



A qualitative program evaluation of the Publicly Available International Foodborne Outbreak Database

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Abstract

Background: The Publicly Available International Foodborne Outbreak Database (PAIFOD) is a regularly updated repository that contains international outbreak data collected from multiple surveillance systems and sources. As of February 2020, the database contained more than 13,000 entries spanning over 20 years. PAIFOD is the only known database that captures international foodborne outbreak data.

Objective: To explore user perceptions and identify potential directions for PAIFOD and make recommendations for databases with food safety information.

Methods: Between January and March 2020, 16 semistructured telephone interviews were conducted with 24 previous, current and potential PAIFOD users. Interviewees were asked about their knowledge of and experience of using PAIFOD as well as about its strengths and limitations and recommendations for the database. An inductive thematic analysis approach was used to analyze qualitative data and generate themes.

Results: Four main themes were generated based on the 24 interviewees' accounts of their experience with and recommendations for PAIFOD: participants viewed PAIFOD as a useful tool; they weren't familiar with its contents or purpose; they stated it should become an open-access platform or linked with another information-sharing initiative; and they considered that PAIFOD had the potential to enhance the Agency's reputation by becoming widely recognized and used.

Conclusion: This work, along with the ever-changing landscape of foodborne surveillance, supports the need to ensure that PAIFOD is updated to meet the modern-day demands of food safety experts.

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Introduction

Reporting of foodborne outbreak data is important to evaluate lessons learned, identify trends and patterns and inform future public health policies, risk assessments and mitigation strategies (1). In 2000, the Public Health Risk Sciences Division of the National Microbiology Laboratory at the Public Health Agency of Canada (PHAC) launched the Publicly Available International Foodborne Outbreak Database (PAIFOD). PAIFOD is a repository of international foodborne outbreak data recorded through various publicly available surveillance systems and sources such as reports, listservs, press releases, government

websites and peer-reviewed journals. To date, PAIFOD is the only known database to capture global foodborne outbreak information.

Academia and federal, provincial and territorial government clients use information from PAIFOD to inform evidence briefs, risk summaries, risk assessments, outbreak analyses and other research projects (2–5). PAIFOD uses Microsoft Access (Redmond, Washington, United States) to store outbreak data (**Figure 1**). As of February 2020, the database contained 13,355



Figure 1: A preview of the Publicly Available International Foodborne Outbreak Database, its columns and outbreak characteristics that are captured

Abbreviation: RTE, ready-to-eat
 Note: The database is hosted on Microsoft Access and only some fields are shown

entries. Recorded outbreaks date from 1945 to the present day. Currently, PAIFOD contains information on 31 bacterial species, 20 parasites, 9 viruses, 7 marine biotoxins and 3 mycotoxins. The most commonly captured foodborne outbreaks are linked to *Salmonella* Enteritidis (n=2,420) and norovirus (n=1,958).

PAIFOD is updated daily. On average, five outbreaks are added weekly to the database, with seasonal variation. A summary of the fields contained in PAIFOD is shown in **Table 1**. The database is not publicly accessible. Instead, customized summary reports are requested by contacting the database manager, at PHAC (see Acknowledgements).

Since its early development, PAIFOD has continually grown in size and frequency of use. However, a stakeholder-needs assessment has never been conducted to evaluate the database and identify opportunities for enhancement.

The authors conducted a qualitative program evaluation to obtain stakeholder input on the database and to gauge interest in a variety of possible changes to PAIFOD. The purpose of this study was to explore users' perceptions on the database, assess its strengths, limitations and areas for improvements.

Methods

Study participants

Semistructured interviews were conducted with previous, current or future users of PAIFOD between January and March 2020. From PAIFOD users and networks, a list of 47 individuals, from 29 different organizational departments and divisions was compiled

Table 1: All the fields captured in Publicly Available International Foodborne Outbreak Database and their description

Category	Field(s)
Food product	<ul style="list-style-type: none"> Vehicle RTE (whether the food product was ready-to-eat)
Microorganism	<ul style="list-style-type: none"> Specific virus, bacterial species, fungi or parasite responsible
Geography	<ul style="list-style-type: none"> Country Province or state City Setting (e.g. school, restaurant)
Date	<ul style="list-style-type: none"> Year Month Day
Case information	<ul style="list-style-type: none"> Presumptive cases Confirmed cases Age group(s) Number of hospitalizations Number of deaths Symptoms Major sequelae if reported
Additional information	<ul style="list-style-type: none"> Causative reason (e.g. temperature abuse, raw food consumption) Concentration (e.g. CFU/ml) Verified (yes/no) Confirmed (laboratory, epidemiologically)
Other	<ul style="list-style-type: none"> Source (e.g. details of journal article, name of newspaper) Sensitive information (yes/no) Website URL Story (i.e. written description of relevant information extracted from source document)

Abbreviations: CFU, colony-forming units; RTE, ready-to-eat; URL, Uniform Resource Locator



to contact and recruit. For the purpose of the interviews and analysis, each unique organizational department or division as a separate study, was considered “participant” and unit of analysis. The participants were from federal, provincial and municipal government departments and divisions as well as researchers from universities. Participants were recruited via email for either a one-on-one or a group interview, depending on the number of individuals within each contacted department or division.

This study was exempt from review by the Ryerson University Research Ethics Board because it is classified as program evaluation (6).

Data collection

Participants were interviewed over the telephone with the use of a semistructured interview guide. The interview questions were open-ended and asked about (a) users’ knowledge of PAIFOD; (b) users’ experience with the PAIFOD; (c) strengths and limitations of the database; and (d) recommendations for improvement. The interview guide (available from the authors on request) was modified according to the participants’ experience with the database.

Interviews lasted between 15 and 50 minutes, and the number of participants varied between one and four. The interviews were audiorecorded to ensure accuracy. In one case, the interviewer wrote their notes after the interview because they were having technical difficulties with the recording device. The audiorecordings were professionally transcribed, and the transcripts were validated and anonymized prior to analysis.

The names used in this article are arbitrary pseudonyms to protect confidentiality.

Triangulation methods were used: two investigators analyzed and interpreted the collected data to add multiple perspectives, and both in-depth individual and group interviews were conducted (7). Member checking was conducted to increase the validity of findings (8).

Data analysis

The research team analyzed data using an inductive thematic analysis approach within a constructionist framework (9). This consisted of a data-driven process of creating categories (10). The coding process included repeated readings of transcripts to identify trends, inconsistencies and contradictions across the data. Two investigators reviewed five transcripts independently and generated a list of codes. The coding framework was consolidated and refined through discussion. The remaining transcripts were also individually coded, then consolidated. Themes were generated using a latent approach, that is, examining assumptions, ideas and meanings and identified themes based on interpretations of the content of the interviews (10). Themes were mapped, revised, modified, defined and named. Data excerpts were selected (i.e. quotes) to depict

the best representation of each theme. Analysis was conducted using NVivo 12 qualitative analysis software (QSR International, Doncaster, Australia).

Results

In total, 16 interviews were conducted with 24 individual interviewees. Most participants were from different departments and divisions of PHAC (n=8, 33%), the Canadian Food Inspection Agency (CFIA; n=5, 21%) and Health Canada (n=5, 21%) (Table 2). Most respondents were previous or current users of PAIFOD (n=15, 63%).

Four themes each with three or four subthemes were generated from the coding framework (n=29). The themes are presented below with participants’ comments quoted verbatim as illustrations.

A useful tool that guides experts’ work

Requests are tailored and timely. Participants who had used PAIFOD (n=16) were quick to mention how important the resource was to their work. They found the service and communication to be fast. For example:

Hannah: [T]hey have been extremely helpful and extremely useful and easy to obtain, the staff at PHAC have been very knowledgeable and very useful and very quick and, yeah, very impressive, very impressive program and useful product.

Reports are detailed, meet needs and expectations. Users generally found the reports were tailored to their needs, often as a result of their conversations with the database manager.

Todd: I’ve been very happy with how responsive and the turnaround time that are given to us whenever we request information and I find that they are very good about any clarifications or if there are any specifics to our requests and it could [be] ironed out that that’s performed in a very timely manner.

A personal relationship with the database manager. Clients mentioned their relationship with the previous and current database managers who helped generate the required outputs. For instance:

Rose: And sometimes they add an element actually to our search. They will say, you know, I looked in the database I couldn’t find anything but quickly here’s my opinion on X, Y, Z and they can kind of lead us down another path because we’ve had a human interaction.

Leila: Yeah, a second brain.



Table 2: Interview participants’ details

Participant ID	Interview	Pseudonyms	Organization ^a	PAIFOD user status
1	A	Dimitri	Canadian Food Inspection Agency	Past/current
2	B	Hannah	Canadian Food Inspection Agency	Past/current
3	C	Susan	University of Guelph	Never used
4	D	Todd	Canadian Food Inspection Agency	Past/current
5	E	Marie	University of Guelph	Past user
6	F	Anna	Public Health Agency of Canada	Past/current
7	F	Kate	Public Health Agency of Canada	Past/current
8	F	Richard	Public Health Agency of Canada	Past/current
9	G	Rachel	Public Health Agency of Canada	Past/current
10	G	Shelly	Public Health Agency of Canada	Never used
11	G	Luc	Public Health Agency of Canada	Past/current
12	G	Rebecca	Public Health Agency of Canada	Never used
13	H	Rose	Health Canada	Past/current
14	H	Leila	Health Canada	Past/current
15	I	Aaron	Health Canada	Never used
16	J	Yen	Public Health Ontario	Past/current
17	J	Manon	Public Health Ontario	Past/current
18	K	Olivia	Canadian Food Inspection Agency	Never used
19	L	Joon	Ontario Ministry of Agriculture, Food and Rural Affairs	Never used
20	L	Chris	Ontario Ministry of Agriculture, Food and Rural Affairs	Never used
21	M	Kim	Health Canada	Past/current
22	N	Moshe	Health Canada	Past/current
23	O	Farid	Canadian Food Inspection Agency	Never used
24	P	Mark	Public Health Agency of Canada	Never used

Abbreviations: PAIFOD, Publicly Available International Foodborne Outbreak Database
^a Divisions within organizations are omitted for reasons of confidentiality

Database and its contents not known or opaque

Lack of familiarity with what the database looks like.

Respondents were unsure of how outbreak entries were captured in the database, and what fields and categories were included.

Marie: I guess what I’m saying is I plead ignorance, all I know is what’s (...) in the reports that I received.

PAIFOD is not publicly available or searchable. When asked about a data dictionary, participants expressed interest or stated that every database should have such a dictionary. In addition, those who had not requested outbreak summary reports before were also unsure of the request process or even where to find information on PAIFOD.

Rachel: I think it would be good for people to also know what is included in the database and know how it is standardly captured.

Inclusion or amendments to data fields or request process.

Despite not knowing the full extent of the database, interviewees suggested adding fields (e.g. spatial data, genomic data, gender of cases, chemical and physical agents, common points of purchase) and were open to the idea of implementing a standard request template form.

Joon: I’d rather have it and not need it than need it and not have it.

Manon: Well, we just found that a lot of information I think was, in this one field that was called ‘Notes’ or something like that, there wasn’t really, it was difficult to extract information, in fact it was very time consuming.

Demand for an online, open-access platform Interest in Cloud-based interface and intention to use it often.

Participants suggested that a Web-based platform was the ideal next step for PAIFOD because it would ease access, allow customizable generation of reports and graphical outputs and facilitate on-the-go review of outbreak entries.



Shelly: I agree with Luc and Rachel that if it's easily, readily accessible it's going to be probably easier to use.

Rebecca: I agree with that as well.

Current use is limited or occasional for most clients. Many clients were only occasional users. They stated they would use PAIFOD more often if it were accessible online without having to go through a "gatekeeper."

Kim: I think it would make it easier and more convenient if the database was available to researchers so that they could search it themselves. Like, imagine if you had to ask somebody to search PubMed each time for you, you know, instead of you do it yourself.

Need for flexible data outputs, graphical outputs and report formats. Most users would prefer that the reports be provided as Microsoft Excel spreadsheets rather than PDFs, which is the current standard. For example:

Rose: It would be easier if it were always in Excel.

Susan: I would need an Excel base with the ability to filter, and Excel I like 'cause you can just sort of pull... directly into a stats program...

Human component can be beneficial to guide users. Some participants did acknowledge The value of interacting with the database manager to help individuals with producing the correct outputs.

Olivia: I suppose like, human contact if there's issues or maybe if you have questions. A contact name you could ask for any technical help.

Potential to be well-known and utilized food safety resource

Openness to collaboration. Interviewees suggested that collaboration would improve the number of outbreaks captured in PAIFOD, especially recent ones, thus strengthening the database.

Moshe: I would say for a good start is, one, have a conversation with us...

Rachel: I think we could just be more collaborative with each other about this. It could help serve some of our needs, probably, and we could help serve some of their needs too.

Need to address institutional barriers. Clients acknowledged that some institutional barriers may appear when trying to expand PAIFOD's coverage.

Farid: Yeah, well having memorandums of understanding that permit that data sharing, especially when food safety issues are implicated, may help a little more [with] transparency of information and that it can be instantaneous. If the database is proposing open access to the information that would be ideal.

Strong resource with potential to expand use internationally. Users saw a lot of potential in PAIFOD because it contains information on international foodborne outbreaks.

Moshe: You know like, "Oh you've, what do we know about this? Oh, it's okay, Canadian PAIFOD, yeah, the Canadians have this, Public Health Agency of Canada." ... if I was managing the thing I'd sort of see that as a no brainer, any chance of potential value, organizational value, together that makes it user accessible...

Discussion

Study participants were familiar and comfortable using modern databases such as those within PulseNet Canada, which is also used to identify foodborne disease outbreaks (11), and the publicly available National Outbreak Reporting System (NORS), which reports all waterborne and foodborne disease and enteric disease outbreaks known to the Centers for Disease Control and Prevention (12).

As more food safety databases are moving online (13,14), this platform has proved to be preferred for work-related activities because access can be immediate, reports can be generated flexibly and public health surveillance is more timely and responsive.

It was also clear from the interviews that clients were happy with the depth of detail that PAIFOD provided, but would like access to more fields. An increasing number of scientific techniques and indicators are being used to identify food safety issues and pathogens, some of which allow researchers to conduct in-depth analyses for their work to protect the Canadian food supply. Since PAIFOD gathers information from publicly available reports, the database should consider adding new fields and categories as reports are published.

Another avenue would be for this database to develop partnerships with other agencies. Generally, surveillance systems such as PulseNet Canada, PulseNet USA and the new Government of Canada initiative, Canadian Food Safety Information Network (CFSIN), are shared data repositories that allow local, state and provincial/territorial and federal regulatory agencies to access and share resources quickly (11,15,16). However, the information in these networks is not accessible to the public. PAIFOD should aim to form linkages that will expand the database, yet still make it publicly available.



In the future, PAIFOD should aim to shift to a more updated, user-friendly platform, becoming open access like other successful outbreak databases; be flexible on the types of reports generated; become more comprehensive by including new data fields and categories; serve a wider variety of food safety experts and epidemiologists; and push for collaboration between Canadian and international partners to enhance the depth and promote the use of PAIFOD. Ongoing expansion of PAIFOD can help to reveal trends, identify gaps and determine the effectiveness of future interventions on the reduction of foodborne disease.

Limitations

Most of the participants in this evaluation were federal government employees. Though they appeared to be the main users of the database, their needs may differ from those of other clients, which could have affected the generated themes.

Secondly, it was unclear whether group interviews contained homogenous responses because participants were from the same department or because of existing power structures (17). The investigators observed that voices were disproportionately greater among those with more database experience and those in a leadership role. The absence of disagreements within groups suggests that it may be beneficial to conduct future evaluations exclusively through one-on-one interviews.

Conclusion

This program evaluation explored current user experiences of PAIFOD, including extent of knowledge about the outbreak database, its strengths, limitations and areas for improvement through a qualitative thematic analysis approach. Overall, most stakeholders did not know the entire contents of the database because they only received summary reports; current and previous users believed the database to be a useful tool that helped their food safety activities; and nearly all respondents were interested in an online, open-access platform and believed that PAIFOD was a strong and unique resource that has the potential to expand. The interviewees recommended improvements to the database to enhance their personal use and PAIFOD's legitimacy and reputation.

Many insights from this study were broad and could be applied to other foodborne and infectious disease surveillance databases.

Authors' statement

IY — Conceptualization, funding acquisition, analysis, investigation, methodology, project administration, resources, software, supervision, validation, writing—review & editing
 AT — Analysis, investigation, methodology, project administration, validation, writing—original draft
 MM — Conceptualization, resources, validation, writing—review & editing
 LW — Conceptualization, resources, validation, writing—review & editing

Competing interests

None.

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