# Clinical Trial Data exploration and visualization

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- Introduce:

Clinical trials are vital to medical research and healthcare. We chose four aspects such as age, date of participation, leader or collaborator, and the nature of the experiment to display the data, hoping to reflect more connections and patterns in the data, and meet the research purposes and directions of different researchers. We also visualize the countries participating in clinical trials and the distribution of clinical trials. In this report, we explain why these features were chosen and provide a brief description of each.

- Feature selection and motivation:

Age range:

Age is a key factor in clinical trials because different age groups may respond differently to treatments. Analyzing age data helps us understand how age affects trial results and plan treatment accordingly. For future researchers, they can adjust the scope to find past experiments that correspond to their research population for reference.

Date range:

Timing is important in clinical trials because medical practices change over time. Selecting a date range helps us track trends and the progress of ongoing trials. At the same time, users of this app can also filter studies during the time period of interest by adjusting the date range to compare clinical trials during the same period, making the results more valuable for reference. Future literature review and meta-analysis research can directly filter the target pool of literature by date range.

Collaborators or leaders:

Collaborators and principal investigators can influence trial results. Analyzing data according to collaborators can help identify patterns and potential biases.

Type of Study:

There are different types of clinical trials, such as observational trials, interventional trials, randomized trials, etc., and the goals of each trial are different. Selecting the study type allows us to conduct more detailed analysis and exploration of the same category of trials, making the results more informative.

Spatial visualization of participating countries:

By choosing the feature "Spatial visualization of participating countries", users can conduct a more detailed analysis and exploration of clinical trials involving different countries. Different countries may play distinct roles in clinical trials due to variations in resources, disease prevalence, and patient populations. Therefore, selecting this feature allows for more informative results.

Overall status distribution visualization:
The feature is selected in order to gain a more comprehensive understanding of the current status of various clinical trials. For stakeholders, visualizing the distribution of overall trial statuses allows to track the progress of clinical trials. Meanwhile, we can have better understanding on how the clinical trial is going on, which is valuable for adapting research strategies and interventions as needed. Furthermore, we may be able to take a look at the reason of why study stopped.

- Description

Age range:
This feature displays and categorizes the age of participants. By adjusting the age range, users of this app can view experiments for the target age range. It provides insights into the safety and effectiveness of treatments across age groups.

Date range:
This feature captures the trial start and end dates. Users of this app can filter studies for the time period of interest by adjusting the date range to help track trends and ongoing trial progress.

Collaborators or leaders:
This feature is used to classify and identify leadership or cooperative trials. Users of this app can view the people behind the experiment by selecting different categories, helping to assess expertise and potential bias. In clinical trials, each NCT ID (National Clinical Trial Identifier) represents a specific clinical trial project. Each NCT ID can contain multiple studies, and the order in which these studies are arranged can vary, but in most studies, it is arranged in chronological order based on their start date or planned date, from the earliest study to the most recent. In this app, we selected the first study in each clinical trial identifier and display its data of collaborator or leader. We believe the earliest stage of the trial is the best phase to represent how the whole study is shaped and is of the most value for users' reference.

Type of Study:
This feature classifies trials into types such as Interventional (clinical trial) or observational studies. Users of this app can view experiments of different natures by selecting different categories, which can give users a clearer and more accurate reference for similar experiments and provide a background for understanding experimental methods.

Spatial visualization of participating countries:
This function spatially visualizes the countries of clinical trials and performs geographical stratification and coloring according to the number of trials conducted. Users of this app can very intuitively observe the geographical scale of clinical trial participation, which helps to understand the global distribution of clinical trials. . Provide a reference for subsequent research on geographical analysis and

spatio-temporal distribution statistics.

Overall status distribution visualization:
This feature provides a clear view of trial progress and results, so clinical trials show the distribution of trials by trial status (e.g., ongoing, completed). Through such visualization, users of this app can grasp the general status of the entire clinical trial and estimate the progress of the trial. The categories are listed as below:

- Not yet recruiting: Participants are not yet being recruited
- Recruiting: Participants are currently being recruited, whether or not any participants have yet been enrolled
- Enrolling by invitation: Participants are being (or will be) selected from a predetermined population
- Active, not recruiting: Study is continuing, meaning participants are receiving an intervention or being examined, but new participants are not currently being recruited or enrolled
- Completed: The study has concluded normally; participants are no longer receiving an intervention or being examined (that is, last participant's last visit has occurred)
- Suspended: Study halted prematurely but potentially will resume
- Terminated: Study halted prematurely and will not resume; participants are no longer being examined or receiving intervention
- Withdrawn: Study halted prematurely, prior to enrollment of first participant

Selected features and visualizations help us make informed decisions in healthcare research, understand the effects of age and time, evaluate research collaborations, and identify patterns across trial types. This data-driven approach contributes to medical science and better healthcare outcomes.

Reference:
https://clinicaltrials.gov/prs-info/protocol-definitions