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From Tweets to Statistics
Sentiment analysis of tweets reveals how people’s feelings have changed during the pandemic in Luxembourg

by Francesco Sarracino, Talita Greyling, Kelsey O’Connor, Chiara Peroni, Stephanie Rossouw

Sentiment analysis applied to Twitter data provides timely insights into how people in Luxembourg fared during the COVID-19 crisis. This short article reports some preliminary results from the project “Preferences through Twitter” and showcases some of the possibilities and limitations made available by the new techniques. STATEC Research leads the project with the support of Fonds National de la Recherche.
Improving people’s well-being has several beneficial consequences, besides being a desirable outcome per se. Happier people tend to live longer and healthier lives, have better employment outcomes, be more productive and collaborative, and make for less absent workers. Additionally, higher levels of past and present happiness predict higher levels of compliance during COVID-19 (Krekel et al., 2020). However, traumatic events – such as the COVID-19 pandemic – can alter well-being in rapid and persistent ways, thus triggering medium to long-run social and economic consequences. How can we monitor the changes in people’s well-being during the pandemic? Researchers at STATEC, University of Johannesburg (South Africa) and Auckland University of Technology (New Zealand) retrieve timely and frequent data from applying sentiment analysis to tweets. Such data are relevant for effective decision-making because people’s well-being can affect the success of health policies, “exit” strategies to ease lockdowns, and recovery plans.

Well-being data are usually collected via large scale surveys that take time to administer, and are thus only available after some delay. For instance, the European Commission administers Eurobarometer surveys multiple times a year in each of the member states. In 2019, the Eurobarometer assessed people’s well-being twice; whereas in 2020, the survey was only administered once (see table 1).
From Tweets to Statistics (continued)

The Eurobarometer indicates that life satisfaction a valid and reliable measure of well-being, decreased by eight percentage points between Autumn 2019 and Summer 2020. Survey data alone can not explain the decrease. It is possible that it is due to the pandemic, but how much of an influence has it had and through which mechanisms? Even the size of well-being impacts is somewhat unknown. It could be that the decrease was actually larger than eight percentage points, but individuals could have recovered somewhat by the time they participated in the survey. Or, perhaps, the survey was administered at a specifically low point in their life, but individuals recovered quickly. New sources of timely information can valuably complement survey data.

This wealth of short texts provides a real-time source of information that can be transformed into usable data using sentiment analysis. Sentiment analysis is an automated process that uses natural language processing to determine the feelings and attitudes of a written text’s author (Hailong et al. 2014). It has been used by many researchers, for instance, to predict future events, such as the result of elections or stock markets, to track the influenza rate, and to measure people’s well-being (Iacus et al., 2020). STATEC Research collaborates with researchers from the University of Johannesburg (UJ) and Auckland University of Technology (AUT), with the funding support of the FNR, South Africa’s URC and AUT, to compute a real-time measure of well-being – the Gross National Happiness (GNH) which was developed by Greyling et al. (2019) – in Luxembourg and in a selected group of European countries during the COVID-19 pandemic.

The GNH in Luxembourg (solid line in Figure 1) increased from the end of June to mid-July, perhaps because COVID-19 and the lockdown seemed to be in the past. However, as people became aware of a resurgence in new cases, their well-being declined suddenly and continued to do so. In fact, the changes in GNH are consistent with the changes in the number of new positive cases, though in

Table 1. Life satisfaction in Luxembourg from Spring 2019 to Summer 2020.

<table>
<thead>
<tr>
<th></th>
<th>Spring 2019</th>
<th>Autumn 2019</th>
<th>Summer 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>people not satisfied with their lives (%)</td>
<td>4</td>
<td>6</td>
<td>14</td>
</tr>
<tr>
<td>people satisfied with their lives (%)</td>
<td>96</td>
<td>94</td>
<td>86</td>
</tr>
</tbody>
</table>

Source: Eurobarometer data (European Commission 2019, 2020). The original variable is organized into four categories. For ease of interpretation, the bottom and top two categories have been collapsed.

Thus, researchers turned to Twitter data. Every day a large number of people around the world share their opinions, reactions, discoveries, worries, questions, and decisions via tweets. In Luxembourg, people share approximately 500 tweets per day, which is nearly 4500 tweets per week.

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How did well-being change in relation to the containment and health policies adopted by the government? And did people comply with the containment policies? Figure 2 shows the rise in GNH during July coincides with a period of relaxation of containment measures (see the dash-dotted line in Figure 2), whereas the subsequent decline in GNH mirrors the progressively more stringent policies adopted afterwards.

The good news is that people generally complied with containment measures. This is shown by the close relationship between the changes in people’s distancing behavior (the dashed line) and the changes in containment measures (the dash-dotted line). This evidence suggests people followed the provisions of the government in Luxembourg. Indeed the correlation between the two measures is 80%. For the sake of comparison, the correlation is 71% in France, 68% in both Belgium and Great Britain, 55% in Germany, and 64% in Spain. The correlation in Luxembourg is second only to Italy (86%).

Another advantage of sentiment analysis applied to Twitter data is that it allows researchers to compute GNH for any country in the world (with sufficient Twitter users). In Figure 3 the trend of GNH in Luxembourg is contrasted with those from six other European countries that were severely affected by COVID-19 during the spring of 2020: Italy, Spain, the United Kingdom, France, Belgium, and Germany. The comparison reveals that since July, Luxembourg experienced greater changes (cont’d on pg 5)
From Tweets to Statistics (continued)

than most of the other EU countries considered, as well as a greater loss of well-being: by the end of October, Luxembourg had the lowest GNH score. Well-being declined in each country as we moved into autumn, but the changes in Italy, Germany, the UK, and Belgium are not as severe as those in Luxembourg, France, and Spain.

What drives these changes? And what explains the different levels of well-being across countries? Unfortunately, it is still too early to say. The country-specific mix of containment policies, contagion rates, and economic performance may contribute to answering these questions.

At present the research team is focused on producing the GNH score for each day since the first of January 2020, for Luxembourg and the other six European countries. Additionally, the team is working to widen the number of variables derived from Twitter to monitor the changes in economic insecurity, trust in others and institutions, and feelings towards immigrants. Importantly, the team is evaluating whether this data can be considered as reliable and accurate.

The researchers have gathered two pieces of evidence which support the validity of the GNH as a measure of well-being. First, the average GNH score correlates strongly with average life satisfaction as measured by the Eurobarometer (see Figure 4).

Second, GNH correlates meaningfully with a measure of negative emotions over time. Indeed, for a measure that has the benefit of timeliness and frequency, the real test of validity is correlation over time. To this end, the researchers created an index of negative emotions (dotted line in figure 5) by averaging daily Google search scores for three topics: fear, sadness, and anger. If GNH varies in a meaningful way over time, then it should correlate negatively with the index of negative emotions. The correlation between the two indices is indeed -69%. To ascertain whether the correlation is coincidental, the researchers run a falsification test: they compared the GNH with Google search scores for a “neutral” topic, one that should not be correlated with GNH. In this case, the chosen topic is Google itself, one of the most searched for terms. The dashed line in Figure 5, corresponding to searches for Google, is
In summary, sentiment analysis applied to Twitter data can be used to generate timely and frequent measures of well-being. These figures will be extended to cover the whole of 2020, enriched with additional explanatory variables, and further tested for validity and reliability. Nevertheless, GNH promises to deliver a timely measurement of how well-being changed throughout 2020 in Luxembourg and in international comparison. Such information can supplement the evidence based on survey data to provide invaluable insight for the general public, research community, and policy makers. Building upon and extending the data presented here, the team will deliver new results in the coming months.
Given the uncertainty of the current global pandemic, travel restrictions, and planning challenges the 2021 ISQOLS Annual Conference will be held virtually in August 2021 (specific dates to be announced). The ISQOLS 2021 Conference will offer a forum for discussion of the research findings concerning quality of life, well-being, and happiness, similar to all of our past, in-person conferences.

The theme of the Conference is “quality-of-life and adaptation in a virulent world”. The world has changed dramatically in the past year. How do we now examine quality-of-life, wellbeing, and happiness? What are the challenges and opportunities for well-being research and policy in the face of a global pandemic? What important work is being carried out to encourage personal, communal, environmental, and social resiliency in a Covid-19 world? We invite researchers, practitioners, students, professionals, faculty, retirees, experts and novices to participate and engage in this virtual event. Please visit the conference website for more details: https://isqols.org/2021Conference

ISQOLS MEMBERS: receive early info and registration discounts!
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REGISTRATION NOW OPEN

Over 250 abstracts were submitted for the 2021 ISQOLS Virtual Conference!
Early Bird Registration Deadline is May 15.
The Regular Member Fee is only $50 USD/$35 USD for members students/retirees/developing countries.

LEARN MORE AND REGISTER ONLINE AT:

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ISQOLS 2021-2022 LEADERSHIP TEAM

Thank you to all members who voted approval for the 2021-2022 ISQOLS Board of Directors. All nominees have been confirmed. Additionally, we are pleased to announce the 2021-2022 Executive Committee members listed below.

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Now available to MEMBERS ONLY: Quality-of-Life Focus Groups Discussion Forum. We invite you to post any comments, questions, ideas, articles, papers, books, links, and interesting content to the forum of your choice. When you click "SUBSCRIBE" at the top of the forum, you will receive email summaries of the content posted. This is a great way for our members to connect to other like-minded researchers. Please SUBSCRIBE to any or all of these forums by visiting isqols.org/forum. (Be sure to log-in to your member profile)

We are looking for "Forum Topic Coordinators" to manage each individual forum listed above. The responsibilities of the forum topic coordinator are simple: post relevant content! If you find relevant QOL/Happiness/Well-being articles, events, videos, journals, books, etc. related to your forum topic-- we simply ask that you post it in the forum AND engage with other posts in your forum. At minimum, we would like 4 posts a month— that's only 1 post once a week! It will take only minutes of your time. To compensate you for your efforts, in exchange for your commitment in this role for one year, we will provide you with a free annual membership to ISQOLS. We already have a few coordinators assigned, but if you are interested, please email Jill Johnson at office@isqols.org.
25 YEARS OF QUALITY-OF-LIFE STUDIES

The International Society for Quality-of-Life Studies (ISQOLS) was established in 1995, making 2020 our 25th year anniversary! Our success and longevity as an organization would not be possible without the generous support, time, and work done by all of our members and community.

In the last 25 years, ISQOLS has had many incredible accomplishments. Our organization has successfully hosted and facilitated eighteen international conferences, with thousands of presentations on topics ranging from gender and quality-of-life, wellbeing around the world, consumption economic issues, adolescent quality-of-life, life-span, happiness and sustainable development, well-being and policy, health, human suffering alleviation, education, job satisfaction and work. Our official journal, Applied Research in Quality of Life Studies, has produced over 15 volumes and has reached an impact factor of 1.528 (2018). Our membership has spanned the globe, representing many countries and from six continents. Our Society is comprised of researchers, practitioners, professionals, students, retirees, statisticians, faculty, and people of all ages from all parts of the world, with an interest in exploring quality-of-life, happiness, and wellbeing.

Anniversary T-Shirts Now Available!

ISQOLS Anniversary T-Shirts are now available! Make a donation of $25 USD or more to our "Education Grants" travel scholarship and you'll be entitled to a special anniversary shirt. The Education Grant Travel Scholarships provide funds to students from developing countries to travel to our ISQOLS Annual Conferences. To make your contribution, please visit isqols.org/donate and select "Education Travel Grant" as your choice for your donation. A confirmation email and details will be sent to you upon receipt of your donation.

Send Us Your ISQOLS Memories & Photos:
We invite EVERYONE (members, non-members, veterans, newcomers, etc.) to write any and all special memories and photos of ISQOLS to be published on our ISQOLS 25th Anniversary Virtual Memory Wall. Please send memories via email to office@isqols.org.
standards they prefer. They may adopt very different standards and even inconsistent or immoral standards, and may change them whenever they want to.

This freedom must be respected, but it can be a source of confusion. Happiness of different individuals will be incomparable if their standards are very different; it will be complicated if they adopt inconsistent standards, and it will be unstable if they change their standards very often.

Happiness can even be immoral, and unfit as a general standard, if people adopt immoral standards. Through research we know that people usually adopt consistent, comparable, and morally acceptable standards, and do not change them very often, but there is nevertheless substantial confusion about these issues.

Another potential source of confusion is the relation between overall happiness, cognition, and emotions. It is not unusual to distinguish cognitive and emotional or affective happiness with different dynamics, either as components of overall happiness or as different types of happiness. Both options are acceptable, but we should not define overall happiness as a high frequency of positive emotions and a low frequency of negative emotions. People may value positive and negative emotions in different ways if they apply different standards. Negative emotions can be unpleasant and even painful, but can also be valuable and, perhaps in retrospect, indispensable in someone’s life as a whole.

It is therefore respectful to pay attention, first of all, to evaluative happiness, based on some reflection as a cognitive activity. It is also practical since people think a lot about their own life, and they are usually able to answer questions about their evaluative happiness quickly and in a rather reliable way. Attention can then be paid to the different roles of cognition and emotions, and to characteristics like consistency, comparability, stability, and morality. The interaction between cognition and affect is intensive, but it is a good start to assess the results of cognitive evaluation first. (continued page 12)
An interesting outcome of happiness research is that it is relatively easy to explain differences in average happiness in nations by an evaluation of actual living conditions, while it is difficult to explain differences in individual happiness. One reason is that more information is needed to explain differences in individual happiness, for example, information about individual genetics, personality, personal experiences, and mental problems. Such information is not readily available in regular statistics and it is difficult to collect such information with simple surveys. Information about actual common man-made living conditions can be found in regular statistics, or collected through surveys. It is fascinating that the dramatic differences in average happiness in nations can be explained quite well. One implication is that differences in collective man-made living conditions play a crucial role for happiness.

Freedom contributes to happiness. There is more of individual freedom and happiness in rich nations thanks to a high level of labor productivity. There are, however, some awkward problems. There are unhappy minorities, for example, relatively poor people and people with mental problems. There is financial insecurity for people with flexible labor contracts, and there is discrimination against minorities. There are high levels of positional competition and commercial manipulation, without proportional benefits. The relations between rich and poor nations are unbalanced. The sustainability of happiness is in danger due to serious ecological developments. Some problems are related to neo-liberalism.

Neo-liberalism is the dominant social-economic ideology in many societies. This ideology has positive consequences for freedom and happiness, but there are shortcomings. The most fundamental shortcoming is arguably that all the needs of the rich are gratified, while the fundamental needs of the poor and their children remain ungratified. A more specific shortcoming is that people are heavily manipulated by commercial advertising. Their individual freedom to decide about standards is undermined.

Some other specific shortcomings are unjustifiable inequality, positional competition, financial insecurity, and an upward pressure on production and consumption with negative ecological consequences.

It is not the ambition of this book to offer some blueprint for a perfect society, but it does aim to reduce the confusion about the concept and the nature of happiness. Reducing confusion can improve the effectiveness of deliberations and discussions about happiness as subjective well-being and well-being in general. It will make it easier to assess happiness as a potential descriptive standard, or as a potential standard to be pursued, and it will make it easier to identify and analyze the current shortcomings of neo-liberalism.

Reducing confusion can also be beneficial in yet another different way. Many rich people want to change their priorities. They want to put less priority on economic standards like income, and more priority on noneconomic standards like happiness. The Corona pandemic supports this development. Many people have to stay home over longer periods. This can be a financial disaster for poor people, but many rich people discover that money is not enough for happiness. A reduction of the confusion about happiness and well-being in general can facilitate this development beyond economics.
Call for Proposals To Host ISQOLS Conference: 2025, 2026

The Conference Committee of the International Society for Quality of Life Studies (ISQOLS) invites interested organizations to submit a proposal for hosting future ISQOLS Conferences. Hosting the conference can provide considerable exposure regarding quality of life in the area. Further, holding the conference can provide an economic stimulus to the area as well as opportunities to gain recognition for the sponsoring organization.

Application Deadline for proposals to host conferences for 2025-2026 is June 30th, 2021. Applications will be reviewed at the 2021 conference by the Board of Directors/Executive Committee. Decisions will be announced by September 2021.

Learn more at: https://isqols.org/futureconferences

Why YOU should consider hosting a future ISQOLS conference:

- ISQOLS conferences bring global attention and attendees to your university, college, department
- ISQOLS conferences bring extra revenue and additional funds to your university, college and department
- ISQOLS conferences help galvanize quality-of-life, happiness, and well-being research at your university, college, and department

UPCOMING CONFERENCES

AUGUST 2021: VIRTUAL CONFERENCE
2022: BURLINGTON, VERMONT, USA
2023: ROTTERDAM, NETHERLANDS
2024: BORNEO, MALAYSIA
2025: UNDETERMINED
2026: UNDETERMINED
ISQOLS now provides our members with opportunities to post requests for both career and research support through our new "Career and Research Support Forum". Log-in to your membership profile and visit: [https://isqols.org/career](https://isqols.org/career)

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- Provides recognition through the ISQOLS awards program, including funding for the PhD Dissertation Award
- Allows ISQOLS to have dedicated staff, focused on the society’s mission to advance Quality-of-Life, Happiness, and Well-being Research across the globe!
- Supports initiatives that bring attention to QOL, happiness, well-being research, like webinars, Social Indicators Network Newsletter production, and mentorship programs
- Advances the publication of Applied Research in Quality-of-Life (ARQOL), and expands the annual conference to a broader audience

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PLEASE SHARE YOUR RESEARCH!

As an international organization, we especially feel the far reaching effects of this unprecedented health crisis, as many of our members are impacted worldwide. In these uncertain times, it is crucial that our society comes together to support one another. One of the ways we can stay connected, is by sharing our personal experiences via our membership forums (https://isqols.org/forums) and sharing our current research with one another.

This is a crucial time for us as professionals, academics, researchers, and students to galvanize our work in the field of quality-of-life, well-being, and happiness. One of the ways you can personally contribute during this time is by considering sharing your research through any of the following ways:

1) Webinar Research Presentation:
Our webinars are posted to youtube, shared on our social media, and sent out to our nearly 8,000 email subscribers. We will make all of our upcoming webinars free and available to the general public. All you have to do is prepare a powerpoint presentation (as you would do for any regular conference session), have a computer with a webcam, and pick a time that works with your schedule. Our webinars can range anywhere from 10-30 minutes--- you pick your topic, create your presentation, pick a time --- and we will take care of the rest. Please send your webinar description to office@isqols.org
Looking for examples? Check out our past webinars here: https://isqols.org/Webinars

2) Summarize Your Research for our SINET issues:
ISQOLS is seeking long-form essays submissions for SINET. Long-form essays are meant to report news of their social indicator activity, research, policy development, etc. as it relates to quality-of-life, wellbeing, and happiness research. Essays must be no more than 4,000 words in length. Please send essay submissions to office@isqols.org.
Examples of past issues can be found at: https://isqols.org/SINET/

3) Write a Blog:
We are seeking guest bloggers for the ISQOLS website. Blogs can be on any QOL, happiness, well-being topic; no more than 500 words in length. Blogs will be posted on our website, social media, and E-news and will be useful in helping ISQOLS spread our mission around the globe. Please send your blog submission to office@isqols.org

In the midst of social distancing and isolation, these "quality-of-life, happiness, and wellbeing" webinars are a fantastic opportunity for us as a society to help bolster connectivity and inspire positivity. Thank you for your consideration. Please send all questions to office@isqols.org.
Established, in 1995, the International Society for Quality-of-Life Studies (ISQOLS) is a global organization with a mission to promote and encourage research in the field of quality-of-life (QOL), happiness, and wellbeing studies. In the last 20 years, ISQOLS has become a globally-recognized professional organization, with its own publications, journals, conferences, and identity.

ISQOLS mission focuses on creating a paradigm shift within traditional academic disciplines and to transform “Quality-of-Life” studies into an academic discipline in its own right. Our goal is to establish academic degree programs, departments, and schools within institutions of higher education worldwide, all focused on the science of well-being. The ultimate goal is to help with the creation, dissemination, and utilization of knowledge of the science of wellbeing across all walks of life.

Our Society is comprised of researchers, practitioners, professionals, students, retirees, statisticians, faculty, and people of all ages from all parts of the world, with an interest in exploring quality-of-life, happiness, and wellbeing.

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