TEMPORAL AND GROUP-SPECIFIC INSTABILITY OF SELF-RATED HEALTH IN 2020

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SUMMARY

Self-rated health (SRH) is a widely used indicator for policy evaluation due to its consistency, reliability, and ease of administration. Since the index is evaluated subjectively, there are known socio-demographic biases in the evaluation. In this article, the next step is taken, and the instability of the SRH of different socio-demographic groups is investigated. To evaluate the changes, multiple corrected Chi-squared tests were applied to the data from the 2020 Gender and Generation Survey. For exploratory purposes, uncorrected tests were also reviewed. Since the pandemic's effects must have varied over time, temporal aspects are also taken into account. The results show that SRH was mostly stable or increased after the 2020 lockdown, depending on sex-age group. For some groups, temporal dynamics existed, but present theories cannot explain them. The changes significantly and substantially depended on the socio-demographic and socio-economic position of the individuals. Some classical inequalities (e.g., gender) were validated, but most could not explain the changes. Finally, curvilinear effects were also observed. This paper thus fills an important niche in scientific literature on SRH evaluation and SRH stability. It also gives better perspectives for its usage in policy analysis.

Keywords: *Self-rated health, interoception, social bias, COVID-19, lockdown, Moldova*

INTRODUCTION

Self-rated health (SRH) is a useful indicator for health scientists and policy-makers. It has several undeniable advantages, especially low management costs and the usage of hard-to-measure organism characteristics. The indicator also has several pitfalls that stem from the process of SRH evaluation. In this paper, the influence of the global health crisis is discussed. Previous studies have already observed that during the COVID-19 pandemic, SRH indicators usually *grew* among the non-affected population, although most researchers concluded that, objectively, SRH must have declined. Several suggested explanations that refer to changes in objective health status as well as changes in the SRH evaluation process. This paper disentangles these explanations and evaluates them on the data provided by the Gender and Generation Survey in Moldova (Ministry Health et al., 2021).

By coincidence, the Gender and Generation Survey started in January 2020, before the seriousness of COVID-19 was widely known, and was paused from April to July due to the restrictions. The dataset is divided into two parts. The survey is abundant with questions on the socio-economic, demographic, and health status of respondents. As a result, multiple previously suggested hypotheses can be tested, which is done in the first part of the analysis section. In the second one, new hypotheses are generated, and unrestricted multiple Chi-squared tests are done. While researchers typically approach data-driven subgroup analysis with caution (see Lipkovich et al., 2017, for a great discussion on this issue). The corrected Chi-squared tests for ten sex-age subsamples are the benchmark for such exploration, but the uncorrected Chi-squared tests are also considered. This method maintains the complexity of the five-point scale of SRH, which is especially important since the benchmark for health can differ for different sex-age groups. The study suggests that the primary driver of the increase in SRH was linked with the process of SRH evaluation (including changes in health benchmarks and attention to bodily sensations) rather than changes in objective health or socio-economic status.

LITERATURE REVIEW

Self-rated health (SRH) is widely used in health research, policy architecture, policy evaluation, and large-scale international surveys (Bombak, 2013; Cislaghi & Cislaghi, 2019; Garbarski, 2016; Jylhä, 2009; Martinussen & Rydland, 2020; Paul et al., 2021). It has two major advantages. First, it is very simple to collect. Generally, respondents are asked to evaluate their health on a five-point scale from "very unhealthy" to "very healthy". Second, it consistently reflects the objective health properties (Feenstra et al., 2020; Inkrot et al., 2016; Wu et al., 2013). According to Jylhä (2009), the evaluation process involves multiple stages and sources of information. First, the person evaluates what bodily sensations and facts are more or less important in their overall health status evaluation. Then, this information is integrated with different systems bearing different importance and their states having different weights. Finally, the integrated rating is compared against the benchmarks that the person has for different levels of health.

At the same time, SRH has systemic imbalances in evaluation. For example, a chronic condition or functional disability has a greater negative influence on SRH of the younger individuals (Idler & Cartwright, 2018). Similarly, women report worse SRH while also having higher life expectancy. SRH is also distributed unequally among socio-economic classes (Akanni et al., 2022; Hulsegge et al., 2023). Country, a proxy for climate, culture, language, etc., also has a sizeable effect (Jürges, 2007; Lazarevič, 2023).

COVID-19 had a negative effect on health, especially if infected (Lüdecke & Von Dem Knesebeck, 2023) or had limited physical activity during the lockdown (Reigal et al., 2021). Negative SRH trajectories were also reported (Elran-Barak & Mozeikov, 2020; Lüdecke & Von Dem

Knesebeck, 2023). However, if compared directly, the post-pandemic SRH were usually higher (Cheung et al., 2023; Hulsegge et al., 2023; Jeon et al., 2024; Torrado et al., 2022).

The literature offers several intersecting explanations for the change in self-rated health during the lockdown that had a predictable or previously detected effect. A set of explanations referred to the negative effects of lifestyle changes (for example, among housekeepers, who faced additional home chores, and those who could not work from home, H1). Two explanations linked the changes with changes in objective health parameters, including a greater attention to respiratory diseases (H2) and getting COVID-19 (H3). There is an explanation linked with the changes in SRH evaluation: the "Eye of the hurricane" effect, H4. Finally, one paper suggested that the SRH was due to better mood among younger British cohorts. This paper aims to disentangle the explanations and test their effectiveness.

DATA AND METHODS

The data comes from the Generation and Gender Survey conducted in Moldova in 2020 (Ministry for Health et al., 2020). The survey was launched in January, ended in December, and was suspended from April to June. In 2020, the lockdown lasted for two months from March 17 to May 15. After omitting individuals younger than 18, 2984 observations are in the first, pre-lockdown part of the survey, and 7050 are in the second, post-lockdown part. The data for four months (with 1 to 88 observations) were included in the other months' data, as there are reasons to believe that the data were collected at the end (or the beginning) of the month.

Contacting COVID-19 affected the SRH evaluation, but GGS does not provide such data. As of November 30th, 2020, 2265 Moldovans died with COVID-19 being the primary or secondary disease, which means roughly seven potential participants of the second part of the survey passed away because of it (Ministry for Health, 2023). As of November 30th, 2020, 107'364 cases were registered. This means that around 330 potential participants contracted COVID-19.

GGS offers a variety of questions, including a five-level question on SRH ("very bad" to "very good"). Since the benchmark state of health changes over time, it was chosen to preserve the complexity of this variable. Hence, Chi-squared tests were chosen for the variable description and hypothesis tests. First, the temporal changes were studied. 210 Chi-squared or Fisher tests are done on their similarity. The gap between the end of the lockdown and the relaunching of the survey was over a month and a half. The suspension allows us to test the hypothesis on post-lockdown relief. Based on previous literature, we could expect the SRH to be higher for the younger cohorts in July than in March, when it was suspended, and this jump must follow a dip afterward. Second, the group-specific effect will be studied, with special attention to the person's employment status, household composition, and objective health characteristics. Finally, in the exploratory part, the variables are ranked by the number of sex-age subgroups that have a significant change in SRH.

A substantial problem with the multiple test algorithms is their increased vulnerability to Type I, false positive errors. Several correcting procedures exist for such vulnerability, with every procedure suggesting stricter alphas to count a test as significant. Benjamini-Hochberg (1995) procedure is at the centre as the more balanced procedure, but reference, the results for two stricter procedures, Bonferroni and Holm-Bonferroni (Holm, 1979), are also given. The Bonferroni correction uses a stricter alpha, $\alpha_{Bonferroni}=\alpha_0/n$, where $\alpha_o=0{,}05$, and n is the number of tests (each sex-age subgroup has a separate number of subgroups). The Holm-Bonferroni procedure rejects null-hypotheses with the smallest p-values until the p-value i is larger than $\alpha_o / (n - i + 1)$. Finally, the Benjamini-Hochberg procedure finds the largest p-value i that is smaller than $\alpha_o * i/n$ and rejects every null-hypothesis with a stronger p-value.

Originally, it had 1787 variables, but only a minority were meaningful in this context. Overall, 902 categories were used in total to conduct 5818 Chi-squared or Fisher tests on differences in each subsample with enough observations. The description statistics for the selected variables are presented in Table 1.

Table 1. Descriptive Statistics for the Sample Overall and the Sex-Age Groups Separately.

	Female 18-34	Male 18-34	Female 35-44	Male 35-44	Female 45-54	Male 45-54	Female 55-64	Male 55-64	Female 65-79	Male 65-79	Over-all
Number of observations	1259	721	931	562	838	622	1356	930	1715	863	9797
Mean self-rated health	3.88	3.97	3.64	3.66	3.25	3.39	3.02	3.09	2.74	2.91	3.29
Post-lockdown respondents, %	73,8	76,4	73	68,3	70,2	68,6	70,6	68,6	67,7	64,8	70,2
Urban residents, %	43,1	46,5	39,5	39,7	32,1	27,2	30,5	28,4	31	29	34,3
School education, %	45,3	53	50,6	49,5	41,5	38,6	46,2	36,8	56,4	42,2	46,8
Professional education, %	31,1	28,6	25,9	32,4	44,3	52,7	43,4	53	31,3	43,8	37,9

	Female 18-34	Male 18-34	Female 35-44	Male 35-44	Female 45-54	Male 45-54	Female 55-64	Male 55-64	Female 65-79	Male 65-79	Over-all
Employed, %	30,2	52,1	49,6	57,5	54,9	48,9	20,2	35,5	2,7	1,5	30,3
Unemployed, %	7,7	18	12,9	22,6	14,4	23,5	4,2	15,5	0	0,5	9,7
Partner living in the household, %	64,7	46	72,3	66,5	67,7	63,2	56,7	65,6	32,8	62,2	57,5
Children living in the household, %	72,5	35,4	85,3	64,4	42,2	42,6	22,9	20,9	17,2	16,5	39,7
At least one significant illness, %	11,5	13	24	17,3	46,9	34,4	71,2	51,4	83,4	68,1	47,2
Some difficulties by WGD, %	2,4	2,4	3,7	4,1	8,7	8,8	14	14,1	26,9	24,2	12,5

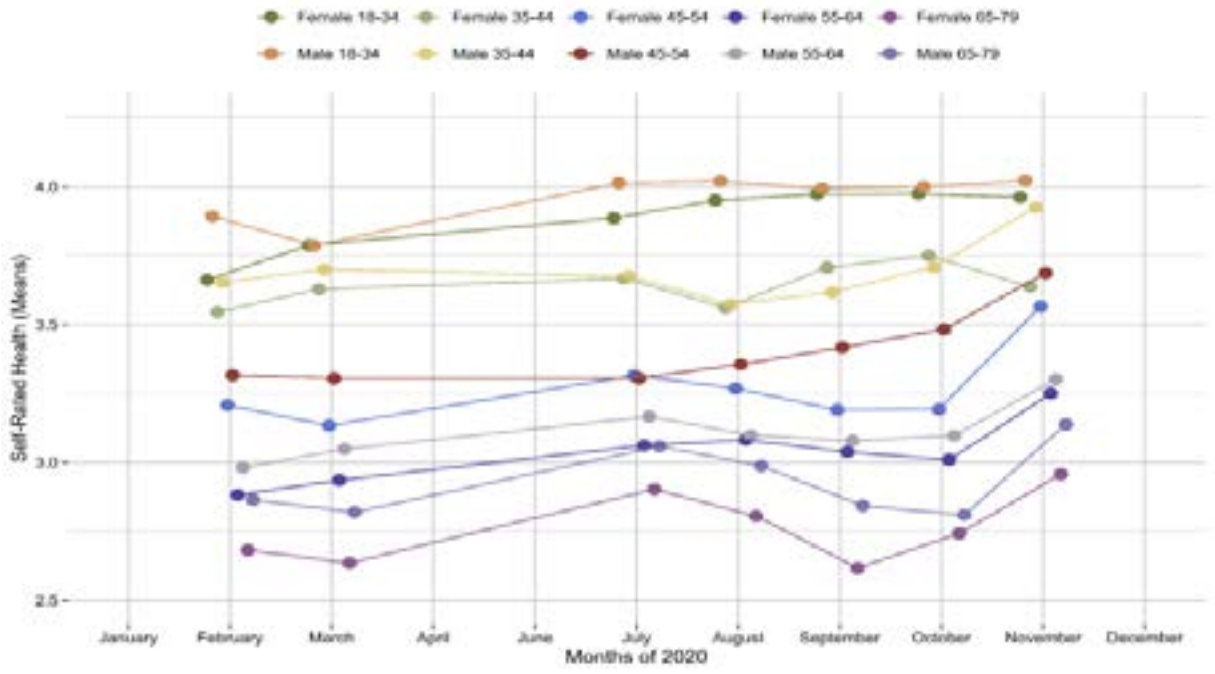
Source: author's calculations based on GGS Moldova 2020.

MAIN RESULTS

SRH TRENDS

The average monthly SRH levels were taken for the sex-age group (see Figure 1). Overall, the difference between February and November was significantly positive for every sex-age group older than 45 and for women aged 18-34, with significance varying between 0.1% and 5%. The increase during the lockdown was only significant for women aged 65-79 (5% significance level). While some commonalities in the groups' month-to-month SRH dynamics are noticeable, few month-to-month differences were significant. The fall from February to March was significant for men aged 65-79, and the fall from August to September was significant for women aged 65-79. The difference between October and November was significant for men aged 65-79 (1%) and women aged 45-54 (5%), 55-64 (5%), and 65-79 (5%). Finally, the September dip is noticeable, but it is significant for the same four groups (1% each). So SRH increased only for one group, and after the lockdown, it fell for the group and several others.

Figure 1. Temporal changes in Self-Rated Health.



Source: author's calculations based on GGS Moldova 2020

The post-lockdown relief hypothesis struggles to explain these dynamics. Following past literature, the effect can be expected primarily among the youngest cohorts. However, they neither experience a significantly better SRH nor do they experience the September dip. At the same time, the September dip was experienced by four sex-age groups out of ten, and it is possible that this was due to the shift in the sampling over time.

GROUP-SPECIFIC CHANGES IN THE WAY OF LIFE

In this subsection, the changes in four specific groups are considered: by age, employment, education, and objective health problems. The data partially confirms these links.

Table 2 below suggests that age has a curvilinear association with the change in SRH. The increase was larger in the youngest cohorts and in the pre-pension age threshold. It can also be complemented by the fact that SRH increased for women more than for men, which would explain the lack of a significant increase for male 18-34 and 65-79 cohorts. This contradicts the previous suggestion that the pandemic was harsher for the youngest and easier for the oldest cohorts.

Table 2. The Chi-square test for the association between the lockdown and the self-rated health (five-point scale) for ten sex-age groups.

	Female 18-34	Male 18-34	Female 35-44	Male 35-44	Female 45-54	Male 45-54	Female 55-64	Male 55-64	Female 65-79	Male 65-79
Total	0.27***	0.14	0.1	0	0.09	0.11	0.18**	0.13*	0.11*	0.09
Employed	0.28***	0.08	0.04	0.03	0.17	0.08	0.1	0.19		
Unemployed	0.37	0.21	0.17	-0.06	0.02	-0.03	0.42	0.31		
Outside LF	0.24***	0.18	0.19*	0.01	-0.01	0.37	0.18**	0.04	0.09	0.1
School education	0.2**	0.12	0.1	-0.02	-0.02	-0.08	0.15*	0.09	0.1	0.06
Vocational education	0.28**	0.21	0.12	0.07	0.16	0.24	0.22*	0.19**	0.15	0.1
Higher education	0.42***	0.05	0.07	-0.09	0.2	0.19	0.14	-0.07	0.06	0.13
Not diagnosed with a significant illness	0.27***	0.07	0.14	-0.04	0.2	0.17*	0.17	0.13	0.16**	0.15
Significant illness	0.11	0.23	-0.14	-0.07	-0.08	-0.14	0.15*	0.08	0.05	0.05
Significant non-CVD or non-RD illness	-0.1		-0.08		-0.21	0.02	0.15	0.02	0.12	-0.05
CVD or RD	0.28	0.03	-0.17	0.02	-0.02	-0.22	0.15	0.09	0.04	0.08
CVD	0.14		-0.15		-0.02	-0.19	0.15	0.1	0.05	0.12
RD							0.07	0.13	-0.03	-0.39
No CVD or RD	0.26***	0.13*	0.13	-0.05	0.11	0.16	0.19	0.11	0.18**	0.09
No CVD	0.27***	0.13*	0.12	-0.04	0.1	0.15	0.2	0.11	0.15*	0.06
No RD	0.26***	0.14	0.1	-0.01	0.08	0.13	0.17**	0.13*	0.11*	0.13
No regular sports							0.24**	0.21**	0.14**	0.08
Regular sports							0.02	-0.01	0.02	0.12

Source: author's calculations based on GGS Moldova 2020.

The increases in SRH were unequally distributed by employment status and education. The increase was the most often among women not in the labor force aged 18-34 (0.1%), 35-44 (5%), and 55-64 (1%). Among the employed, the SRH increased only among women aged 18-34 (0.1%), and no subgroup of the unemployed had a significant increase. This also contradicts previous suggestions that housekeepers were among the most vulnerable, whereas the workers switching to work from home have the greatest opportunities to increase their SRH. The more educated strata also had a dimmer increase in SRH compared with those with a school or vocational education, especially in the older age groups. This also contradicts previous observations that those with higher education have a greater increase in SRH during the pandemic.

The absence of cardiovascular or respiratory system illnesses led to significant increases in SRH for three groups — men and women aged 18-34 and women aged 65-79 — whereas the absence of respiratory illnesses alone led to increases for the four aforementioned groups. This generally coincides with the hypothesis that individuals started to pay greater attention to the state of the cardiovascular and respiratory systems. The groups with significant illnesses, generally, did not see their SRH increased apart from women aged 55-64. Overall, forty sex-age groups with significant illnesses were tested, which means that the detected change was a false positive. In other words, individuals with significant illnesses have a more stable appreciation of their self-rated health than the general public. Similarly, one can observe that individuals who regularly practice sports have a more stable appreciation of their health than those who do not.

Overall, this section highlights that the previous findings on the SRH instability have a poor standing in the Moldovan context. The increase in SRH was more pronounced among the female housekeepers and those with vocational and school education. Employed individuals, as well as those with higher education, saw a less omnipresent increase in SRH. The exception to this is the unemployed, who did not see an increase in SRH at all. The objective health status and practices also highlighted that the individuals who pay attention to their bodily sensations have a more stable SRH compared to their peers. While this does not contradict the previous findings, it is a different formulation compared to them.

EXPLORATION SUBGROUPS OF SEX-AGE GROUPS

In this subsection, the rest of the questionnaire is considered to detect other variables with a stable association with or patterns of increase in SRH. See Table 3 for the performance of the variables by sex-age groups. The distribution of tests with statistically significant results supports the suggested curvilinear relationship between age and the change in SRH during the lockdown, as well as greater instability of women's SRH.

As mentioned above, the Benjamini-Hochberg correction was chosen as the benchmark for the analysis as it balances the avoidance of Type I error while being less restrictive than the Bonferroni or Holm-Bonferroni corrections. The last two corrections also highlight that the increase in SRH was more pronounced among the youngest female group, while some groups around the pension age also had a robust increase. Most of these groups refer to consumption possibilities and the distribution of chores. These results circle back to the questions of privilege and housekeeping, but suggest that practices rather than status are the appropriate, although non-universal, explanatory factor. The most notable subgroup is women aged 65-79 who speak Gagauz at home. This is a rare example of the significance of an ethnolinguistic group.

Table 3. The Number of Subgroups Inside Sex-Age Groups with the Significant SRH Changes By Correction.

Group	Female 18-34	Male 18-34	Female 35-44	Male 35-44	Female 45-54	Male 45-54	Female 55-64	Male 55-64	Female 65-79	Male 65-79
Total number of tests	724	568	666	545	595	505	626	568	602	489
Bonferroni correction	205	0	0	0	0	1	3	0	3	0
Holm-Bonferroni correction	210	0	0	0	0	1	3	0	3	0
Benjamini-Hochberg correction	432	0	0	0	0	1	68	0	3	0

Group	Female 18-34	Male 18-34	Female 35-44	Male 35-44	Female 45-54	Male 45-54	Female 55-64	Male 55-64	Female 65-79	Male 65-79
Non-corrected significant	452	49	37	6	35	75	196	79	104	10
Non-corrected negative significant	0	0	2	4	1	0	0	0	4	4

Note: the significance is based on chi-squared tests.

Source: author's calculations based on GGS Moldova 2020.

Of the 902 categories, 449 categories yielded at least one subgroup with a statistically significant change. 88% of them had only one sex-age subgroup with a statistically significant change, 11.8% had two subgroups, and one (affording no pocket money) had three. Most of the variables that were significant for women aged 55-64 were also significant for women aged 18-34. They do not yield an overall pattern. The most significant groups among the 68 variables were values of the individual (8), consumption possibilities (7), and subjective well-being (5).

When taking the uncorrected Chi-squared tests, 546 categories yielded at least one subgroup with a statistically significant change. 45.6% of them had one sex-age subgroup with a statistically significant change, 27.1% had two subgroups, 19.2% had three subgroups, and the rest had four or five subgroups. Several variables yielded five sex-age subgroups with statistically significant changes. These include living in a city, living in a nuclear household, having a partner, receiving no financial transfers inside or outside the household, having enough people with whom they feel close, and the inability to afford leisure activities.

In several cases, sex-age groups have a specific subgroup with significant changes in SRH distributions. For women aged 35-44, SRH grew among housekeeping mothers whose partners have a stable job, and who are struggling to pay for heating and unexpected expenses. For women aged 45-54, the SRH grew among government employees with permanent contracts. For men aged 18-34, the SRH grew among those who equally participate in household and childcare chores, do not have a fixed work schedule, and come home too tired several times a year. Other sex-age groups seem to have a greater number of points of SRH growth, and grouping them is harder. For men aged 35-44 and 65+, such groups virtually do not exist, and for the youngest women, the changes are universal. As discussed in the previous section, these results should be considered with reservations. Generally, they also highlight that the changes in SRH were curvilinear and different for men and women.

DISCUSSION

This study disentangled and tested several hypotheses on SRH instability that were raised in past literature. While it shows temporal changes, it rejects the hypothesis that they can explain the increase in SRH. It also showed that, in the Moldovan context, using employment or educational status to study the influence of lifestyle on health is less productive than using conditions per se. Past research highlighted housekeepers and manual workers with non-tertiary education as groups with declining SRH, which was explained by their greater workload due to the changed lifestyle and greater vulnerability to COVID-19. In this study, if any, a positive change in SRH was registered among these groups. Finally, more ground is given in this study to the model of Jylhä (2009), as it shows that individuals who pay attention to their bodily sensations have a more stable SRH compared to their peers.

The exploratory part highlights several important issues. First, it shows for the first time that Moldovan ethnolinguistic groups had varying levels of SRH increase, specifically, with the Gagauz women aged 65-79 having a very robust increase in SRH. Previous studies show that benchmark state varies from language to language (Palosuo et al., 1998), and it is possible that the Gagauz have different standards for SRH levels compared to the rest of the population.

Second, the uncorrected tests suggest that different sex-age groups have different socio-economic groups with the SRH increase. Among the second youngest female group, only the most vulnerable housewives reported an increase. This contrasts strongly with the youngest female group, who had an overarching increase, as well as the middle-aged female group, among whom state-employed bureaucrats had such an increase. It is possible that the mechanisms differed among these three. For example, while for women aged 18-34 and 45-54 the chief mechanism could be a change in their benchmarks, for women aged 35-44, it could be an example of stoicism (see Moore et al., 2013 for discussion of this term). However, since these results are only supported by the uncorrected Chi-squared tests, they should be treated with caution.

There are three substantial problems with this study. First, the impact of COVID-19 itself on the health of the surveyed could not be measured. Some groups must have been exposed to COVID-19 more than others, and these groups' SRH must have fallen accordingly. This leaves

the benchmark hypothesis hanging. Second, the pre- and post-lockdown subsamples have systemic differences, as reported by the data collectors (Cristei, 2020). Further research should consider matching the observations and creating a more comparable sample, although this will reduce the size of both pre- and post-lockdown subsamples. Finally, the method assumes the stability of the subgroups. This could also be solved with matching.

CONCLUSIONS

It was previously noted that self-rated health (SRH) increased during the COVID-19 pandemic in a dozen countries. Several overlapping explanations related to the changes in the actual health and health practices, environment, and SRH assessment were proposed. In this study, these explanations were evaluated on the Moldovan GGS, a survey conducted in 2020 in two parts with nearly three thousand people surveyed before the lockdown and seven thousand people surveyed after it. As in other countries, the Moldovan data also show that the SRH increased, although the changes were not equally distributed across ages, genders, and their subgroups.

This study has two chief scientific contributions. First, it classified and evaluated the previously suggested explanations. They had varying performance. The SRH dynamics by month did not support the explanations via a relief due to the end of the lockdown. The classical socio-economic measurements of disadvantage were not associated with a decrease and proved themselves to be proxies that do not work in the Moldovan context. The study confirmed that the respiratory and cardiovascular systems acquired greater weights in SRH measurement, with the respiratory diseases alone being a more consistent predictor. However, generally, any variable on regular interoception had an association with a more stable self-rated health.

Second, a further analysis of the GGS also offers the following interpretation. Age has a curvilinear effect on the SRH instability, with SRH being the most unstable in the earliest ages and in the cohorts aged 55-64. Women had a greater increase than men. Several socioeconomic factors stimulated the increase in SRH. These include living in a city, having a partner, a good respiratory system, a social support system, and financial independence. The exploratory analysis also suggests that such stimulating variables can vary by gender and age groups. Specifically, it found that such groups with growth were different for women aged 35-44 and those aged 45-54. As mentioned in the discussion section, these changes may be driven by changes in the SRH evaluation process, with different groups experiencing distinct changes. While we can suggest that different socio-economic groups have different inclinations to change (e.g., housekeeping mothers from disadvantaged households becoming more 'stoic', unlike other women), they seem to be unpredictable overall. Thus, the study showed that SRH is a rather inconsistent index during a health crisis such as the COVID-19 pandemic, and should be used with great caution to evaluate policy efficiency.

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