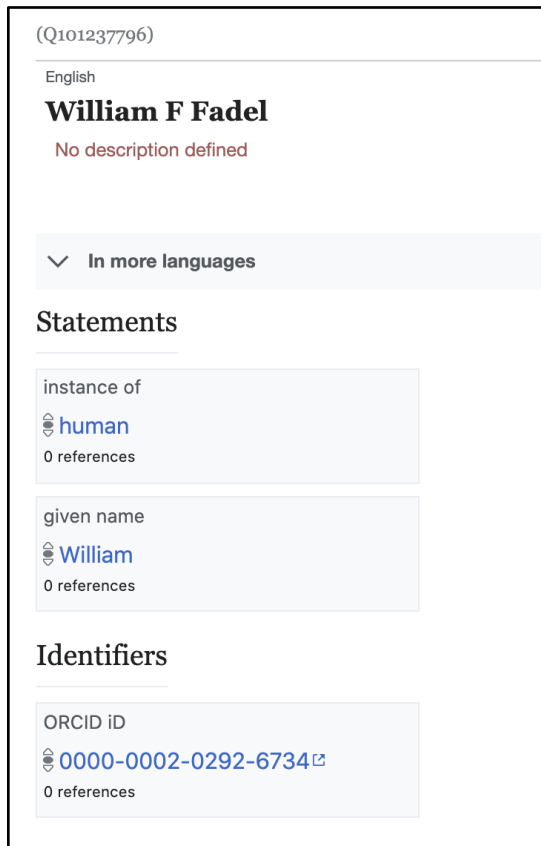


Figure 4. Example of minimal Wikidata entry created by bots using data from the author's ORCID profile

The authors also experienced some difficulties disambiguating names during the linking process for already-existing entries and relied on the affiliation information available on the

article's source page. There were different author name variations used in the articles' entries compared to the ones present in the spreadsheet. These different name variations presented a challenge in identifying the correct author's name to be linked to a particular publication. For instance, "J.A. Al-Tawfiq" was used as a value in the *author name string* (P2093) statement for 4 articles, but in the spreadsheet "Jaffar A. Al-Tawfiq" was the name recorded. Additional examples include "C. M. Schmidt" instead of "C. Max Schmidt", "Ben Gaston" instead of "Benjamin Gaston", just to name a few. Having all different variations of the name included in Wikidata for the authors facilitates findability for both humans and machines, and decreases the possibility of duplication. Other forms of the names were added to items as they were found.

Discussion and Next Steps

The Wikidata knowledge base not only stores structured linked data, but also offers an environment where multidisciplinary communities can come together to collaborate at scale. Wikidata provides a venue for the library community to participate and develop community-driven open knowledge projects that contribute to strengthening a culture of openness. Sometimes these projects emerge as a response to a public health crisis as it is the case of the pandemic caused by COVID-19. While the three COVID-related projects described in this article are representative of micro-contributions within the context of a global effort in advancement of open knowledge, they are nonetheless important contributions made for the public good. With these projects we were able to improve the coverage of health organizations based in the State of Indiana, contribute to a global effort to ensure representation of researchers and their COVID-related publications and replicate the latter for our local community of IUPUI faculty/researchers through the *COVID-19 IUPUI Faculty Publications* project.

We find the overall experience of working on these projects to be rewarding and strongly believe that taking a collaborative approach increases engagement and productivity among participants. The partnerships and collaboration among library personnel were conducive to the success of the projects. We plan to continue encouraging other library personnel to contribute to Wikidata in the pursuit of a more balanced knowledge base.

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Appendix A: COVID-19 Articles Project Description

As of March 24, 2020, there were 243 articles in Wikidata related to COVID-19. Most of them do not yet have the authors' names listed under the **author** field, which means that these publications would not come up under the name of the author until the connection is made between their names and the publications they authored. The goal of this project is to either link existing authors to their publications, or create new entries in Wikidata to represent those missing to then link them to their publications.

A spreadsheet listing all the publications will be shared with participants.

Tasks:

- Create new entries to represent authors and then link them to their publications
- Link existing authors to their publications

Creating entries for new authors:

1. Use the link provided in the **Wikidata Item** column to access the entry for the publication

Wikidata Item	Your Wiki Username	Author	IUPUI or IUSM Faculty	Existing Author Linked
http://www.wikidata.org/entity/Q84957779		Daphne Gjc Mulders	-	-
http://www.wikidata.org/entity/Q84957779	Mliemusrojas	Tobias Bleicker	No	No
http://www.wikidata.org/entity/Q84957779	Mliemusrojas	Bart L. Haagmans	No	Yes
http://www.wikidata.org/entity/Q84957779		Gabriel Goderski	-	-

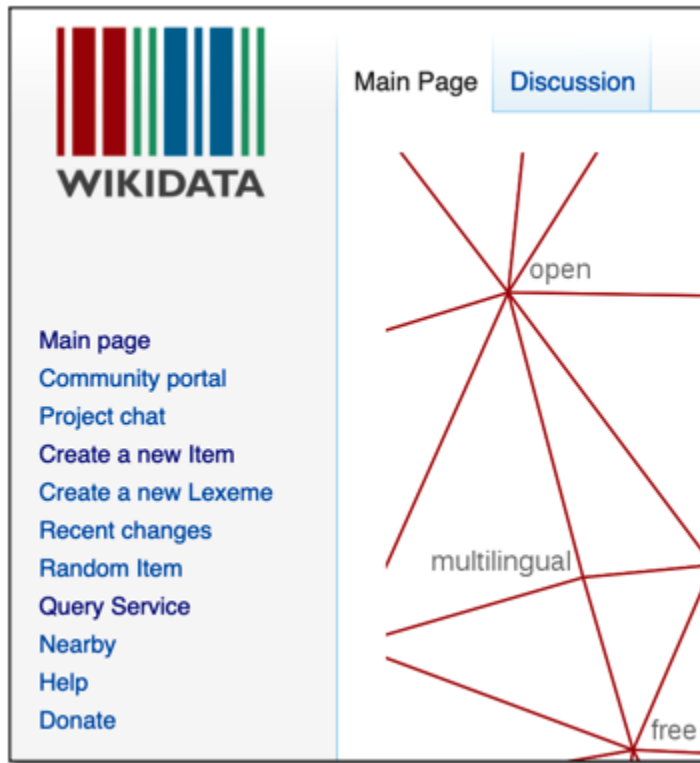
2. Look for the **author name string** property with the names of authors



3. Copy the name into another Wikidata tab to see if the entry is already available

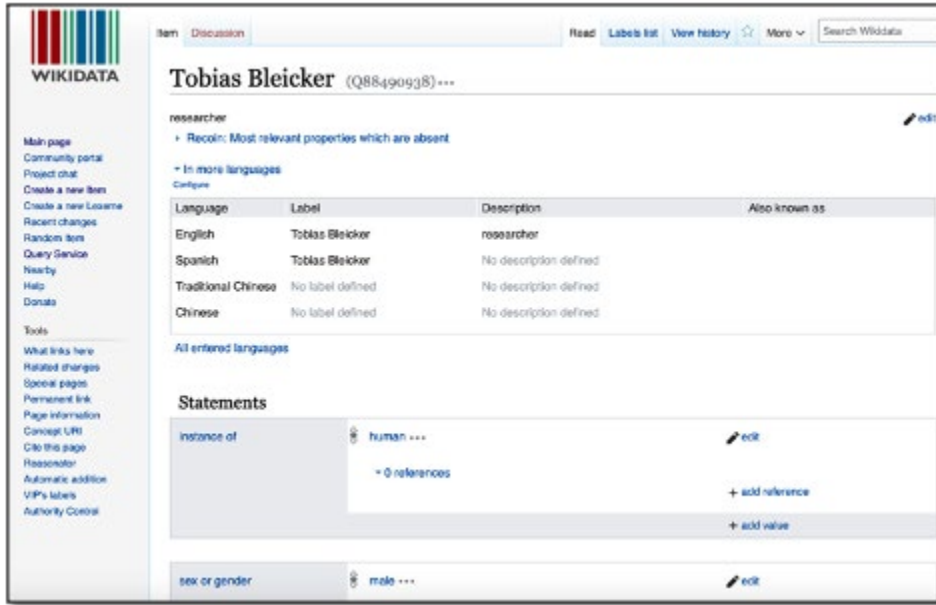


4. If it isn't, click on "Create a new Item" to start creating the entry for the author

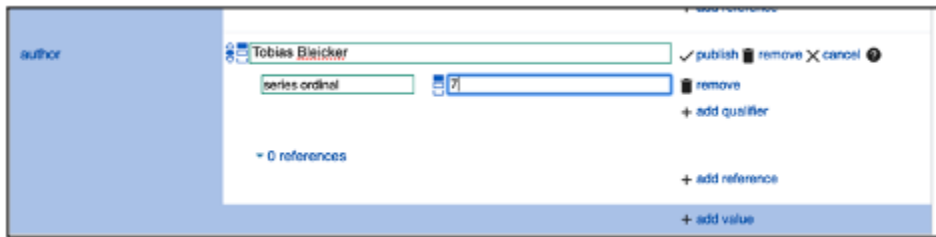


5. Add a **Description** to the item you are creating. For instance, “academic” when the person is affiliated to an academic institution, or “researcher”. Whenever possible, use the list of properties below to add relevant info. A complete list of properties can be found at: https://www.wikidata.org/wiki/Wikidata:List_of_properties

- **instance of** -> human
- **given name**
- **family name**
- **sex or gender**
- **occupation** -> university teacher, researcher, or both as applicable
- **employer** -> Indiana University-Purdue University Indianapolis [for faculty employed at IUPUI]
- **affiliation** -> Indiana University School of Medicine [for faculty affiliated with IU School of Medicine]
- **official website**



- Once the item for the author is created, go back to the item for the publication and if the **author** property is not present, click on “add statement” and enter the **author** property and the name of the author as its value, then click on “publish”. If the **author** property is already present, then click on “add value” to enter the name of the item you just created, and click on “publish”.



- The next step is to remove the value (name of the author) from the **author name string** by finding the name and clicking on “edit” and then “remove”.

Linking authors/researchers to their publications:

- Follow steps 1-3 above and skip to step 6-7