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Tutorial

# Teaching Mixed Methods: Using the Titanic Datasets to Teach Mixed Methods Data Analysis

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**Supplementary Materials:** Data, Materials [see Index of Supplementary Materials]

## Abstract

The Titanic quantitative dataset has long been used to teach statistics. However, combining the quantitative dataset with a qualitative dataset of survivor testimonies shows that the Titanic case is an even better example to teach mixed methods. This article offers practical tools to teach mixed methods to undergraduate or postgraduate students in the social sciences, using the Titanic datasets. Based on an empirical analysis of the survival probabilities on the Titanic, we show how mixed methods lead to superior explanations than mono-method strategies. This paper has two goals: 1) to introduce the freely available linked Titanic datasets; and 2) to present a three-hour step-by-step exercise with the Titanic datasets that can be used to learn and teach mixed methods.

## Keywords

mixed methods, Titanic, qualitative content analysis, quantitative analysis, survival analysis, teaching, integrated data analysis, social games

Mixed methods research has made much progress in recent decades, but there is still a lack of highly visible examples and publicly available datasets that may be used for learning and teaching mixed methods (Bazeley, 2003; Bryman, 2008; Creswell et al., 2003). There are hundreds of free mono-quantitative and mono-qualitative datasets on the Internet or in specific data-repositories, but very few mixed methods datasets. We do not claim that we can solve the situation here, but wish merely to make a start. We add one mixed methods dataset that researchers may download and use freely for their learning and teaching (for downloading datasets, the coding schemes, the syntax files for

the exercises and helpful publications see Supplementary Materials). While this is only one example, we think it is a good one for three reasons.

First, students are fascinated both by the historical case of the Titanic and by the spectacular correlations between gender/class and likelihood of survival. Second, the example shows that a mixed methods analysis is actually superior to a mono-method analysis (Stolz & Lindemann, 2019; Stolz et al., 2018); it is therefore very useful to show the specific added value of mixed methods. Third, this is all the more noteworthy because the quantitative Titanic data are often used for the mono-method teaching of statistics in all major packages (SAS, R, SPSS, STATA; Bellocco & Algeri, 2013; Kohler & Kreuter, 2017; Landau & Everitt, 2004).

This paper has two goals: 1) to present the linked Titanic datasets; and 2) to present a three-hour exercise with the Titanic datasets that can be used to learn and teach mixed methods.

Since we have been using the Titanic example in our teaching both for beginners and advanced students for years, we have experience of the kinds of questions that students might have and the kinds of insights that are possible. We have therefore tried to integrate this knowledge, and have been inspired in doing so somewhat by Strauss (2003[1987]).

As will become clear, the exercises reflect to a certain extent our views of the mixed methods approach and its philosophical background – for example, that mixed methods may use a realist philosophical background, and that one central rationale of mixed methods can be to give more valid answers to research questions by eliminating validity threats from other methods (Kelle, 2001, 2007; Maxwell & Mittapalli, 2010; Stolz, 2016, 2017; Stolz & Lindemann, 2019; Stolz et al., 2018). However, we believe that the example of the Titanic may also be useful for mixed methods researchers with other philosophical, theoretical, or methodological leanings. These researchers may want to adapt several elements of the exercises below.

## The Titanic Datasets

The Titanic datasets consist of a quantitative dataset ($n$ = 2,207) and a qualitative dataset of testimonies provided by the survivors ($N$ = 214). These two datasets are linked perfectly by a variable indicating the names of the survivors.

### The Quantitative Dataset

The initial version of the quantitative dataset was created by Frey et al. (2011) from the Encyclopedia Titanica. We cross-checked and enhanced this dataset with a number of variables in light of its use in a mixed methods study. More specifically, we added variables on the time when individuals boarded a lifeboat[1], the side of the boat from

where individuals boarded the lifeboat, the order in which the lifeboats left the Titanic, and whether or not the individuals gave a testimony.

**Table 1**

*Descriptive Information on the Quantitative Titanic Dataset (Selection of Variables)*

| Variable name | Variable description | Range/category | Mean/% | *SD* | *n* |
|---|---|---|---|---|---|
| lived | survived/perished | 0 - 1 (1 = survived) | 0.32 | 0.47 | 2,207 |
| boatentertime | time of boarding a lifeboat | 40 - 135[a] | 121.23 | 24.72 | 2,188 |
| sex | sex | 0 - 1 (1 = female) | 0.22 | 0.41 | 2,207 |
| age | age | 1 - 74 | 29.91 | 11.75 | 2,196 |
| child | child yes/no | 0 - 1 (1 = child) | 0.06 | 0.23 | 2,207 |
| classcrew | class of passenger, type of crew | | – | – | 2,207 |
| | | 1st class passenger | 14.7% | | |
| | | 2nd class passenger | 12.9% | | |
| | | 3rd class passenger | 32.1% | | |
| | | A la carte crew | 3.1% | | |
| | | Deck crew | 3.0% | | |
| | | Engine crew | 14.7% | | |
| | | Victualling crew | 19.5% | | |
| country | country of origin | | – | – | 2,207 |
| | | England | 52.7% | | |
| | | USA | 19.2% | | |
| | | Ireland | 5.2% | | |
| | | Sweden | 4.8% | | |
| | | Other | 18.1% | | |
| testimony | has given a testimony | 0 - 1 (1 = testimony) | 0.10 | 0.29 | 2,207 |
| boatnumber | boat number | | – | – | 701 |
| | | 1 - 16 | | | |
| | | A - D | | | |
| boatorder | order of lifeboats leaving titanic | 1 - 21 | | | 701 |
| boatside | side of titanic where lifeboat was | | – | – | 698 |
| | stationed | starboard | 18.2% | | |
| | | port | 13.4% | | |
| name | name of individual | | | | 2,207 |
| id | id of individual | | | | 2,207 |

[a]Individuals not entering a lifeboat are assigned the time 135 (censored).

The quantitative dataset contains the following variables (see Table 1):

1) This is measured with a proxy: the time when the boat actually left the Titanic (and which is reasonably well know).

- Dependent variables: survived/perished, time of boarding a lifeboat (in minutes, after impact).
- Independent variables: sex, age, child, class/crew, country of origin.
- Additionally, there are some context variables: Side of the boat from which individuals boarded a lifeboat (port/starboard), boat number, order in which the lifeboats left the Titanic, name of the individual, ID, as well as a dummy variable indicating whether or not individuals gave a testimony after the tragedy.

The quantitative dataset is available as an SPSS file or a CSV file. Readers who use R can use the R syntax provided to label the variables of the CSV file.

## The Qualitative Dataset

The qualitative dataset contains the testimonies of 214 survivors. These testimonies have been taken from the Encyclopedia Titanica[2] and the British and American trial proceedings.[3] The survivor testimonies were grouped according to the lifeboat that enabled the individual to survive. These testimonies come in a variety of forms: a. interviews given to journalists; b. testimonies given at the trial proceedings; c. accounts provided by journalists of what survivors had told them; d. letters to family and friends; e. affidavits. The testimonies were given at very different times, in different contexts, to different publics, and are of very different lengths (the shortest contains a few sentences, while the longest contains more than 280 pages).[4]

The qualitative dataset comes in two forms:

1. In a number of text files, ordered according to the lifeboats in which the survivors were rescued.
2. As a coded MAXQDA file.

In Textbox 1, we present a selection of the code list. On level 1, we distinguish "Filling rules", "Authority acceptance", "Way to the boat deck", "Attribute nationality", and "Social network". Every code has a specific coding rule that can be inspected by looking at the code memo in MAXQDA. Many codes (such as filling rules and authority acceptance) come in two forms: whether the respondent experienced the attribute of the situation when entering the lifeboat herself, or whether she observed this attribute of a situation in another context. This allows us to quantify the attributes experienced and cross-tabulate them with the variables of boat side, lifeboat, gender, and class. To create the

2) https://www.encyclopedia-titanica.org.

3) http://www.titanicinquiry.org/about.php.

4) There is some overlap between this section describing the datasets and validity issues and the same description in (Stolz et al., 2018) We believe that this is acceptable and do not claim originality for this part of the paper. What is needed here is consistency over the different papers.

**Textbox 1**

*Coding Scheme (Selection)*

| Level 1 | Level 2 | Level 3 |
|---|---|---|
| **Filling rules** | | |
| | Women & children first | |
| | If no more women - fill randomly | |
| | Couples first | |
| | Fill with anybody | |
| | Shortage of women | |
| | Women hesitate/refuse to board | |
| **Authority acceptance** | | |
| | Officers in charge | |
| | People calm, follow orders | |
| | People panic | |
| | Men try to sneak into boats | |
| | Men try to rush boats | |
| | Officers re-establish order | |
| | Officers shoot | |
| | Fill from A deck | |
| **Way to boat deck** | | |
| | Crowd size | |
| | | Crowd small |
| | | Crowd large |
| | Arrival time on deck | |
| | | Arrives before 0.40 |
| | | Arrives 0.40 - 1.20 |
| | | Arrives 1.20 - 2.05 |
| | | Arrives after 2.05 or not (all boats gone) |
| | Way to boat deck specific | |
| | | On first decks when impact occurs |
| | | Informed through crew |
| | | On other decks first |
| | | Difficult way to boat deck |
| | | Crowd obstructs passage |
| | | Crew obstructs / unhelpful |
| | | Reluctant to go to boat deck |
| | | Finds gates locked |
| | | Finds gates open |
| **Age & strength** | | |
| **Attribute nationality** | | |
| **Social network** | | |
| | | Informed through social network |
| | | Goes to deck with others |
| | | Get on - encouraged by social network |
| | | Social Network generic |

coding scheme, we used “game heuristics”, an inductive method that starts out with

the idea that social phenomena are interlinked "social games", and that codes have the goal to reveal "game mechanisms" that may explain a given social outcome (Stolz & Lindemann, 2019). Game heuristics offers a series of initial heuristic concepts that are used to code the qualitative material. The initial sensitizing codes are: players, goals, rules, representations, actions, objects, and context. These initial codes work similarly to the well-known "coding paradigm" (consisting of conditions, interactions, strategies, and consequences) in grounded theory (Strauss & Corbin, 2014 [1998]).[5] Inductively working through the material with the research question in mind, the codes are then transformed to focus in on the relevant parts of the social game at hand. To give some examples: in our case, the goal of the game can be assumed to be survival and important actions are how individuals learn of the impact, how they go to the boat deck and whether or not they follow orders (authority acceptance). Important rules of the game are the filling rules regarding the boats. Important context information is just where the cabins of the individuals were located, how difficult the way up to the boat deck was, when the individuals arrived on the boat deck (if they did), and whether they found a large or small crowd there waiting to get into the lifeboats. In Textbox 1, readers see a selection of the final codes that we arrived at (for the full coding scheme see Supplementary Materials).

## Reliability and Validity Issues

Most variables in the quantitative dataset have a high level of reliability. We have a very thorough knowledge of who was on the Titanic, their age, sex and nationality, and the type of ticket (class) they had or the type of crew member they were. For almost all survivors, we are quite confident about which lifeboat they boarded and at what approximate time. While the information in the quantitative dataset is of a high quality, we have to acknowledge that a lot of what is interesting remains unmeasured. For example, we do not have useful variables that give us information about the location of individuals' cabins, the time when they were informed about the emergency, or their activities and strategies thereafter.

The qualitative dataset gives us a wealth of information about many of the points that are missing in the quantitative dataset. However, this qualitative information has its own problems that may restrict its validity/credibility.[6]

1. Problems of selection: One obvious problem is the fact that we only have the testimonies of surviving individuals, who are not a typical subset of all individuals

5) An advantage of game heuristics in comparison to the grounded theory coding scheme is that it includes rules as a sensitizing concept. In the case of the Titanic, rules are indeed extremely important to understand what happened.

6) Mixed methods researchers have not yet reached a consensus on what terms to use when discussing quality issues of data and analysis. What we mean here may be as well termed validity (in a quan perspective) or credibility (in a qual perspective). For a discussion of these terms, see (Tashakkori and Teddlie, 1998)

**Table 2**

*Passengers & Crew, Survivors, and Those Providing a Testimony*

| | Those providing a testimony | | Survivors | | Passengers & crew | |
|---|---|---|---|---|---|---|
| **Variable** | ***N*** | **%** | ***N*** | **%** | ***N*** | **%** |
| Women | 93 | 43.2 | 351 | 49.9 | 485 | 22.0 |
| Men | 121 | 56.8 | 353 | 50.1 | 1722 | 78.0 |
| 1. Class | 69 | 32.1 | 200 | 28.4 | 324 | 14.7 |
| 2. Class | 34 | 15.8 | 115 | 16.3 | 285 | 12.9 |
| 3. Class | 36 | 16.7 | 178 | 25.3 | 708 | 32.1 |
| Restaurant Crew | 2 | 0.9 | 3 | 0.4 | 69 | 3.1 |
| Deck Crew | 28 | 13.0 | 42 | 6.0 | 66 | 3.0 |
| Engine Crew | 17 | 7.9 | 72 | 10.2 | 325 | 14.7 |
| Victualling Crew | 29 | 13.5 | 94 | 13.4 | 430 | 19.5 |
| English | 122 | 57.0 | 293 | 41.6 | 1164 | 52.7 |
| American | 58 | 27.1 | 207 | 29.4 | 424 | 19.2 |
| Other | 34 | 15.9 | 204 | 29.0 | 619 | 28.0 |
| *N* | 214 | 100 | 704 | 100 | 2207 | 100 |

(e.g., women and individuals from higher social classes survived more often). Furthermore, only a subset of survivors provided a testimony, and the selection is again not typical, with precedence being given to men and people of an Anglo-Saxon heritage. The two-stage selection process can be inspected in Table 2.

2. Problems of credibility of testimonies: Other problems may result from the fact that individuals (a) may have had a poor recollection of the events, and all the more so since these events were clearly extremely traumatic; (b) may have confused their memories with stories that they heard later or with films that they watched later; (c) may have adapted their stories to their audience in order to create specific effects – for example, to embellish their role or render certain points more dramatic; (d) may have withheld or invented important information, especially if they feared negative judgment on their behaviour.

While these problems are real, we can also do much to counter them; indeed, this is precisely the advantage of using mixed methods:

- Since our qualitative dataset is nested in the quantitative dataset, we can investigate the extent of selection concerning gender, class/crew, and nationality in Table 2.
- As survivor testimonies are qualitative accounts that all refer to the same event, they contain valuable information about what happened not only to those testifying, but

also to others (both surviving and non-surviving), and about the evolving context as a whole. By triangulating different testimonies, we can often make very precise assertions about what actually happened on the boat deck, and build quite a good picture of the ways to the boat deck that different classes took.

- Again, because both the qualitative and quantitative datasets are concerned with the same social process, we can also triangulate and cross-check results between data types.

## A Three-Hour Exercise to Show the General Usefulness of Mixed Methods

In what follows, we present an exercise that uses the Titanic datasets and that shows students the general usefulness of mixed methods. We often do the exercise in three hours, but the time obviously varies greatly according to how much time is taken to go into depth in specific steps. Of course, there are countless exercises that one could create with these datasets and every teacher will adapt the exercise in one way or another. This is why we put a special emphasis on the more general points we want to get across to students with this exercise.

### Goal of the Exercise

At the end of the exercise, students should:

1. Understand the usefulness of mixed methods, i.e. the fact that mixed methods may lead to more valid conclusions about a research question than a mono-method analysis.
2. Understand that all hypotheses made about social mechanisms and the meaning/function of x and y variables rest on assumptions that may be wrong and that can be scrutinized with qualitative content analysis.
3. Understand that the results of qualitative content analysis – for example, typologies and perceived causal mechanisms – can very often be quantified. Sometimes, it is possible to generalize to a larger population, and relationships may be tested for statistical significance. Conversely, variables in a quantitative dataset can be investigated as to their meaning and function in a "social game" and context with qualitative means.
4. Understand how it is possible, in mixed methods, to switch iteratively between quantitative and qualitative analysis.

## Prerequisites

For these exercises, students need a basic understanding of quantitative and qualitative methods, some knowledge of the statistical software SPSS and/or R as well as of the mixed methods software MAXQDA, and laptops that have either SPSS or R and MAXQDA installed. One of the advantages of R is that it is free. Unfortunately, we cannot yet provide a coded version of the Titanic dataset in a free qualitative software (like RQDA).

Readers may use the syntax accessible on our website, for both SPSS and R (see Supplementary Materials).

## Introducing the Exercise

1. Have students whistle Céline Dion's "My heart will go on", or show them a few seconds of the trailer for the Titanic film. In this introduction part, you can also provide some factual and historical information regarding the Titanic.
2. State the research question: What were the causes / mechanisms that led individuals on the Titanic to survive or perish? This step is important because we want to show students that mixed methods are not interesting in themselves, but only have legitimacy if they are able to give a more valid answer to a research problem than a simpler mono-method approach.
3. Preliminary theorizing: have students find explanatory variables that may lead to higher or lower probability of surviving on the Titanic. Students come up with variables like class, gender, physical strength, social ties, location of the cabins, etc. We normally make a sketch on the blackboard of these variables. For every independent variable mentioned, we ask students to specify the "causal story" or "causal mechanism" of how exactly this explanatory variable might have influenced the response variable. For example, if they mention "class", we ask: how did that work exactly? They may say: people in first-class accommodation had more money than people in the lower-class cabins, and they may have bribed the crew to allow them onto the lifeboats. We encourage students to be as precise as possible for every assumed mechanism.

## Exploratory Quantitative Data Analysis

Have students do some exploratory quantitative data analysis with the variables that they have found in the previous step: class, gender, age, and survived/perished.

1. When *crosstabulating "survived/perished" with "gender" and "testimony"*, students can recreate Table 2 above and thus *analyze the selection in testimonies*. We ask: How has the process of what happened on the Titanic influenced the gender ratio of witnesses? Students will work out that there is a double selection process going on with regards to gender: women are much more likely to be in the survivor category,

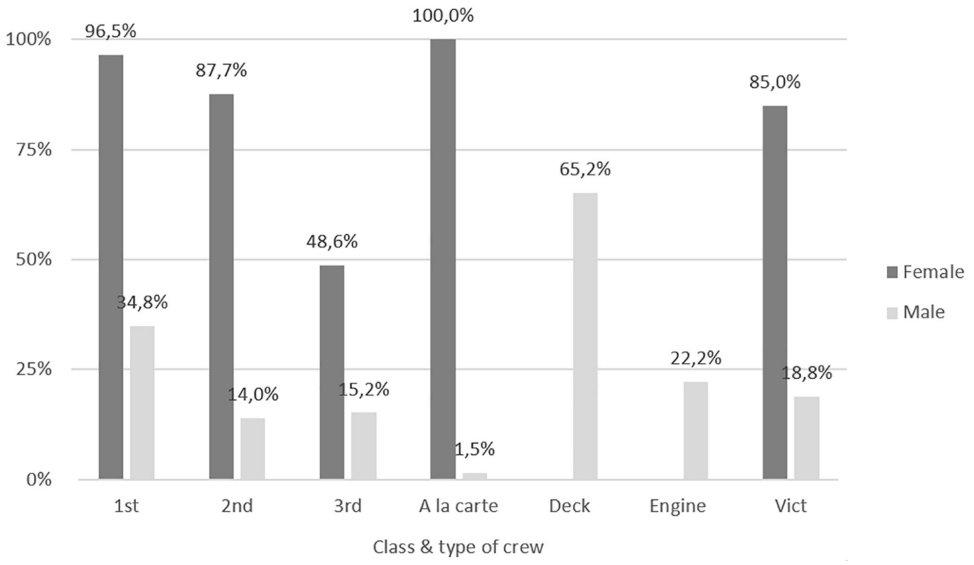
but, of the survivors, men are more likely to be in the testifier category. We ask: should we search for other ways of selection of witnesses? Students come up with the fact that there might also be selection going on with regard to class. If they do not find it themselves, we also point out to students that there is a fundamental selection in that only survivors are witnesses. We urge students to keep these selection processes in mind when interpreting our insights from the qualitative sample.

2. When analysing the results of *simple frequencies of response variable "survived/perished" and explanatory variables gender and class*, students find that of 2207 individuals in our dataset, 1497 (67.8%) perished, and only 710 (32.2%) survived. They notice that there were many more men (78%) on the Titanic than women (22%), and many more third-class (32.1%) than first-class (14.7%) and second-class (12.9%) passengers. Roughly 40% of the individuals on the Titanic were crew members. Students are amazed by the fact that the lifeboats were only full to roughly 60 % of their capacity on average. We ask them to note all the things they find interesting and inexplicable; the continuing analysis should be able to clear as many of these questions up as possible.
3. We let students do *simple crosstabs between "survived/perished", "gender", and "class/crew"* and recreate Figure 1. Students find that women across all classes and types of crew generally have a higher likelihood of survival than men and that higher-class passengers generally survive more often than lower-class passengers (the one exception being that there is no significant difference between second-class and third-class male passengers). Students then notice (or if not, we point it out) that there are interactions between gender and class. There is a very large difference between first-class and second-class female passengers on the one hand, and third-class female passengers on the other. For men, the major difference is between first-class male passengers on the one hand, and second-class and third-class male passengers on the other hand. The men belonging to the restaurant crew (A la carte) have the lowest survival rate of all groups of men, with only 1.5% (both women belonging to the restaurant crew survive). Male deck crew have the highest likelihood of survival of all groups of men (63.6%). We ask: why do we find these massive differences in survival? Are they in line with our initial hypotheses?

In the discussion with students we find that some of their initial hypotheses seem to have been confirmed, but that much remains in the dark. For example, why did men survive at all, if the rule "Women and children first" was applied? Why do we find the interactions between gender and class? And why did the à la carte crew survive so poorly? We point out to students that what happened on the Titanic was of course a process involving intentional and rule-governed individuals in what one could call a "social game". It is this social game that has produced the correlations between our

**Figure 1**

*Survival Ratio According to Class/Crew & Sex*




variables. To more clearly understand the "Titanic game", to reconstruct its context, rules, representations, actions, etc., we now turn to the qualitative data.

## Exploratory Qualitative Content Analysis

Have students do some exploratory qualitative content analysis with MAXQDA. We introduce this part to students with a disclaimer by telling them that they cannot possibly do a content analysis of this material in the short time available during the exercise. Good qualitative analysis means becoming thoroughly acquainted with the material as a whole, reading through all the testimonies, and carefully coding, comparing, and recoding them, etc. Here, the goal is to look at some selected testimonies and coded material to get a general sense of how mixed methods analysis can be put into practice.

In a first step, we give students some excerpts from testimonies (see Textbox 2) and ask, whether they have some new insights about what happened on the Titanic.

This is perhaps the most interesting part of the exercise, as students go through different testimonies and are often amazed at how the hypotheses they had made on the basis of their everyday knowledge were not sufficient to capture the complex reality on the Titanic. We often get students exclaiming things like: "Oh my god, I forgot about the crew". We go very slowly through the examples (the ones presented here, and others),

**Textbox 2**

*Four Extracts of Testimonies From Titanic Survivors*

(1) *My mother got in with her maid. The officer called for other women, but there were none thereabout. Then he called for men passengers. There were only about six just there, of whom I was one, and we got in. The boat was still not filled, so the officer put in some of the crew. Cardeza Thomas*

(2) *When the first boat was lowered from the left-hand side I refused to get in, and they did not urge me particularly; in the second boat they kept calling for one more lady to fill it, and my husband insisted that I get in it, my friend having gotten in. I refused unless he would go with me. Smith Mary Eloise*

(3) *The men that were in the boat at first fought, and would not get out, but the officers drew their revolvers, and fired shots over our heads, and then the men got out. When the boat was ready, we were lowered down into the water and rowed away out from the steamer. We were only about 15 minutes out when she sank. Buckly, Daniel*

(4) *The order maintained on the Titanic was what I would call remarkable. There was very little pushing, and it was in most cases the women who caused the commotion by insisting that their husbands accompany them in the lifeboats. The men were very orderly. Frohlicher, Max*

and ask students to rephrase what is happening in their words, name new hypotheses and suggest possible codes. For example, the first extract in Textbox 2 clearly shows that a rule "women and children first" is applied - but that the rule can only be applied if there are women to put in the boats! In the second extract, students find that some women did not want to go into the lifeboats; this could again be made into a code. In extract 1,2,3 and 4, students find that the crew was extremely important for everything that happened. Often, students are angry with themselves that they had forgotten about the importance of the crew in their hypotheses. Comparing extract 3 and 4, students note that some testifiers talk about great order, while others recall disorder. One student may suggest that this may be a function of time - perhaps there was first great order, and later chaos? We note this as a hypothesis.

In a next step we show our final coding scheme to students (Textbox 1) and explain its main codes (filling rules, authority acceptance, way to boat deck) as well as the most important sub-codes. We tell them to imagine having themselves coded the whole material in this way and now wanting to continue the analysis with the help of these codes.

First, we demonstrate how one can compare testimonies of different kinds of actors. We let students compare testimonies of first, second, and third class with regard to when they arrived on the boat deck (activate code "arrival time on deck" and document variable class in MAXQDA). Reading comparatively through these testimonies, students

note an important difference. It seems that first-class passengers arrived on the boat deck (where the lifeboats were) much earlier than second-class passengers, who in turn arrived earlier than third-class passengers. We ask: why is this? A student remembers that in the Titanic film, third class passengers were locked in. Yes, we say, but what can we do with our data to further investigate the question? Students point to the code "way to the boatdeck". They now compare differing way to the boatdeck for different classes (activate code "way to boatdeck" and document variable class), and find that third class passengers had many more obstacles to pass, limited knowledge, went to the wrong boatdecks etc.

Second, we demonstrate how codes may be analyzed quantitatively ("quantitizing"). We let students create a crosstabulation of *Filling rules * Boatorder*. Students find that the rule "Women and children first" was used in all boats, except the two last ones. The rule "If no more women - fill up with men" was used in only some boats and not others. We ask students to read through the material and come up with explanations as to why the latter rule was only used in some boats and not others. They normally don't succeed. We tell them to note the question. We continue the investigation by crosstabulating *Crosstabulation Filling rules * Boatside*. Students find that filling rules were different on Port and Starboard! On Starboard, boats were filled up with men, but not on Port. We ask students why this might be the case? Students come up with the idea that the officers on Port and Starboard interpreted the rule differently: On Port, it was understood as "Women and children only". On Starboard it was interpreted as: "Fill up with women and children - but if there are no more women and children around, fill up with men". We explain that, once we had noticed this, we had the idea of creating the variable “boatside” for our quantitative dataset to test this hypothesis.

We point out to students that this example shows us how testimonies can be linked to variables we also have in our quan dataset, so that the typical individual perspectives of different types of actors become visible and comparable. In this way, we could show the meaning and function of the quantitative variables in the context of the “social game” that was played on the Titanic. This social game used rules, representations, objects, actions and interactions that students had not thought of when making their initial hypotheses. The reason is that they were not familiar enough with the specifics of the “social game”. Their “everyday assumptions” about the Titanic were incorrect (for example that first-class passengers were wealthier and bribed the crew to enter the boats). This might happen for any mono-quantitative research in which the researcher is not familiar enough with the case in hand.

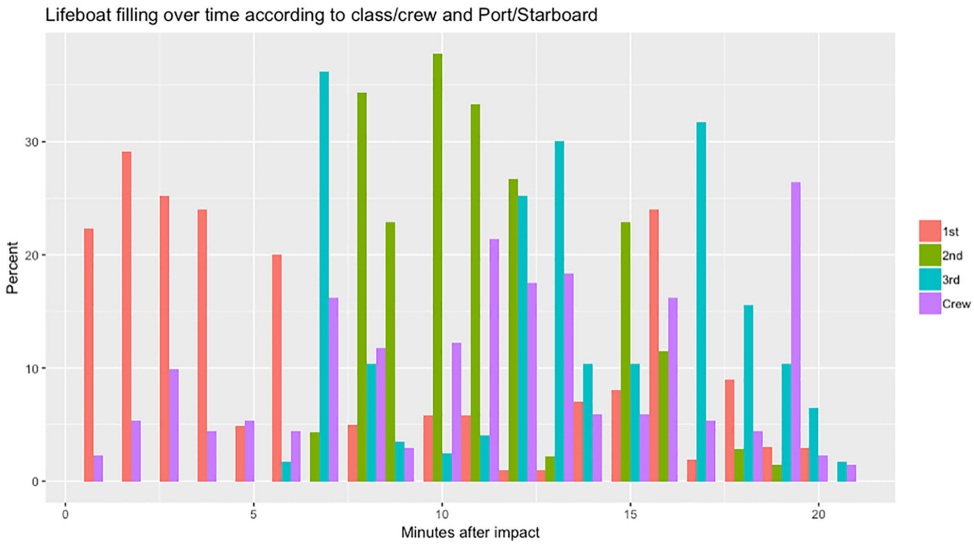
## Revisit the Quantitative Data

Once students have a better understanding of the social game played on the Titanic, and new ideas about what might be important in explaining survival probabilities, we invite them to do a second round of quantitative analysis. This round incorporates analyses

that look at the specific time that individuals boarded a lifeboat and the side of the Titanic from where they boarded the lifeboat.[7] In their further quantitative analysis, students test the new ideas that they had during their qualitative content analysis. We bring together the results in class: 1) *Class and boarding time*: As suspected, higher-class passengers had a higher chance of boarding the lifeboats that left the Titanic earlier. While the qualitative material allowed us to create the hypothesis, analysis of the quantitative data leaves no doubt that this was in fact the case (Figure 2); 2) *Class, sex and boat side*: The quantitative data confirm that rules of filling were applied differently on port and starboard. In fact, on starboard, more men boarded lifeboats than women (Figure 3). This was the case in spite of the fact that the rule "women and children first" was in fact applied, and can be explained by the fact that the rule "when there are no more women, fill with men" was applied on starboard (but not on port).

**Figure 2**

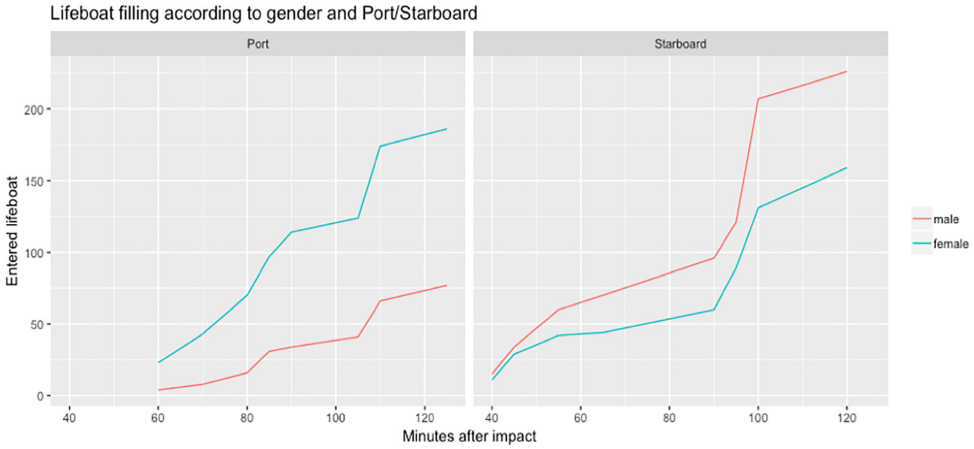
*Lifeboat Filling Over Time According to Class/Crew and Port/Starboard (This Graph is Only Possible in "R")*




7) Note for SPSS: The "boatentertime" variable indicates 40.00 for 00:40 a.m. and 120.00 for 1:20 a.m.

**Figure 3**

*Lifeboat Filling According to Gender and Port/Starboard (This Graph is Only Possible in "R")*




## Wrapping Up

In a final part, we wrap up the exercise with the students and highlight a few general points. We often do this by asking students the following questions, discussing their responses, and then making the following points (if they have not already been made by the students themselves).

### Have we learned more by using both qualitative and quantitative data than we would have had we only used one method? Are our conclusions more valid than if we had had only quantitative or only qualitative data?

Students overwhelmingly answer in the affirmative. We then ask: why exactly? The group comes up with something like the following: with the help of the qualitative dataset, we were able to unearth information about the "social game" that we did not initially have to interpret quan-information: this information concerned the importance of the crew, the importance of rules, and the importance of time. We were able to understand the meaning and function of the quantitative variables in the context of the social game better. If students challenge this point, we remind them of their initial hypotheses that almost invariably did not include a large number of the finer points found by qualitative content analysis. Conversely, we were able to quantify, correlate, and generalize many insights gleaned from the qualitative material that would have remained less convincing without quantification (frequency distributions; correlations/bivariate distributions; size and significance of effects). The conclusions we drew are called meta-inferences, which can be defined as conclusions concerning the phenomenon to be analysed based on the analysis of qualitative and quantitative data.

### Why do the datasets allow us to make meta-inferences so well?

In the discussion, we come up with something like the following: a first point is that the data stem from the same case and the same people. This is an important point. Imagine that we had had quantitative data from the Titanic, but qualitative interviews with passengers of a different ship that had also sunk (say, the Costa Concordia in Italy). It would have been very difficult to obtain useful meta-inferences. A second point is that we coded the qualitative material in such a way that it allowed us to provide a systematic description of the mechanisms leading to the outcome of interest. Imagine that we had coded for "dress code" or "metaphors". This might have been interesting – but it would not have helped us with our research question and would not have allowed us to make useful meta-inferences.

### What are the limits to our analysis?

We discuss the limits to our analysis with students. We have already mentioned this when we discussed our data, and we do not need to repeat it in detail here. Suffice to say that we talk about (a) the "survivorship-bias": clearly, only survivors can tell their story, and much of what happened to those who perished will remain unknown forever; (b) the fact that our view of the filling of the lifeboats is more reliable than our view of the way to the boat deck, since we can cross-check so many accounts with the former, but not with the latter.

### How can we summarize the overall findings?

We ask students to give a short summary of the overall results. We then give our own version that goes something like this (Stolz & Lindemann, 2019; Stolz et al., 2018)[8]: Women and children survived more often than men because of the rule "Women and children first", which was the one conscious rule that officers and crew applied throughout the process. Whenever women or children were in sight, they were first allowed onto the lifeboats. However, the rule was interpreted differently on starboard (where the boats were "filled with men", once there were no more women or children in sight) and port (where only women and children, and the members of crew needed to accompany them, were allowed to board). Higher-class female passengers survived more often than lower-class female passengers, because the former arrived earlier on the boat deck, with first-class women passengers arriving earlier than second-class, and second-class earlier than third-class.

Male passengers were able to survive for reasons that changed over time. In the first phase, first-class male passengers were able to survive because of the reluctance of many women to board a lifeboat, and because they were the only men on the boat deck to "fill"

8) This summary contains some findings that were not seen in the exercises.

the lifeboats. In the second phase, a number of lifeboats on port were lowered with a very strict rule of "women and children only", which meant that men (with the exception of male deck crew) only had a very small chance of boarding a lifeboat.

The tragedy of second-class male passengers was that they would have been present on the boat deck and in a prime position to "fill" these boats (since many crew members and third-class male passengers had not yet reached the boat deck) – but they were not allowed to do so. In the third phase, the seriousness of the situation had become obvious, and crew members and third-class male passengers seem to have been more enterprising when "filling" and "surreptitiously boarding" the lifeboats, thereby crowding out both first-class and second-class male passengers. Once in the water, younger men had an edge over older men in surviving until a lifeboat could pick them up (this was rare, however: only one woman survived in this way). The discrimination against lower classes was not a conscious policy when filling the boats. Rather, it was a combination of several mechanisms: for example, the fact that the cabins of lower-class passengers were much farther away from the boat deck, that access to the boat deck was normally denied to third-class passengers, and that there were fewer stewards to attend to them.

## Conclusion

This paper has presented the Titanic datasets and provided a script for a three-hour exercise to teach students the general utility of mixed methods.

We have no doubt that this is a good example for teaching mixed methods, simply because we have used it successfully both in classes and workshops with beginner and advanced students for years. It never fails to engage students and it always creates moments of both puzzlement and sudden insight.

Of course, this example – as any example – has its limits. One of the most important drawbacks is the "survivorship-selection": those who perished obviously did not testify later. Much of what happened on the Titanic during its last hours will remain unknown forever simply because those who know did not survive to tell us.

A second limit is the specificity of the example that is actually seldomly found in other datasets. In this case, we have 214 individuals all telling us what happened during one and the same process, which lasted for roughly two hours. This, of course, gives us tremendous leverage and opportunities to triangulate the various testimonies. In most other studies, we do not have so many accounts all focusing on such a specific process and such a short time span, which means that there are far fewer opportunities to triangulate and cross-check the data. Moreover, the very fact that so many people tell us what happened during those fateful hours also helps us to bring home an important point to students: namely, that there are not two different realities, one quantitative and the other qualitative. The fact that most qualitative researchers think of social reality as negotiated, constructed, fluid, context-dependent, multiple, while most quantitative

researchers think of it as objective, relatively stable over time, single, and caused by various determinants, can be nicely addressed with our example. It is of course the same reality out there, independent of whether we look at it through the testimonies or the quantitative data. Everything that we observe qualitatively could also be counted and correlated; everything that we count and correlate has at its basis a socially constructed interaction that follows social rules, is embedded in social representations, and is (re)created in social action.

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**Data Availability:** Data for this article is freely available (see the Supplementary Materials section).

## Supplementary Materials

For this article the following Supplementary Materials are available (for access see Index of Supplementary Materials below):

- Key-publications.
- Downloadable datasets in different formats.
- Three-hour-long exercise.

### Index of Supplementary Materials

Lindenmann, A., & Stolz, J. (2021). *MIXED METHODS - Mixed methods for the social sciences* [Publications, datasets, exercise]. https://sepia2.unil.ch/wp/mixedmethodstitanic/

## References

Bazeley, P. (2003). Teaching Mixed Methods. *Qualitative Research Journal, 3*(Special Issue), 117-126.

Bellocco, R., & Algeri, S. (2013). Goodness-of-fit tests for categorical data. *The Stata Journal, 13*(2), 356-365. https://doi.org/10.1177/1536867X1301300210

Bryman, A. (2008). Why do researchers integrate/combine/mesh/blend/mix/merge/fuse quantitative and qualitative research? In M. M. Bergman (Ed.), *Advances in mixed methods research: Theories and applications* (pp. 87–100). SAGE.

Creswell, J. W., Tashakkori, A., Jensen, K. D., & Shapley, K. L. (2003). Teaching mixed methods research: Practices, dilemmas, and challenges. In A. Tashakkori & C. Teddlie (Eds.), *Handbook of mixed methods in social & behavioral research* (pp. 619–638). SAGE.

Frey, B. S., Savage, D. A., & Torgler, B. (2013). Who perished on the Titanic? The importance of social norms. *Rationality & Society, 23*(1), 35-49. https://doi.org/10.1177/1043463110396059

Kelle, U. (2001). Sociological explanations between micro and macro and the integration of qualitative and quantitative methods. *Forum: Qualitative Social Research, 2*(1), Article 5. https://doi.org/10.17169/fqs-2.1.966

Kelle, U. (2007). *Die Integration qualitativer und quantitativer Methoden in der empirischen Sozialforschung. Theoretische Grundlagen und methodologische Konzepte.* VS Verlag für Sozialwissenschaften.

Kohler, U., & Kreuter, F. (2017). *Datenanalyse mit Stata. Allgemeine Konzepte der Datenanalyse und ihre praktische Anwendung* (5. Auflage). De Gruyter Oldenbourg.

Landau, S., & Everitt, B. S. (2004). *A handbook of statistical analyses using SPSS.* Chapman & Hall/ CRC.

Maxwell, J. A., & Mittapalli, K. (2010). Realism as a stance for mixed methods research. In A. Tashakkori & C. Teddlie (Eds.), *Mixed methods in social & behavioral research* (2nd ed.). SAGE.

Stolz, J. (2016). Opening the black box: How the study of social mechanisms can benefit from the use of explanatory mixed methods. *Analyse & Kritik, 38*(1), 257-285. https://doi.org/10.1515/auk-2016-0112

Stolz, J. (2017). Milieus and mixed methods: Describing and explaining religion and secularity in Switzerland. *Kölner Zeitschrift für Soziologie und Sozialpsychologie, 69*(Supplement 2), 361-386. https://doi.org/10.1007/s11577-017-0463-0

Stolz, J., & Lindemann, A. (2019). The Titanic game: Introducing game heuristics to mixed methods theorizing and data analysis. *Journal of Mixed Methods Research, 14*(4), 522-544. https://doi.org/10.1177/1558689819885723

Stolz, J., Lindemann, A., & Antonietti, J.-P. (2018). Sociological explanation and mixed methods: The example of the Titanic. *Quality and Quantity, 53*(3), 1623-1643. https://doi.org/10.1007/s11135-018-00830-0

Strauss, A.. (2003 [1987]). *Qualitative analysis for social scientists.* Cambrdige University Press.

Strauss, A., & Corbin, J. (2014 [1998]). *Basics of qualitative research: Techniques and procedures for developing grounded theory* (4th ed.). SAGE.

Tashakkori, A., & Teddlie, C. (1998). *Mixed methodology: Combining qualitative and quantitative approaches, applied social research methods series* (Vol. 46). SAGE.