
PHUSE 2016

DV02

Communicating results with R&Shiny

Mika Mäkinen



Introduction

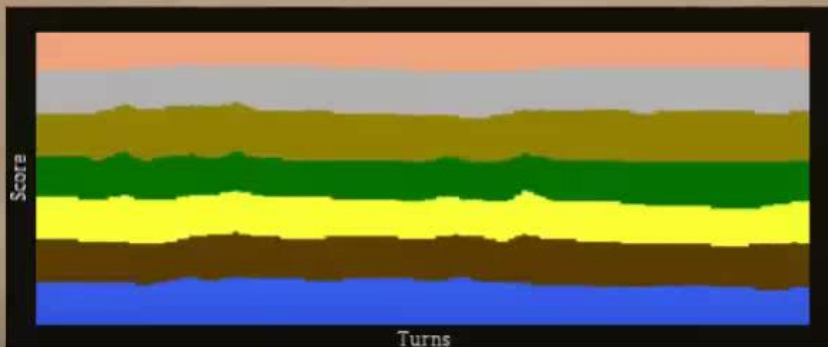
1. Communicating results (not only producing outputs)
2. Cases from a real study
3. Visualization concept

Motivation for interactive & better visualizations

- Responsibility of the function that has access to data & knowledge of technology
 - There is an unmet need for better visualizations from stakeholders
 - Better access & presentation might lead to discoveries
 - it is not always easy for the stakeholder to specify exactly what the question of interest is
- Interactive visualization enables communication
 - User communicates with the data
 - Interactive visualization facilitates discussion between stakeholder and programmer
- Other industries are doing it
 - Stakeholders are used to modern day application feel and look
 - Benchmarking to improve

Inspiration & benchmark

- **Civilization IV (2005)**
- Booking.com
- Pokemon dashboard
 - <http://jkunst.com/flexdashboard-highcharter-examples/pokemon/>



1950 BC: Memphisapur is founded.
 2020 BC: Barcelona is founded.
 2080 BC: Hattenator declares war on Riffix!
 2140 BC: Vaidotas declares war on Washington!
 2260 BC: Washington adopts Slavery!
 2380 BC: idprism declares war on Washington!
 2380 BC: Hamburg is founded.
 2380 BC: Blackstaff declares war on Harshepsur!
 2380 BC: Blackstaff declares war on Kublai Khan!
 2500 BC: Blackstaff declares war on Riffix!
 2560 BC: Leo declares war on Blackstaff!
 2560 BC: Djenne is founded.
 2620 BC: Hattenator declares war on Blackstaff!
 2740 BC: Leo converts to Judaism!
 2740 BC: Judaism has been founded in Timbuktu!
 3040 BC: Hattenator declares war on Harshepsur!
 3160 BC: Riffix converts to Buddhism!
 3160 BC: Leo declares war on Kublai Khan!
 3160 BC: Buddhism has been founded in Mecca!
 3280 BC: Hattenator declares war on Washington!
 3520 BC: Blackstaff converts to Hinduism!
 3520 BC: Hinduism has been founded in Madrid!



Inspiration & benchmark

- Civilization IV (2005)
- **Booking.com**
- Pokemon dashboard
 - <http://jkunst.com/flexdashboard-highcharter-examples/pokemon/>

Find the best accommodation deals

Whoever you are, whatever you seek, it all starts here.

Destination, property name or address:

Barcelona, Catalonia, Spain

Check-in

Sunday 9 October 2016

Check-out

Wednesday 12 October 2016

3-night stay

Travelling for: ☐ Work ☒ Leisure



Search for: ☒ All properties ☐ Hotels ☐ Homes and apartments

Rooms Adults Children

☒ Show Genius discounts first

Search



New deals listed every day

With FREE cancellation on most rooms

Still interested in these destinations?



Les Baux-de-Provence

France

1 Oct - 3 Oct
1 room, 2 adults, 1 child

Resume search



Les Baux-de-Provence

France

1 Oct - 3 Oct
1 room, 2 adults

Resume search



Avignon

France

1 Oct - 3 Oct
1 room, 2 adults

Resume search



How was **La Piazza Menaggio**?

Rate your stay

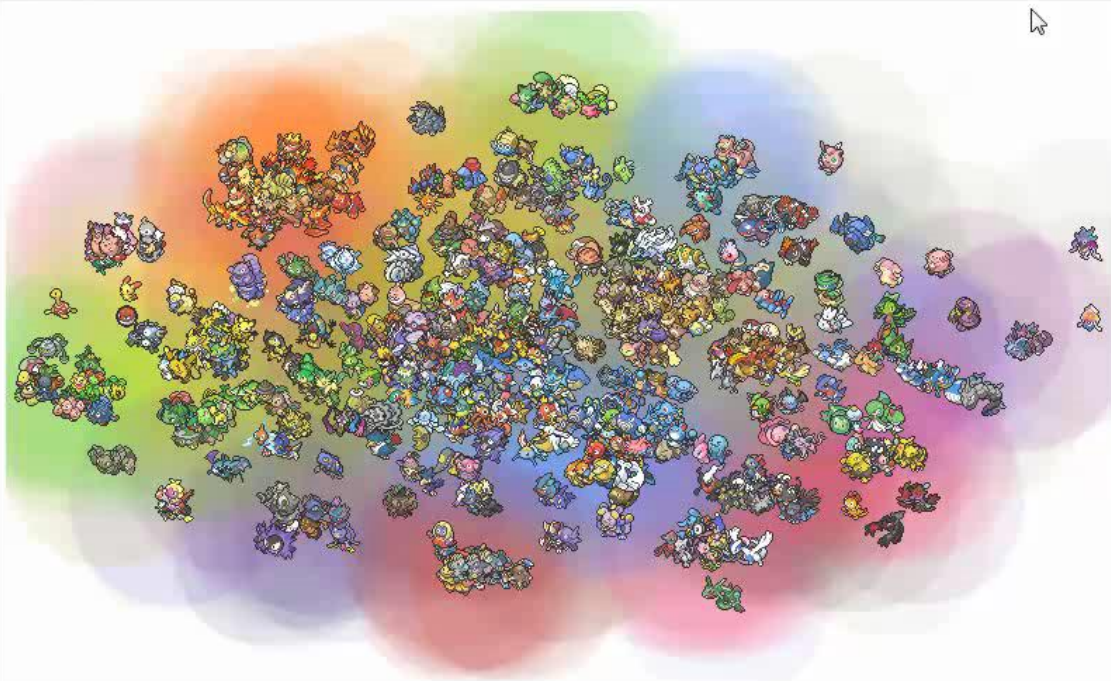
Still planning a trip to this destination?

Inspiration & benchmark

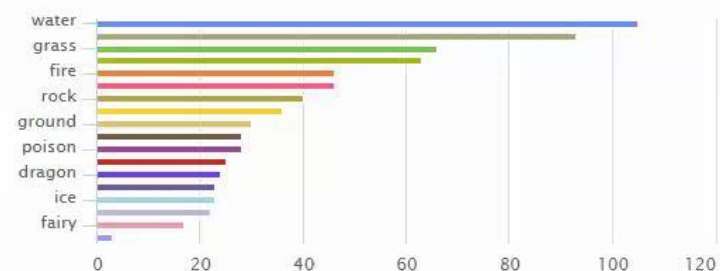
- Civilization IV (2005)
- Booking.com
- **Pokemon dashboard**
 - <http://jkunst.com/flexdashboard-highcharter-examples/pokemon/>

Pokemon Dashboard

t-SNE algorithm



Species count by main type



Types treemap



From paper to browser

- Many questions can be answered through interaction (e.g. Booking change of days)
- Intuitive story telling (Civilization)
- Quick access to the data (Booking)
- Quick to publish & distribute (Pokemon)
- Use of graph objects within visualization (Pokemon)
- Drill down (Pokemon, Booking)

R/Shiny

- R/Shiny has a very good pipeline from programming to publishing
 - Modular programming enables reactivity
 - Distribution of visualizations is easy with server.
- R has great libraries for graphs
 - Base, grid, trellis, ggplot2
- Shiny has plenty of ready to be used templates
 - <http://shiny.rstudio.com/gallery/>
- Visualizations can be produced with other software as well
 - Spotfire, Java script, VBA... etc.

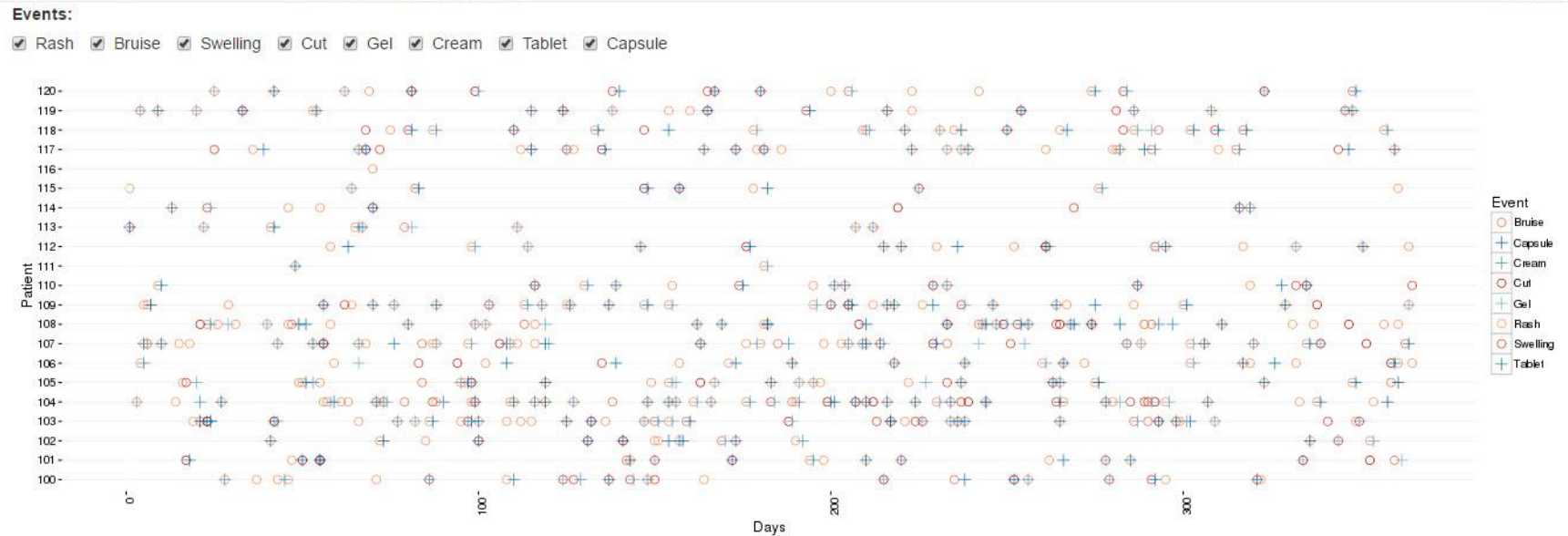
Simulated data

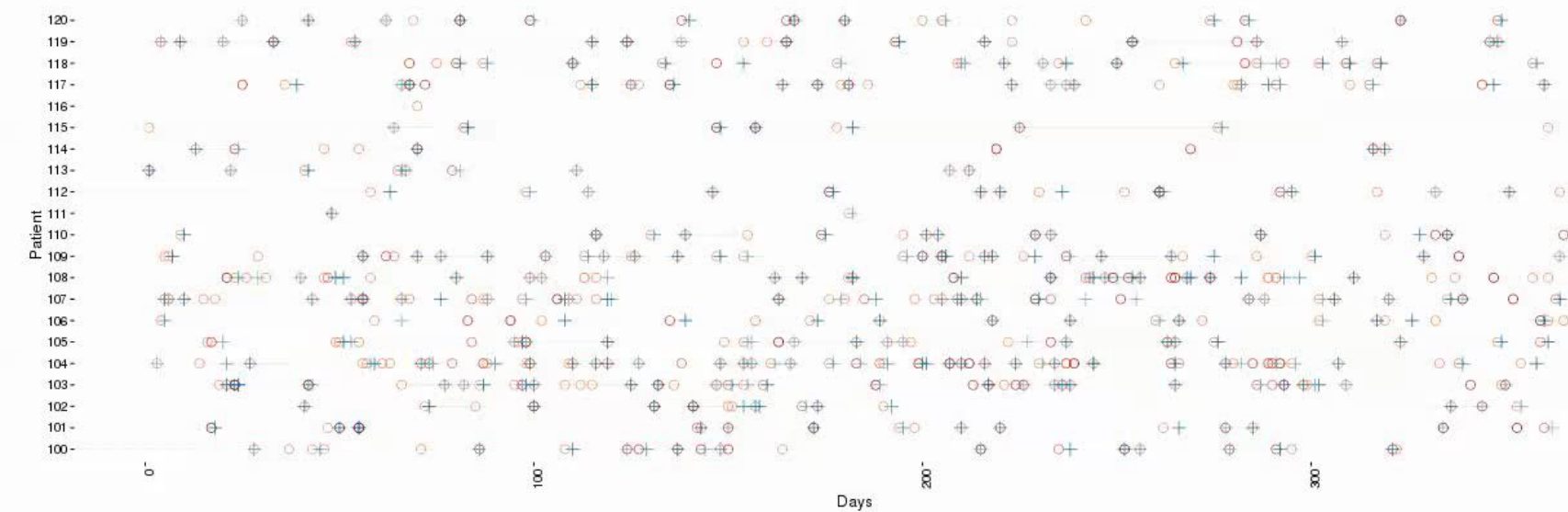
- Structure
 - Events (Rash, Bruise, Swelling, Cut)
 - Treatments (Gel, Cream, Tablet, Capsule)
- Structure similar to any event data
- Used mostly to investigate relationship between event and treatment
 - E.g. whether it is feasible to say that day 65 Rash was treated with day 69 capsule.

patientNum	eventDay	event	eventCat	bodyLocation
100	55	Swelling	Event	8
100	65	Rash	Event	6
100	56	Gel	Treatment	NA
100	69	Capsule	Treatment	NA

INTERACTIVITY IN MULTIPLE EVENT PLOT

<https://r.roche.com/s/afc784a32fb0be6deb0f9/p/4535/> | [Open in Browser](#) | [Publish](#)



Events:
☒ Rash ☒ Bruise ☒ Swelling ☒ Cut ☒ Gel ☒ Cream ☒ Tablet ☒ Capsule


Event

- Bruise
- Capsule
- Cream
- Cut
- Gel
- Rash
- Swelling
- Tablet

INTERACTIVITY IN MULTIPLE EVENT PLOT

- Real visualization
 - Descriptive numbers to follow the collection of data
 - Many options to subset the data
- Visualization was used to share data as the study was ongoing
 - New disease area for company
 - ePRO data
 - Non-interventional study (NIS) to help to understand the data
 - Refreshed as data arrived

INTERACTIVITY IN MULTIPLE EVENT PLOT

- Within biometrics
 - Helped statisticians and programmers to communicate difference between expected and actual data.
 - Helped to communicate data problems to data management
- Outside biometrics
 - Access to visualization was fast after data arrival
 - Visualization helped to see the need to refine the end point definitions for up coming studies
 - Clinical science was able to identify unexpected behaviors to focus medical review
 - Most likely some official adhoc request were avoided as team was able to address questions interactively

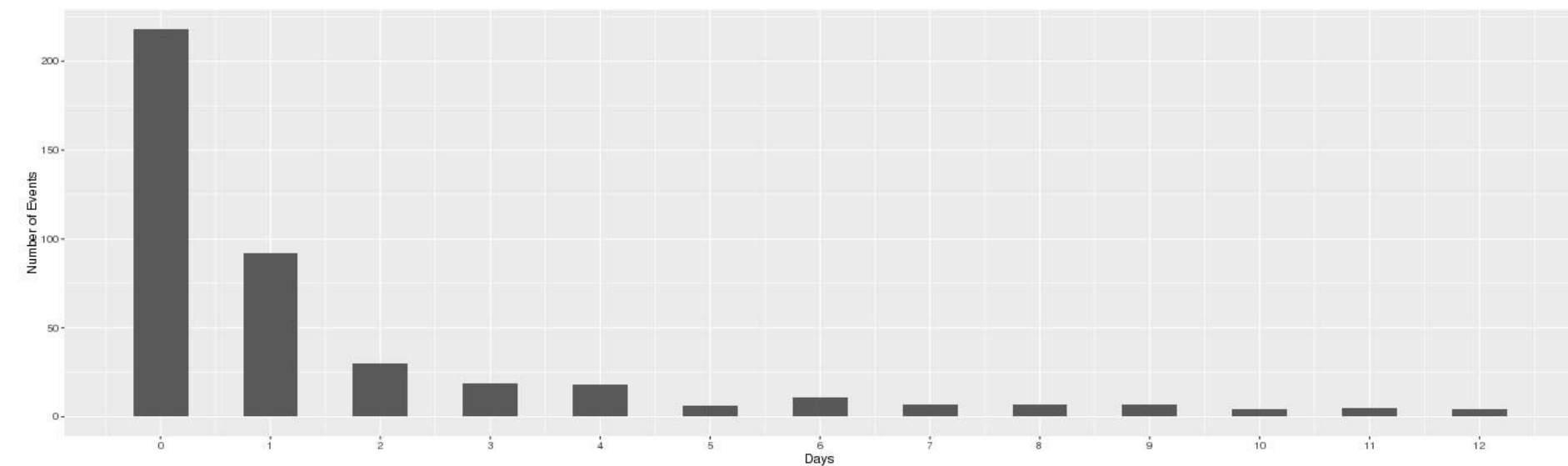
VISUALIZATION OF CHANGE IN DEFINITIONS



<https://r.roche.com/s/afc784a32fb0be6deb0f9/p/4535/> Open in Browser

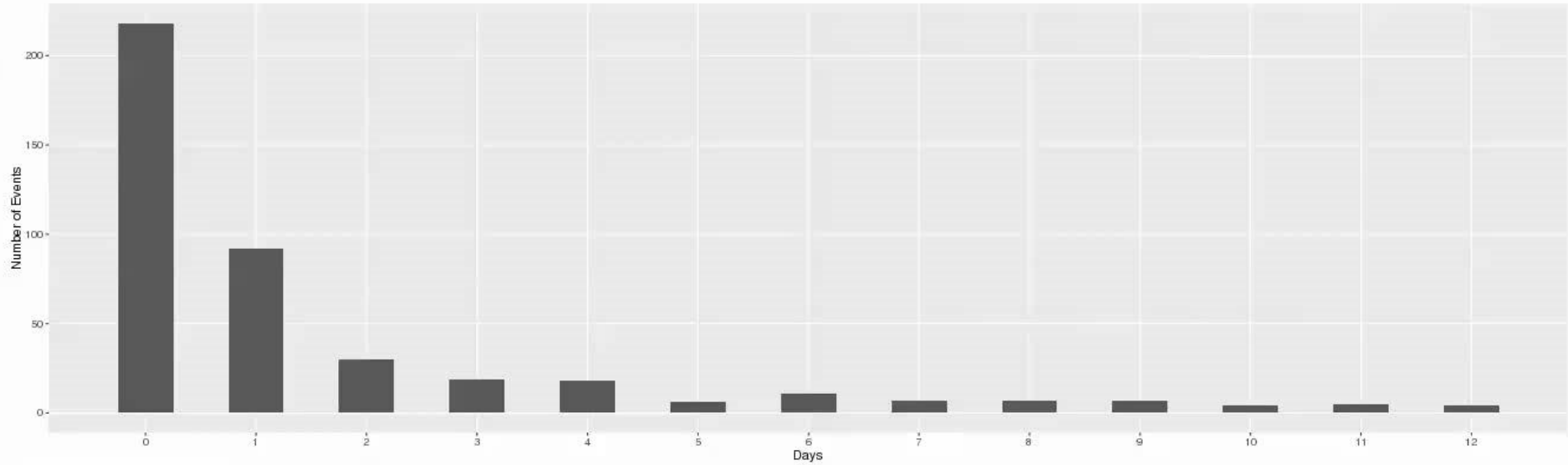
Publish

Choose number of days to be considered



	included	excluded
nObs	428	36

Choose number of days to be considered

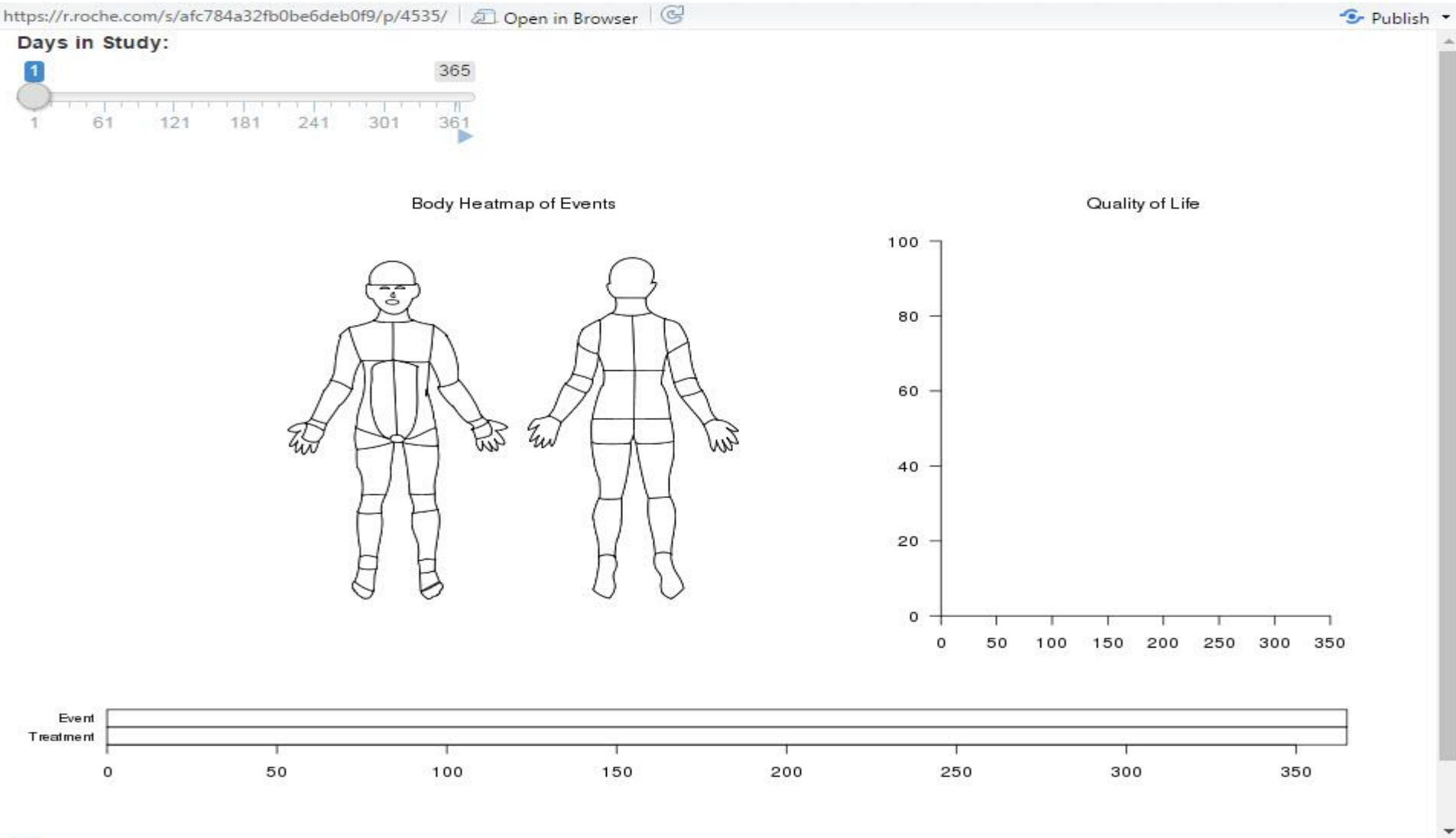


	included	excluded
nObs	428	36

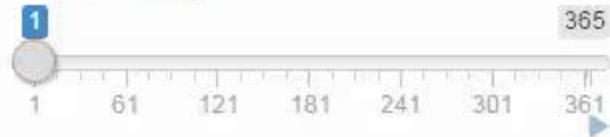
VISUALIZATION OF CHANGE IN DEFINITIONS

- Real visualization
 - More options to change definition
 - Descriptive table
 - Searchable list of events excluded/included as treated
- Visualization was used to assess the definition of treated event.
- Visualization facilitated discussion.
- Helped to see the need of change of definition of treated event.
- Listing data points in side of visualization helps stakeholders to understand handling of individual observation that they are interested.

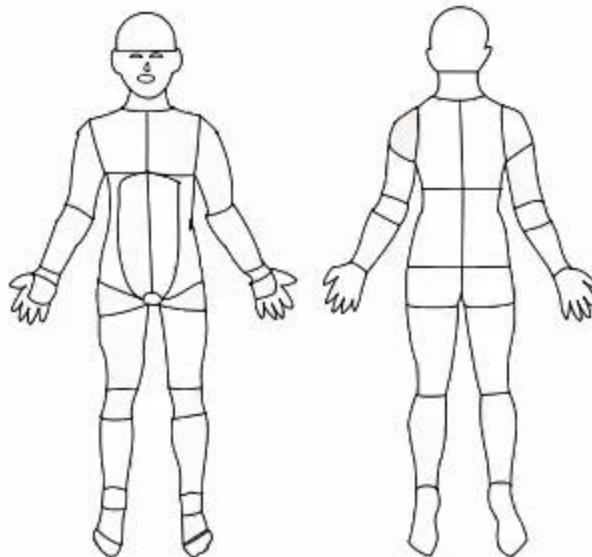
CUSTOM PLOT TO TELL THE STORY OF THE STUDY



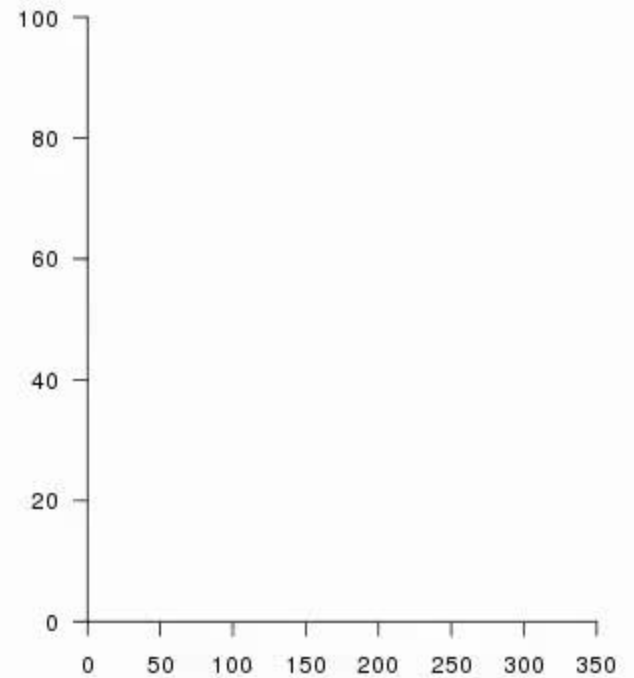
Days in Study:



Body Heatmap of Events



Quality of Life



CUSTOM PLOT TO TELL THE STORY OF THE STUDY

- Engaging visualization for all stakeholders
- Story of the study, combining multiple domains
 - Heatmap type of presentation
 - Numbers/scales could be added to add information
 - Comparison between groups side by side
- Any vector graphic can be imported and used as base for visualization
- Method could be used with much more detailed graphics

Summary

- Interactive visualization facilitates communication.
 - Communication helps programmer to understand and contribute in the project.
- Server based visualizations let users to access the most recent data when there is a need.
- R/Shiny has good tools for interactive visualizations.

Doing now what patients need next