Fast-track Delphi: user guide

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Preface

Purpose

This guide gives an overview of the toolkit to conduct a *fast-track Delphi* process (DelphiFT) and the steps for the analysis.

(i) Note

The *fast-track Delphi* is a process developed by *Unisanté*, aiming to rapidly build consensus among scientific experts on a topical issue in order to support political decisions in a context of public health crisis.

The process consists in three rounds of consultation of experts. The experts (participants) are brought together in a first round during which a series of topics/questions/statements are collected and prioritized using an adapted version of the nominal group technique (NGT). The experts then express their opinion on these statements by responding individually to questions in the second and third rounds using an online questionnaire built with **REDCap**. Rational for the methodology and detailed results of the testing phase can be found in **publications**.

In order to produce results in a very short time frame, we developed an *R project* that connects with *REDCap* to download and process the data, and produce result reports in an **editable word document** format:

- a generic report and individualised reports for the second round (dft2)
- a generic report and individualised reports for the third round (dft3)
- an overall executive summary

We suggest you first discover the demo to understand what you will produce, using the *fast-track Delphi:* code with demo data and results available on GitHub (see also *Chapter 3*)

To start your own project, download the *fast-track Delphi*: *code only* available on GitHub and follow this user guide.

Softwares and packages

- Interface and language: RStudio and R Statistical Software
- Obtain data: **REDCapR** (not necessary for the demo)
- Data management, analysis and visualisation: mainly **data.table**, with some **tidyverse** and other packages. Regex expressions are sometimes used.
- Reports: officedown which builds on bookdown, and flextable from the officeverse

Fast-track Delphi Toolkit

This document is part of a toolkit:

•	Code only
•	Demonstration set (code, anonymized dataset and outputs)
•	User guide

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Credits

This manual is a quarto book.

We want to warmly thank all the people who developed the libraries we used for this work.

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Conferences

- Lebon L, Velarde Crézé C. Cigarettes électroniques jetables « puffs » : premiers chiffres romands et consensus d'expert-e-s sur leur règlementation. Presentation at: Conférence annuelle de l'Association suisse pour la prévention du tabagisme (AT); 2022 Nov 24; Bern, Switzerland. Available from: https://www.at-schweiz.ch/fr
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Publications

 Velarde Crézé C, Lebon L, Duperrex O, Faivre V, Pasche M, Cornuz J. Nouvelles cigarettes électroniques jetables « puffs » : consensus d'expert-e-s sur leur réglementation. Revue Médicale Suisse. 2023;19(812):181-5. DOI: 10.53738/REVMED.2023.19.812.181

- 2. Velarde Crézé C, Zürcher K, Duperrex O, Flahault A, Cornuz J. La recherche de consensus scientifique pour promouvoir le lien entre science et politiques publiques. Rev Med Suisse. 2024 Jan 31;20(859):230–4. DOI: 10.53738/REVMED.2024.20.859.230
- 3. Velarde Crézé C, Duperrex O, Lebon L, Faivre V, Pasche M, Cornuz J. A multi-stage approach to support timely health policy decisions during crisis: the fast-track Delphi. BMC Public Health. 2024. DOI: 10.1186/s12889-024-20903-0

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```
Expand for Session Info
Warning: le package 'sessioninfo' a été compilé avec la version R 4.4.2
Session info -
setting value
version R version 4.4.1 (2024-06-14 ucrt)
         Windows 11 x64 (build 22631)
system x86_64, mingw32
ui
         RTerm
 Language (EN)
collate French_Switzerland.utf8
ctype
         French_Switzerland.utf8
         Europe/Zurich
tz
date
         2024-12-03
pandoc 3.2 @ C:/DATA/R.Apps/RStudio-2024.09.1-394/resources/app/bin/quar
to/bin/tools/ (via rmarkdown)
quarto 1.5.45 @ C:\\PROGRA~1\\Quarto\\bin\\quarto.exe
package * version date (UTC) lib source
sessioninfo * 1.2.2 2021-12-06 [1] CRAN (R 4.4.2)
[1] C:/DATA/R.Apps/R-4.4.1-win/Library
```

1. Pre-requisites

To start using the toolkit for your *fast-track Delphi* project, you will need to:

- install RStudio and R see Appendix A in *Hands-On Programming with R* by Garrett Grolemund
- get some packages see below
- create a REDCap project and the token to access it through the R project see Chapter 4

☐ Tip

We strongly suggest you also go through Chapter 2 to understand the structure of the types of questions and how they are considered by the code for analysis and reporting. The demo we offer with this user guide (see *Chapter 3*) is also useful to explore before starting your own project.

1.1 Get some packages

You will need to run the following chunks (lines of executable code)

☐ Install pacman unless you already have it: simpler to call libraries and keep them up-to-date

```
## install it if not already there
if (!require("pacman")) install.packages("pacman")
```

☐ Load the following packages with pacman::p_Load (it will 1. install package if not installed and keep it up-to-date, 2. call the library)

```
pacman::p Load(
    bookdown,
    crayon,
    data.table.
    flextable,
    formattable,
    fs,
    ftExtra,
    ggplot2,
    haven,
    here,
    magrittr,
    officedown,
    patchwork,
    purrr,
    REDCapR,
    sjlabelled,
    sjmisc,
    sjPlot,
    stringr,
    tidyverse,
    writexl)
## install.packages("remotes") ## If it's not already installed.
remotes::install_github("OuhscBbmc/OuhscMunge")
```

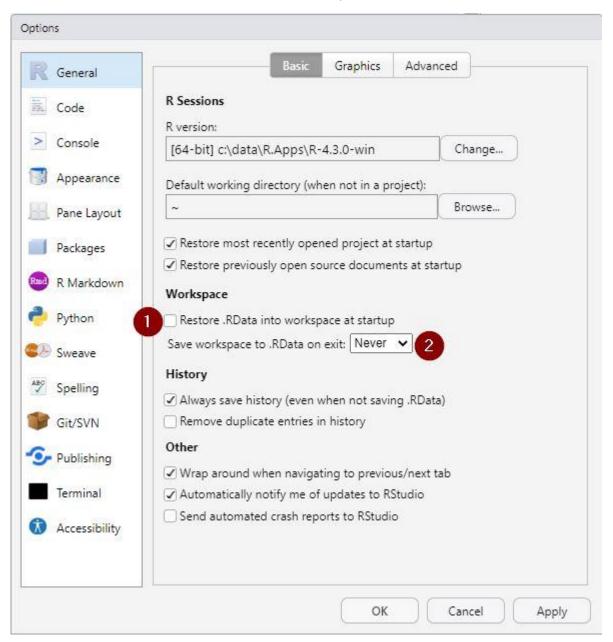
☐ Install fast-track Delphi: code only

```
Download as a zip file (click on green button Code), and unzip locally
remotes::install_github("Unisante/delphi-fast-track")
```

1.2 Our preferred options for RStudio

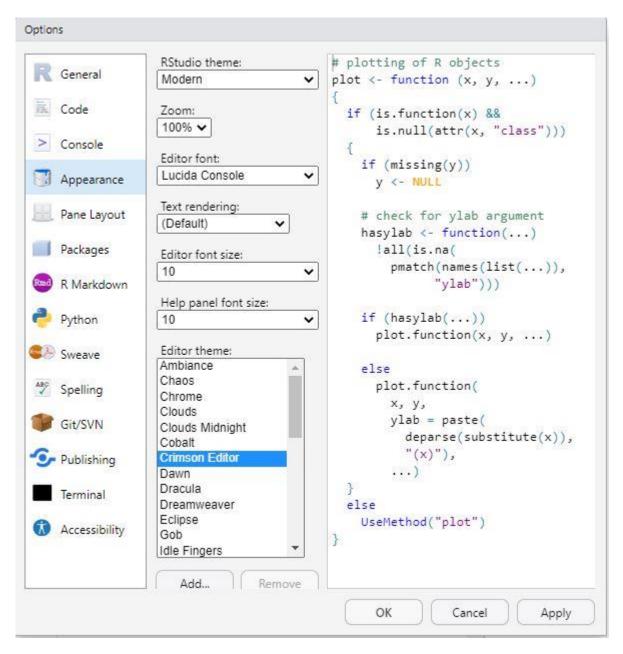
1.2.1 Workspace

Never restore or save the RData into the workspace



1.2.2 Appearance

We like Lucida console and Crimson editor



1.2.3 Pane layout

• We like to have more space for the source to the left



2. Types of questions

There are three types of questions in a *fast-track Delphi* process. Their structure and implications for the analysis and reporting are described below. Round 2 (dft2) will include all three types of question, while round 3 (dft3) should in principle include only type 1 questions.

Detailed rationale for the methodology can be found in *publications*.

We suggest you read the following paragraphs to understand the outputs that will be produced for each type of question, before going further in your project.

2.1 Type 1 question

They are Likert questions. Experts express their opinion by rating their level of agreement with an affirmative statement on a scale from 1 (complete disagreement) to 9 (complete agreement).

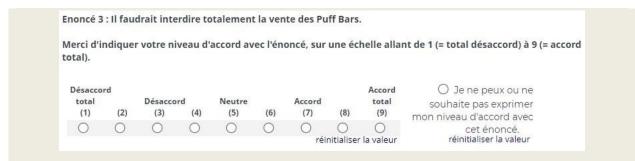


Figure 2.1: Example of a type 1 question (statement #3) as structured in the REDCap e-questionnaire (in French) - *Chapter 4* will guide you through the creation of this type of question within your REDCap project.

- For each statement, the code produces a statistical (median, interquartile [IQR] and minimum-maximum ranges) and a graphical (barplot and boxplot) summary. The number of respondents is also indicated, with percent of total respondents.
- A green tick indicates that an agreement and/or a consensus was reached at the group level (see thresholds in *Section 2.5*).
- For individualised result reports, the expert's answer is displayed in digits (column 'your answers') and on the graphical summary of group response distribution.
- All type 1 questions of a given section are summarised in one unique table. Below is an example (in French) of the output for one statement of one individualised result report.



Figure 2.2: Output examplar for a type 1 question - caption from an individualised result report

2.2 Type 2 question

They are multiple choice questions with one possible response, that aim at clarifying experts' topical propositions and orienting future statements. "No opinion" is always proposed as a choice option.

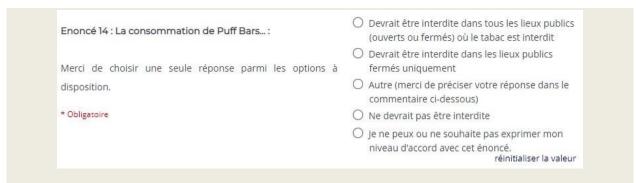


Figure 2.3: Example of a type 2 question (statement #14) as structured in the REDCap e-questionnaire (in French) - *Chapter 4* will guide you through the creation of this type of question within your REDCap project.

- For each question, the code produces a statistical (number of responses for each option with percent of total respondents) and graphical display of group responses.
- A green tick indicates that an agreement was reached for one or several particular answer options (see thresholds in Section 2.5).
- Answer options are automatically sorted by descending frequency of responses ("No opinion" always appearing at the bottom).
- For individualised result reports, the expert's answer is indicated by a red cross (column 'your answer').
- Each type 2 question is summarised in a separate table. Below is an example (in French) of the output for one type 2 question of one individualised result report.

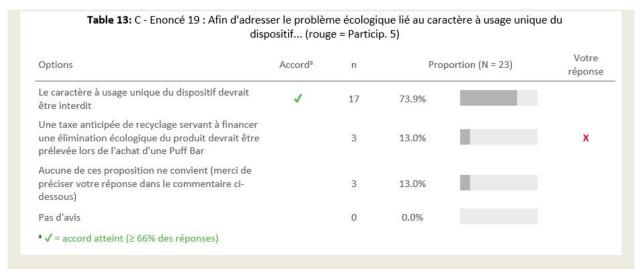


Figure 2.4: Output examplar for a type 2 question - caption from an individualised result report

2.3 Type 3 question

They are multiple choice questions with up to three answer options, that aim at precising experts' topical propositions and orienting future statements. "No opinion" is always proposed as a choice option.



Figure 2.5: Example of a type 3 question (statement #2) as structured in the REDCap e-questionnaire (in French) - *Chapter 4* will guide you through the creation of this type of question within your REDCap project.

- For each question, the code produces a statistical (number of responses for each option with percent of total respondents) and graphical display of group responses.
- A green tick indicates that an agreement was reached for one or several particular answer options (see thresholds in *Section 2.5*). Answer options are automatically sorted by descending frequency of responses ("No opinion" always appearing at the bottom).

- For individualised result reports, the expert's answers are indicated by red crosses (column 'your answers').
- Each type 3 question is summarised in a particular table. Below is an example (in French) of the output for one type 3 question of one individualised result report.



Figure 2.6: Output examplar for a type 3 question - caption from an individualised result report

2.4 Comments

Participants can leave comments after each question (for all types). They are very useful to prepare statement reformulations for round 3 and refine key messages at the end of round 3.

2.5 Agreement and consensus thresholds

We defined the following thresholds based on the literature and a pragmatic approach. These thresholds can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in open can be modified in <a

- For type 1 questions
 - o Agreement is defined by the center value of the data (median), and is considered reached when the median is ≥ 7 out of 10 (≤ 3 out of 10 for disagreement considered reached)
 - Consensus is defined by the dispersion of the data (interquartile range, IQR), and is considered reached when the IQR does not exceed 3 scale points.
- For type 2 and 3 questions
 - Agreement is reached when the answer has been selected by ≥ 66% of the respondents.

2.6 Conventions

Comments in the R code are preceded by ##

- Filenames and paths are in typewriter style
- Packages are in **bold**: data.table
- Functions are followed by a (): fs::dir_tree()
- \square . Run this code ... : actions you need to take to prepare your own project are preceded by a ticking box (not interactive)

The table below summarizes the conventions used in the names of tables and variables.

Word used	Example as part of name	Example inside a word document	What it means
dt	dt_	-	a data.table
current_round	dft2_ , dft3_	-	round 2 or round 3
section	_a_	Section A	sections correspond to different aspects of the topic
statement	_s1_	Statement 1	statement followed by its number
type	_type1	type 1	type of question



Tip

The easiest way to understand the process and see the output is to download the demo and explore it (see Chapter 3).

3. Demo

We provide a demonstration with

- the anonymised dataset and metadata from our pilot study (done in french) (Velarde Crézé et al. 2023)
- the complete code (*.R and *.Rmd), slightly modified (the codes retrieving real nonanonymized data from REDCap and updating introductive texts are not run)
- the final output, so you can go through the reports generated by the code

You can run this demonstration on your machine to make sure it works before starting your own project.

<u>^</u>!\

Sometimes the code might not run smoothly if one of the packages (or R) has been updated.

Should this occur, you can:

- re-run all the code from the beginning so the variables and .RData files have the most recent format
- look on *Stackoverflow* if someone had the same problem
- try to narrow down what causes the problem and ask a question yourself with a reproducible example (reprex) on *Stackoverflow*
- wait a week or two so the problem is spotted and hope a solution was found

3.1 Download the demo

Our fast-track Delphi: code with demo data and results is available on GitHub.

3.2 Look at the reports

In ./output/reports/, you will find the reports which are editable word documents:

- one generic report and one individualized report per expert for the second round (dft2)
- one generic report and one individualized report per expert for the third round (dft3)
- an overall executive summary synthesizing results from the second and third rounds

3.3 Understand the structure

3.3.1 Folders content

- analysis
 - o **Rmd files**: one common for the introductory text for the method section and the others in subfolders for each round (dft2, dft3) and for the overall report
 - docx templates: one in each subfolder
- code: R files that are common to both rounds and others in two subfolders for each round (dft2, dft3) the numbers indicate the order in which they are run
- data: data and metadata RData files for the raw data and in subfolders for each round (dft2, dft3)
- *output*: subfolders *checks*, *png*, *RData*, *reports*. **Final reports** in an editable word format are located in the subfolder *reports* (generic and individualized result reports).
- texts_intro: editable docx with separate introductory texts that will be inserted into the reports

3.3.2 Files to run

• <u>00_run_ME_once_to_create_structure.</u> R: not needed for demo (the folder structure of the project is already created).

The following files at root can be run one at a time:

- 0 run ME dft2 demo.R
- 0 run ME dft3 demo.R
- 0_run_ME_overall_demo.R

They will produce:

- intermediate tables saved in ./output/RData/ and ./output/checks/
- miniplots saved in ./output/pnq/
- word reports saved in ./output/reports/

3.4 Discover the functions

We chose to keep the functions used in these analyses in a R file because it is easier to toy with.

We strongly recommend that you become familiar with the functions developed for this analysis in code ./code/00 functions.R. This code will also run each time ./code/000 parameters.R is sourced.

4. Instructions for REDCap

REDCap is a secure online survey management platform.

For the *fast-track Delphi* process, both e-questionnaires of rounds 2 and 3 are administered with REDCap using two separate 'REDCap projects'. Data are collected and stored within the corresponding REDCap project.

The structure of both e-questionnaires in *REDCap* should follow a particular "skeleton" - explanations provided below - to ensure comprehensive and automatic reading of the data by the R code. Be sure you have read and understood *Chapter 2* explaining the various types of question that are used in a *fast-track Delphi* process.

The steps below will guide you through the creation of your two REDCap projects (one for round 2 and a separate one for round 3).

○ Tip

The idea is for you to familiarize with the structure and parameters of the REDCap project ahead of conducting the fast-track Delphi process itself, so that you only have to feed the project with your statement texts during rush periods.

To this end, we strongly suggest creating both REDCap projects in advance.

4.1 Create the "skeleton" of your REDCap projects

We created a fast-track Delphi REDCap "skeleton" projects including all survey parameters and structured example items for type 1, 2 and 3 questions and saved as *.xml, for round 2 and round 3.

Once you have downloaded the Fast-track Delphi: code only (see Chapter 5), you will find these *.xml files in the folder delphi ft/_xml_for_redcap/.

- these *.xml files into blank projects - talk with your REDCAp Admin if necessary. You should do this twice (once for each round)
- ☐ Give a name to your projects: *DelphiFT project_name round 2* and *DelphiFT project_name* round 3, respectively (replace project name by your project name)
- ☐ Within each of these REDCap projects, manage the access rights to suit your team's needs by modifying access parameters on the 'Users Rights' Menu (left side on your REDCap project page)

You should then familiarize with the proposed structure, which is the following:

- For round 2:
 - o One foreword section containing 6 fields aiming at describing your panel of experts (the email field is MANDATORY - do not remove or modify it!)
 - One 'preamble' section (Z) containing one type 1 question (4 fields), one type 2 question (2 fields) and one type 3 question (6 fields)
 - o Three sections (A, B and C) containing each two questions of each type
- For round 3:
 - One foreword section containing 1 field aiming at collecting experts' email (MANDATORY - do not remove it!)
 - One 'preamble' section (Z) containing three type 1 question
 - Three sections (A, B and C) containing each three type 1 question

This structure is of course subject to modifications to suit your needs in due time, i.e., when you have created the statement content of the e-questionnaire based on the results of the previous round (see the start of Chapter 6 and Chapter 7 for REDCap management during rush periods of rounds 2 and 3, respectively).

Tip

We strongly suggest you try duplicating any type 1, 2 and 3 question in your REDCap project, and test the e-questionnaire, so you are prepared doing it efficiently in a rush period.

When duplicating a question, you must duplicate ALL fields that belong to this question - and update their variable name and branching logic accordingly:

- A type 1 question contains 4 fields (one matrix field, one simple field, one embedding field, and one field for comments)
- A type 2 question contains 2 fields (one simple field, and one field for comments)
- A type 3 question contains 6 fields (two simple fields, one embedding field, two fields for message parameters, and one field for comments)

4.2 Token to access your REDCap projects

The R code can automatically access the data stored within the corresponding REDCap project through a token (a string of letters and digits that functions as a unique identifier for your project).

The steps below will allow the codes to automatically retrieve your personal tokens corresponding to your REDCap project, for each of the two rounds (dft2 and dft3), whilst avoiding sharing them.

- Obtain your tokens from the 'API' Menu in <u>REDCap</u> talk with your REDCAp Admin if necessary
- Update the lines below with your details from the 'API' Menu in REDCap and save it again:

```
redcap_uri <- "https://XXXXXXXXX/api/"
token_dft2 <- "YYYYYYYYYYYYYY"
token_dft3 <- "ZZZZZZZZZZZZZZZ"
```

(i) Note

- . 'token_delphi_ft_this_project.R' has been added to .gitgnore to avoid transmitting the data to a git depot
- . if you use other means to share your work, alway delete the files containing your details to login into your redcap server

5. Start your project

5.1 Pre-requisites

• \square To start your own project, download the *fast-track Delphi: code only* available on GitHub.

- Make sure you have done the steps presented in *Chapter 1* (install RStudio and R + get some packages)
- ☐ Make sure you went through and understood *Chapter 2*
- Make sure you have prepared the structure of your projects in **REDCap** and got a token to access them according to the instructions in **Chapter 4**

5.2 Understand the structure

You are now ready to start your own project. Below you will find the detail of the structure - folders, subfolders and files - when you start your project, and what will be added by the end. The demo you have been through in *Chapter 3* shows a project when it is finished.

```
    ∇ Tip
    You can use fs::dir_tree() to see the structure at any time.
```

5.2.1 At the begining

When you start your project (i.e., when downloading the *fast-track Delphi: code only* on GitHub), you will have the following structure:

```
- <mark>000</mark> READ ME first.md
- <mark>00_run_ME_once_to_create_structure.</mark>R
- 0 run ME dft2.R
- 0 run ME dft3.R
- 0 run ME overall.R
  xml for redcap

    DelphiFTTemplateRound_2.REDCap.xml

   DelphiFTTemplateRound_3.REDCap.xml
- analysis
     00_child_intro_method.Rmd
     dft2
       dft2 child section.Rmd
        dft2_report_generic.Rmd
        - dft2 report per participant.Rmd
       - template-bookdown.docx
     dft3
        - dft3 child section.Rmd
        - dft3_report_generic.Rmd
        - dft3_report_per_participant.Rmd

    template-bookdown.docx

     overall
        - delphiFT Overall FigureFlow.pptx

    ExecutiveSummary figure Target-Consensus.png

        ExecutiveSummary_figure_Target-NoConsensus.png
        overall_executive_summary.Rmd
        - template_exec_summary_bookdown.docx
 code
```

```
000 parameters.R
     00 functions.R
     00_update_texts_intro.R
     03a create flextable results type 1 generic.R
    - <mark>03</mark>b create flextable results type 2 3 generic.R
     04a_create_flextable_results_type_1_participants.R
     04b create flextable results type 2 3 participants.R
     06 prepare tables combined round 2 3.R
     dft2
       — 01a_dft2_update_data_with_REDCapR.R
        - <mark>01</mark>b_dft2_recode_data.R
       — 01c_dft2_define_cols.R

    02a dft2 prepare tables without participant id.R

    02b dft2 prepare tables participants.R

       — 05_dft2_to_render_individual_reports.R
     dft3
       — 01a_dft3_update_data_with_REDCapR.R
        - <mark>01</mark>b_dft3_recode_data.R
       — 01c_dft3_define_cols.R
       - 02a_dft3_prepare_tables_without_participant_id.R
        - <mark>02</mark>b dft3 prepare tables participants.R

    05 dft3 to render individual reports.R

 texts_intro
 token_delphi_ft_this_project.R.example
- delphi ft.Rproj
```

5.2.2 At the end

The following will appear during the analysis and report production.

```
token delphi ft this project.R
data
   - dft2
       - dft2_data_clean.RData
       - dft2_lookup_final.RData
       - dft2 lookup value labels final.RData
    dft3
       - dft3 data clean.RData
      — dft3_lookup_final.RData
    redcap_data_raw

    dft2 data redcapr raw.RData

       - dft2 metadata.RData
       - dft3 data redcapr raw.RData
      — dft3_metadata.RData
output
    checks
      — .. several *.xlsx files
       - .. several *.png files
```

```
RData
  - dft2_dt_comments_m.RData
   dft2_type0_zz1.RData
   dft2 type1 zz combined.RData
  dft2_type2_zz1.RData
   dft2_type3_zz1.RData
  - dft3 dt comments m.RData
   dft3_type1_zz_combined.RData
   type1 zz combined round 2 3.RData
reports
    dft2
      - dft2_report_generic_YYYY-MM-DD.docx
       report_by_participant
            dft2_report_participant_1_YYYY-MM-DD.docx
    dft3
       dft3_report_generic_YYYY-MM-DD.docx
       report_by_participant
            dft3 report participant 1 YYYY-MM-DD.docx
    overall
      - dft overall executive summary YYYY-MM-DD.docx
```

5.3 Create the structure of your project

• □ Run 00 run ME once to create structure.R

This will create the predefined set of folders and subfolders - detailed above in Section 5.2 - within your main project folder.

Warning

We strongly advise keeping this predefined structure as it is. If you still choose to modify it, you will need to revise every path in the *. R and *. Rmd files.

5.4 Update parameters

Open ./code/000 parameters.R and update with your topical inputs, as necessary

5.5 Update the word templates

This project uses *MS Word* templates in order to build the generic and individualized reports. The autonumbering will be created by *bookdown*.

- Update the templates to suit your needs in each subfolder:
 - ./analysis/dft2/template-bookdown.docx

- ./analysis/dft3/template-bookdown.docx
- ./analysis/doverall/template exec summary bookdown.docx

Please refer to the *Officeverse manual* to see how to do it.

5.6 Update introductory texts

These texts are word documents with one or two paragraphs, sometimes images that will be inserted at the beginning of the reports. They will be updated in several steps, once some of the results are available.

ullet Prepare the word documents in advance to gain time

A

- Do not leave a blank line at the beginning of the text, nor at the end
- Headers are not needed in these texts as they will be provided in Rmd files
- Store them on the server in the folder defined in ./code/000_parameters.R (called path_texts_intro_server).
- □ Run ./code/00 update texts intro.R

Congratulations: **you are now ready** to conduct round 1 (expert meeting following an adapted Nominal Group Technique (NGT) procedure - not detailed in this userguide) and round 2 with your panel of experts!

6. Round 2

6.1 E-questionnaire management through REDCap

Round 1 (experts meeting following an adapted Nominal Group Technique procedure - not detailed in this user guide, see publications for more details) is over. Experts have generated and prioritized thematic proposals that you have reformulated into statements (type 1, 2 and 3 questions - see *Chapter 2*).

The following steps should be done in 1 day:

- Within your round 2 REDCap project: replace all "xxx" with the texts of your actual statements and answer options. Duplicate type 1, 2 and/or 3 questions' "skeleton" based on your needs, i.e., the number of sections and types of questions per section that you wish to include in this e-questionnaire
- Test the e-questionnaire to verify comprehensiveness of the content and the absence of technical bugs
- Move this round 2 REDCap project into production mode talk with your REDCap Admin if necessary
- Send the hyperlink to experts (participants) with a deadline for e-questionnaire completion

You can now relax during 3-4 days, until the deadline is over.



Data collection can be observed in real time by accessing the 'Dashboard' Menu in your round 2 **REDCap** project. When getting close to the deadline, remember to send a personalized email to any experts who has not yet completed the e-questionnaire.

6.2 orun_ME_dft2.R - Overview of steps

Once data collection for round 2 is over, you can open 0 run ME dft2.R. It will show you the order of files to update and run. It will upload, process and analyse the data and create reports.

6.3 Update data

• □ Run ./code/dft2/01a dft2 update data with REDCapR.R

This code will connect to the corresponding **REDCap** project using the token, downloads the raw data and metadata from the project, and save them as *.RData files. It also creates *.xlsx tables by type of question (1, 2 and 3, see *Chapter 2*) with the raw data, which can be used for quick checks, if necessary.

6.3.1 Detail of outputs

Folder	Output file	Description
./data/redcap_data_raw/	dft2_metadata.RData	Raw metadata
./data/redcap_data_raw/	dft2_data_redcapr_raw.RData	Raw data

6.4 Recode data

☐ Update as required and run ./code/dft2/01b_dft2_recode_data.R

This code will process the raw data and the metadata downloaded in Section 6.3, in order to create the "clean" data and metadata tables. In particular, it will:

- correct labeling errors, typos, etc.
- simplify labeling
- define the lists of variables by type of questions (1, 2, 3)
- do a conditional deduplication (in case one or several participants have filled in several REDCap records per person => keep the latest chosen answer option and all comments)
- save clean data and metadata in RData format

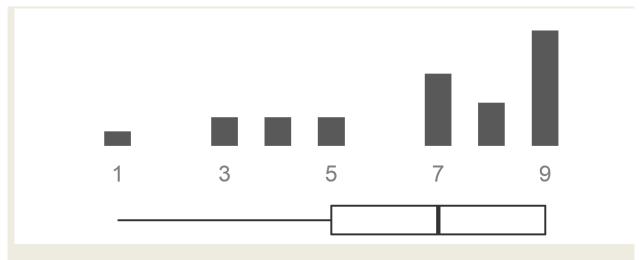


Figure 6.1: dft2_a_s6_type1.png (statement 6 in section A of round 2)

• create visuals (*.png) for all type 1 questions only, showing the distribution of answers on a 1 to 9 scale and a boxplot - see *Figure 6.1*

6.4.1 Detail of outputs

Folder	Output file	Description
./data/dft2/	dft2_data_clean.RDa ta	Clean data
./data/dft2/	dft2_lookup_final.R Data	Clean lookup table (metadata)
./data/dft2/	dft2_lookup_value_l abels_final.RData	Clean lookup table (metadata) with value labels for type 1 and 2 questions
./output/check/	*.xlsx	Various xlsx files that can be used for checks or sharing
./output/png/	dft2_*_s*_type1.png	Visuals for all type 1 questions

6.5 Prepare tables without participant id

• □ Run ./code/dft2/02a_dft2_prepare_tables_without_participant_id.R

This code will analyse the "clean" data (generated in *Section 6.4*) to create the group result tables (= statistical and graphical summaries).

It automatically calls code ./code/dft2/01c_dft2_define_cols.R.

It also creates and saves in *.xlsx format tables containing only the "no opinion" responses, allowing a quick check if necessary.

6.5.1 Detail of outputs

Folder	Output file	Description
./output/RData/	dft2_type0_zz1.RData	Table with characteristics of participants
./output/RData/	dft2_type1_zz_combined. RData	Table with results of all type 1 questions
./output/RData/	dft2_type2_zz1.RData	Table with results of all type 2 questions
./output/RData/	dft2_type3_zz1.RData	Table with results of all type 3 questions
./output/RData/	<pre>dft2_dt_comments_m.RDat a</pre>	Table with all comments
./output/check/	<pre>dft2_type*_zz0_no_opini on.xlsx</pre>	Quick check table of 'no opinion' responses for type * questions

6.6 Update introductory texts

- Update the content of your introductory texts (*.docx) if needed, as indicated in the Section 5.6.
- □ Run ./code/00_update_texts_intro.R

This code updates the local directory of texts used in the introduction of the report sections (from the available and up-to-date directory on the server).

6.7 Publish the generic report

The number of sections and the number of each type of questions within these sections will vary between projects.

The list of sections needs to be defined manually in o00_parameters.R.

□ Publish the generic report by running the lines below in 0 run ME dft2.R

This code will create the word document ("generic report") by inserting the introductory texts (updated in *Section 6.6*) and the results tables (created in *Section 6.5*), based on a reference word template.

```
It automatically calls ./code/dft2/01c_dft2_define_cols.R and ./analysis/00_child_intro_method.Rmd. Then, for each section, it calls
```

./analysis/dft2/dft2_child_section.Rmd, which will create tables for each type of questions that are in the section (conditional for loop), by running two codes:

- ./code/03a_create_flextable_results_type_1_generic.R : creates the result table for type 1 statements in the section and for their comments
- ./code/03b_create_flextable_results_type_2_3_generic.R: creates the result tables for type 2 and 3 statements in the section and for their comments

6.7.1 Detail of outputs

Folder	Output file	Description
./output/reports/d	dft2_report_generic_date_YYYY-MM-	Generic report with date
ft2	DD. docx	

6.8 Publish all individualized reports

 ■ Publish individualized reports - one for each respondent of round 2 - by running the lines below in <u>0 run ME dft2.R</u>

This code will create the word document for each expert participant ("individualized report"), based on a word template, by inserting the email of the expert, the introductory texts (updated in *Section 6.6*), as well as the group result tables with individual answers for each statement.

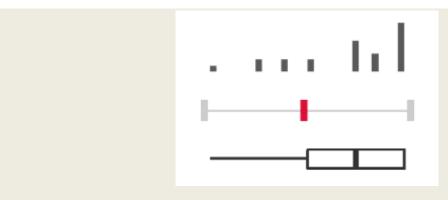


Figure 6.2: dft2_a_s6_type1_participantX.png (statement 6 in section A of round 2 - response of participant X is in red)

The code ./analysis/dft2/dft2_report_per_participant.Rmd (automatically called within ./code/dft2/05_dft2_to_render_individual_reports.R) uses an iterative loop to create the individualized result report for each participant by calling automatically:

- ./code/dft2/01c dft2 define cols.R and
- ./code/dft2/02b_dft2_prepare_tables_participants.R: adds results of the participant to the generic table, and includes plots like Figure 6.2.

It will then call ./analysis/00_child_intro_method.Rmd as well as, for each section, ./analysis/dft2/dft2_child_section.Rmd, which will create tables for each type of questions that are in the section (conditional for loop), by running two codes:

- ./code/04a_create_flextable_results_type_1_participants.R: creates the result table for type 1 statements with individual answers in the section and for their comments
- ./code/04b_create_flextable_results_type_2_3_participants.R : creates the result table for type 2 and 3 statements with individual answers in the section and for their comments

6.8.1 Detail of outputs

Folder	Output file	Description
<pre>/output/reports/dft2/report_ by_participant/</pre>	<pre>dft2_report_participant_X_ YYYY-MM-DD.docx</pre>	Individualized reports (one per participant) with date

Congratulations: you are now ready to conduct round 3!

7. Round 3

7.1 E-questionnaire management through REDCap

Round 2 is over. You have now rephrased, added and/or fused statements from round 2 into new ones and are ready to start round 3.



There should be only type 1 questions in this round. The code is therefore simpler and run faster than in round 2.

The following steps should be done in 1 day:

- Within your **round 3 REDCap project**: **replace all "xxx" with the texts of your actual statements**. Each statement header should also indicate reference(s) to the question(s) in round 2 from which it was derived. Duplicate type 1 questions' "skeleton" based on your needs, i.e., the number of questions per section that you wish to include in this e-questionnaire
- Test the e-questionnaire to verify comprehensiveness of the content and the absence of technical bugs
- Move this round 3 REDCap project into production mode talk with your REDCap Admin if necessary

☐ Send the hyperlink to experts (participants) with a deadline for e-questionnaire completion; together with this hyperlink, send their individualized result report from round 2 (output of **Section 6.8.1**)

You can now relax during 3-4 days, until the deadline is over.



Data collection can be observed in real time by accessing the 'Dashboard' Menu in **REDCap**. When getting close to the deadline, remember to send a personalized email to any experts who has not yet completed the e-questionnaire.

7.2 o run ME dft3.R - Overview of steps

Once data collection for round 3 is over, you can open $0_{run_ME_dft3.R}$. It will show you the order of files to update and run. It will upload, process and analyse the data and create reports.

7.3 Update data

• □ Run ./code/dft3/01a dft3 update data with REDCapR.R

This code will connect to the corresponding **REDCap** project using the token, downloads the raw data and metadata from the project, and save them as *.RData files. It also creates one *.xlsx table with the raw data, which can be used for quick checks.

7.3.1 Detail of outputs

Folder	Output file	Description
./data/redcap_dat a_raw/	dft3_metadata.RData	Raw metadata
./data/redcap_dat a_raw/	dft3_data_redcapr_r aw.RData	Raw data

7.4 Recode data

☐ Update as required and run ./code/dft3/01b dft3 recode data.R

This code will process the raw data and the metadata downloaded in Section 7.3, in order to create the "clean" data and metadata tables. In particular, it will:

- correct labeling errors, typos, etc.
- simplify labeling
- define the lists of variables by type (1)
- do a conditional deduplication (in case one or several participants have filled in several REDCap records per person -> keep the *latest answer choice* and *all comments*)
- save clean data and metadata in RData format

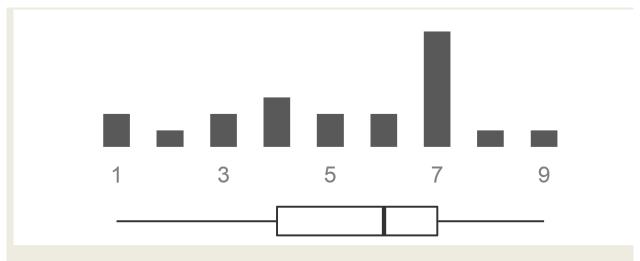


Figure 7.1: dft3_z_s4_type1.png (for the statement 4 in preamble of round 3)

create visuals (*.png) for all type 1 questions, showing the distribution of answers on a 1 to 9
 scale and a boxplot - see Figure 7.1

7.4.1 Detail of outputs

Folder	Output file	Description
./data/dft3/	dft3_data_clean.RData	Clean data
./data/dft3/	dft3_lookup_final.RData	Clean lookup table (metadata)
./output/check/	*.xlsx	Various xlsx files that can be used for checks or sharing
./output/png/	dft3_*_s*_type1.png	Visuals for all type 1 questions

7.5 Prepare tables without participant id

• □ Run ./code/dft3/02a_dft3_prepare_tables_without_participant_id.R

This code will analyse the "clean" data (generated in *Section 7.4*) to create the group result tables (= statistical and graphical summaries).

It automatically calls code ./code/dft3/01c_dft3_define_cols.R.

It also creates and saves in *.xlsx format the table containing only the "no opinion" responses, allowing a quick check if necessary.

7.5.1 Detail of outputs

Folder	Output file	Description
./output/RData/	dft3_type1_zz_combined.R Data	Table with results of all type 1 questions
./output/RData/	dft3_dt_comments_m.RData	Table with all comments
./output/check/	<pre>dft3_type1_zz0_no_opinio n.xlsx</pre>	Quick check table of 'no opinion' responses

7.6 Update introductory texts

- Update the content of your introductory texts (*.docx) if needed, as indicated in the Section 5.6.
- □ Run ./code/00_update_texts_intro.R

This code updates the local directory of texts used in the introduction of the report sections (from the available and up-to-date directory on the server).

7.7 Publish the generic report

The number of sections and the number of questions (all type 1) within these sections will vary between projects.

The list of sections needs to be defined manually in o00_parameters.R.

• □ Publish the generic report by running the lines below in 0 run ME dft3.R

This code will create the word document ("generic report") inserting the introductory texts (updated in *Section 7.6*) and the results tables (created in *Section 7.5*), based on a reference word template.

```
It automatically calls ./code/dft3/01c_dft3_define_cols.R. and ./analysis/00_child_intro_method.Rmd. Then, for each section, it calls ./analysis/dft3/dft3_child_section.Rmd, which will create tables for all questions (type 1) that are in the section (conditional for loop), by running one code:
```

• ./code/03a_create_flextable_results_type_1_generic.R : creates the result table for type 1 statements in the section and for their comments

7.7.1 Detail of outputs

Folder	Output file	Description
	dft3_report_generic_date_YYYY-MM-	Generic report with date
ft3	DD.docx	

7.8 Publish all individualized reports

 ■ Publish individualized reports - one for each respondent of round 3 - by running the lines below in <u>0 run ME dft3.R</u>

This code will create the word document for each participant ("individualized report"), based on a word template, by inserting the email of the participant, the introductory texts (updated in *Section 7.6*), as well as the group result tables with individual answers for each statement.

The code ./analysis/dft3/dft3_report_per_participant.Rmd (automatically called within ./code/dft3/05_dft3_to_render_individual_reports.R) uses an iterative loop to create the individualized report for each participant by calling automatically:

- ./code/dft3/01c dft3 define cols.R and
- ./code/dft3/02b_dft3_prepare_tables_participants.R : adds results of the participant to the generic table

It will then call ./analysis/00_child_intro_method.Rmd as well as, for each section, ./analysis/dft3_child_section.Rmd, which will create tables for all questions (type 1) that are in the section (conditional for loop), by running one code:

• ./code/04a_create_flextable_results_type_1_participants.R: creates the result table for type 1 statements with individual answers in the section and for their comments

7.8.1 Detail of outputs

Folder	Output file	Description
/output/reports/dft3/re		Individualized reports (one per
port_by_participant/	nt_X_YYYY-MM-DD.docx	participant) with date

Congratulations: **you are now ready** to create your overall synthesis report! Individualized reports created in *Section 7.8* can be sent to participants for their information.

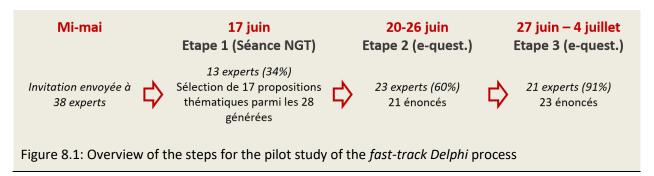
8. Overall

Once you have finished with the analysis and reports of round 3, this page will guide you through the steps to publish the final overall report which synthesizes results from round 2 and 3 (statistical and graphical summaries).

8.1 Update summary image

Update the image for the executive summary in the
 ./analysis/overall/delphiFT_Overall_FigureFlow.pptx
 provided with the details
 pertaining to your project and save it as
 ./analysis/overall/ExecutiveSummary_figure-Flow.png

It summarises the process with dates, number of experts (participants) and number of statements. See *Figure 8.1* below for an example of this figure using data from the pilot study provided in the demo data (in French).



8.2 Update introductory texts for the executive summary

- Update the introductory texts on the server
- Run ./code/00_update_texts_intro.R one more time to update the *.docx files in your local directory

8.3 Modify executive summary report titles and details

- □ Open the code ./code/000 parameters. R and go to section 4
- \square Check and modify if necessary title_overall, subtitle_overall and authors_text
- Update the list of type 1 statements from round 2 that you want to keep in the overall report : statement_numbers_in_dft2_to_keep_for_execsummary (some statements might have been reformulated despite reaching agreement and consensus)

8.4 <u>@_run_ME_overall.R</u> - Publish overall report

• □ Run 0 run ME overall.R

This code will:

update the introductory texts by running ./code/00 update texts intro.R

- prepare the result tables (only type 1 questions) with combined round 2 and 3 by running
 ./code/06 prepare tables combined round 2 3.R
- create *.x\lsx \tables for quick checks, if necessary
- publish the overall report (called Executive summary) by running ./analysis/overall/overall_executive_summary.Rmd

8.4.1 Detail of outputs

Folder	Output file	Description
./output/checks/	<pre>chk_recode_exec_sum mary.xlsx</pre>	Quick check table
./output/checks/	<pre>type1_zz_combined_r ound_2_3.xlsx</pre>	Quick check table
./output/RData/	type1_zz_combined_r ound_2_3.RData	Clean data for all type 1 questions from round 2 and 3
./output/reports/ overall/	<pre>dft_overall_executi ve_summary_YYYY_MM_ DD.docx</pre>	Executive summary

8.5 Finalise overall report

Here are a few tips to be done manually (directly in your Word software) to improve the look and comprehensiveness of your executive summary:

- Open the summary report using the Word software
- Add page numbers (still an unsolved problem see *Stackoverflow question*)
- □ Add your 'Key messages'
- Add the "target" images (available in ./_img/ as *.png files) in the table headers (sorry, we had trouble doing it by code)
- If necessary, rearrange the order of the statements within the tables (example: first, statement that have reached consensual agreement by the end of round 2, then those having reached consensual agreement in round 3)
- □ Delete the 'section' column
- Adjust the height of the table rows
- Delete the table 'Consensual disagreement reached' if none of your statements have reached a consensual disagreement

Tip

If table captions and/or tables are on next page, it is probably because of paragraph formatting:

- select caption or table and go to Paragraph > Line and Page Breaks tab (Enchaînements in french)
- uncheck Widow/Orphan control (Eviter veuves et orphelins) and Page break before (Paragraphes solidaires)

... et voilà!

Congratulations for going through all steps of the *fast-track Delphi* process. You are now ready to spread the consensual messages that have been reached by your expert participants. Good luck and enjoy the communication part!

Appendix A — Resources

Here are some of resources we used to learn and improve our skills with R, RStudio, Quarto and various packages.

Thanks to the contributors of the packages and tutorials.

- R for Data Science (2e) by Hadley Wickham, Mine Çetinkaya-Rundel, and Garrett Grolemund
- Tom Mock. Beautiful Reports and Presentations with Quarto. 2022-09-27
- Tracy Teal. These are a few of my favorite things (about Quarto presentations). RStudio (2022)
- Quarto Blog News, tips, and commentary about all things Quarto
- David Gohel. Using the flextable R package
- David Gohel. Officeverse

Velarde Crézé, Camille, Luc Lebon, Olivier Duperrex, Vincent Faivre, Myriam Pasche, and Jacques Cornuz. 2023. "Nouvelles Cigarettes Électroniques Jetables « Puffs » : Consensus d'expert-e-s Sur Leur Réglementation." Revue Médicale Suisse 19 (812): 181–85.

https://doi.org/10.53738/REVMED.2023.19.812.181.