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Assessment of public perception of radioactivity in Brazil

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ABSTRACT

Nuclear energy divides public opinion with its "good" and "bad" applications. Almost immediately after the discovery of radiation, radioactive elements purified by the Curies were used in health treatments, but with the nuclear bombs of Hiroshima and Nagasaki, the subject was marked by bad public opinion, being related to death and destruction. Nowadays, nuclear physics is used in many important fields, such nuclear medicine for the diagnosis and treatment of various types of diseases, but the prejudice and lack of knowledge of the general public has not yet improved its "fame". This work proposes to change a little of this paradigm. Through a questionnaire, the public perception of radioactivity was evaluated. The most important result obtained is that the public is interested in learning about radiation and nuclear energy and is willing to change their negative views.

Keywords: **radiation, public opinion, nuclear physics, nuclear energy, statistics.**

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1. INTRODUCTION

The atomic bombs that devastated Hiroshima and Nagasaki stayed in everyone's memory and with them the devastating power that nuclear energy can have [1]. To this day, people continue to receive negative information about radioactivity from the media, which treats scientific topics in a superficial and biased way, leading adult populations to believe in scientific untruths that can lead to loss of interest in science [2].

The increase in people and organizations that promote their ideologies above scientific evidence directly impacts the credibility of the population and causes a variety of protest movements focused on the environment, information technology, health care and medicines without scientific basis [2]. Scientists have an important role in reversing the situation, creating mechanisms that bring the correct information to the population.

The study of radioactivity in Brazil is part of the Radiation Physics course, which is optional in almost all higher education Physics courses (except for Medical Physics). Its study at the secondary level is poorly managed because its fundamentals are difficult to explain, require multidisciplinary knowledge and compete for space with other topics such as mechanics and electromagnetism. In the end, there are not enough class hours for the correct approach to the topic [1].

Criticism of the current teaching methodology that presents science in highly scientific terms and with a superficial approach to basic knowledge about radiation reflects the low frequency in which questions with this theme fall into major university entrance exams in Brazil. The use of peaceful applications of nuclear energy as a basis for teaching is the best education technique and means of propagating these technologies. The planning of teaching materials based on knowledge of the general opinion on the subject establishes greater dialogue, exploring different points of view, with informal ideas to interpret the present reality and promote clarification on new nuclear technologies. [3].

Most people see science as a subject in which names are memorized for tests, only to be forgotten, and that science itself should be left to the scientists. But as scientific research accelerates, the population must increasingly deal with scientific issues that impact their daily lives. Public policy decision-making depends on complete information for the population to engage as an informed and independent thinker. That is why it is important to review the school curriculum and develop new forms of scientific dissemination in a simple way, showing the impact of science on people's daily lives [2].

Spreading science to the non-scientific community encourages students to become researchers. In addition, societies with more knowledge can make better decisions for the future. Discovering through questionnaires what people think about a particular technology, identifying their sources of information, exploring their logic and opinion, and then used the data in the creation of educational materials completes the learning cycle more effectively [4].

This work aims to create a questionnaire to assess public opinion on radioactivity and perform statistical analysis of the data, seeking to create links between characteristics.

According with Paul Slovic "Surveys of the general public in the United States and elsewhere have consistently shown that people perceive nuclear power and nuclear waste as having high risk, but perceive other sources of radioactivity - such as medical x-rays and naturally occurring radon gas- as posing much lower risk. Most radiation experts see things quite differently, rating nuclear power and nuclear waste as less risky than the general public does, and perceiving medical x-rays and radon as riskier than generally believed. This perception gap demonstrates that acceptance of risk is conditioned by several factors, such as trust in the managers of the technology and appreciation for the direct personal benefits of the technology" [5].

A research conducted in South Korea [6] evaluated the public perception of radiation one year after the Fukushima Accident. A total of 2.754 people answered the questionnaire. The poll found that one of the main reasons radiation seemed harmful was that, after exposure, it might not have bad effects right away, but the following generation might experience negative effects (66.1%). 39.5% of respondents agreed that we should stop using nuclear power in light of the Fukushima nuclear power plant accident, while 41% of respondents expressed opposition to the government's radiation report.

Evaluating the current perception about radiation and its uses will help educators to develop materials that will help to correctly inform the population. Focusing on the region is also important. Brazil has gone through one of the worse accidents in the world and this may shape the public's idea of radiation and direct the educational material to a different direction. Wieland et. al. conducted a research in Brazil 10 years after the Goiânia accident. They used a 7-page questionnaire that was answered by 227 people. About 80% of the interviewees viewed radiation's applications in industry, research, and medicine as essential or extremely important/important. Although 55% of respondents had similar opinions on the usage of nuclear energy, they voiced skepticism about Brazil's ability to manage this technology properly and without putting the population or environment at undue danger. Despite the fact that 81% of people were familiar with the topic of radioactivity, 35% were unsure of

what the symbol for the presence of radiation represented. There was a lot of interest in nuclear issues. About 90% of those surveyed said they wanted additional information on the fundamental ideas relating to radiation. School (46.7%), media (newspaper, TV) (43.6%), CNEN (38.8%), Ministry of Health, Civil Defense, or nuclear energy plant (2.2%) were the most favored information sources. [7]

2. METHODS

2.1. The questionnaire

For the construction of the questionnaire, the following steps were followed:

- Questions were formulated to assess concepts that could or could not be included in the booklet. We tried to keep the form filling time to a maximum of 5 minutes;
- The questionnaire text was simple and straightforward. The use of questions with written answers was avoided as much as possible;
- Basic visual aspect provided by Google forms was used;
- Pre-test was performed during the 3 days prior to the release of the questionnaire.

Respecting the sanitary measures of social distance, the evaluation of public opinion was carried out through the application of an online questionnaire, prepared on Google forms. The advantages of using the virtual environment for data collection are:

- it allows capturing participants from different regions of Brazil or even Brazilians living abroad;
- the convenience of answering the questionnaire at any time using the computer or cell phone;
- a feature of mandatory questions, in which the participant only advances to the next question when answering the current one;
- the attainment of an automatic database, transferred directly to MS Excel enabling statistical analysis of the answers [8].

According to the resolution of the National Health Council CNS 510/2016, public opinion polls with unidentified participants do not need to be registered or evaluated by the CEP/CONEP (Brazil Central Ethics Committee) system. It is characterized as “public opinion survey: verbal or written

consultation of a specific nature, carried out through a specific methodology, through which the participant is invited to express their preference, evaluation or the meaning attributed to themes, actions of people and organizations, or products and services; without possibility of identification of the participant" [9].

The questionnaire "Assessment of public perception about radioactivity" began with an introductory part explaining that it was developed as part of the Professional Master's Degree in Radiation Technology in Health Sciences, of the Nuclear and Energy Research Institute – IPEN-CNEN/SP, with optional participation and that the results obtained will be used only for academic purposes, and will be kept anonymous. As the purpose of the questions is to assess the opinion and knowledge about radiation, it was requested that the answers to the questions not be searched on the internet. At the beginning, a space was left for those interested in knowing the results and receiving the link to future developments. Next, the questionnaire is presented.

Questionnaire: Assessment of public perception of radioactivity

INTRODUCTORY PART

This questionnaire was developed for a survey carried out within the Professional Master's Degree in Radiation Technology in Health Sciences, of the Nuclear and Energy Research Institute – IPEN-CNEN/SP and is optional.

The results obtained will be used for academic purposes only, and will be kept anonymous. Please do not search the internet for answers to questions, as the purpose of the questions is to assess your opinion and knowledge about radiation. This survey will take 5 minutes of your attention.

Thanks for participating!

contact email: assessmentocancer@gmail.com

If you want to know the results and receive the link, see the results of this pool and any future updates, leave your email below.

*** *RESPONDENT PROFILE***

- Age Group, Education, Gender, Profession

ABOUT NUCLEAR ENERGY

- Do you know what nuclear energy is?
- Do you know the difference between ionizing and non-ionizing radiation?
- Are all types of radiation harmful to health?
- Ever heard of radiation sickness?
- Do you know any use of nuclear energy in our daily lives?
- Have you ever heard of a nuclear accident?

KNOWLEDGE TEST

- Check the ○ of which examples below radiation and/or nuclear energy are used
  - o Microwave oven
  - o X-Ray
  - o MRI
  - o Ultrasound
  - o Tomography
  - o Hydroelectric Power Plant
  - o Sterilization of Medical Materials
  - o Electricity Generation
  - o Cancer Treatment
  - o Interventional Cardiology
  - o Manufacture of Materials for Use in Industry
  - o Dating of Archaeological Pieces

- Tick only the alternatives that you know to be true
  - o Our body is constantly bombarded with natural radiation
  - o The crew of a submarine is less subject to radiation than those on dry land
  - o The smoker receives an annual radiation equivalent to 200 chest X-rays
  - o The fungus Cryptococcus neoforman grows in places where there are high concentrations of radiation
  - o Radiation can cause genetic mutations that cause changes in our body
  - o Is it possible to make use of nuclear energy safely?

- I would not do radiotherapy because I don't like the idea of receiving radiation
- I would not eat food that was sterilized by radiation
- I would like to have more knowledge about the area before making decisions about what to accept

- Do you know the half-life of Cobalt-60 (don't google it, this is a control question)?

FEELINGS AND OPINIONS

- Are you afraid of nuclear energy and radiation?
- Do you think Brazil should build more Nuclear Reactors?
- Do you think Brazil should install more equipment that uses radiation in medicine?
- Do you think that research in the areas of radiation should continue? For example: effects of radiation on materials, sterilization, radiation in medicine.
- Do you think nuclear energy is safe?
- Could a class or folder containing informational material on nuclear energy/radiation make you change your mind?

The questionnaire was released for the public in December 2021 until February 2022, on the social networks WhatsApp, Facebook, and Instagram at:

- WhatsApp: East Zone Student Group of SP: 10 thousand members; Butantã teacher groups: 2 thousand members;
- Facebook: Research Group - Questionnaires and Answers (6,500 members), Academic Questionnaires Group (2,000 members), New High School Teachers (5,300 members), Study Dissemination Group: Science and Related (94 thousand members)
- Instagram: https://instagram.com/radiacaoemsaude?igshid=YmMyMTA2M2Y=

2.2. Statistical analysis

The statistical test used to compare the variables was Pearson's Chi-Square test, which is utilized to evaluate three types of comparisons: adherence test, which establishes whether the distribution of observed frequencies is different from the theoretical distribution; independence test, which evaluates unpaired observations in which two variables are independent of each other; and homogeneity test, which compares the distribution of two categorical variables and checks whether they are homogeneous with each other. The Fisher's exact test is employed when the contingency table's predicted values are less than 5, meaning there are fewer cells and the chi-square test is insufficient. Given that it is based on a hyper-geometric distribution, the Fisher's exact test may be applied to any sample sizes and delivers the correct p value without the need for an approximation technique [10].

To apply the tests and analyze the data of the research developed, the statistical software JAMOVI was used. It provides a free and open statistical worksheet, created by the scientific community, allowing to evaluate, determine and analyze data sets [11]. Two major questions were made:

- If the persons that answered positive for fear of radiation are would be willing to change their views with education;
- If the persons that answered negatively if they think Brazil should build more nuclear reactors willing to change their views with education;

3. RESULTS AND DISCUSSION

3.1. Descriptive data analysis

The questionnaire was answered by 488 people, of which 32.8% left an email to receive the results and the link to the booklet. The first part of the questionnaire was to assess the profile of the interviewee (figures 1 and 2). In these graphs, it is observed that most of the answers are female (352), from the Southeast region, with complete higher education and that reached all the proposed age groups.

Figure 1: Graph relating age group, sex, and region.

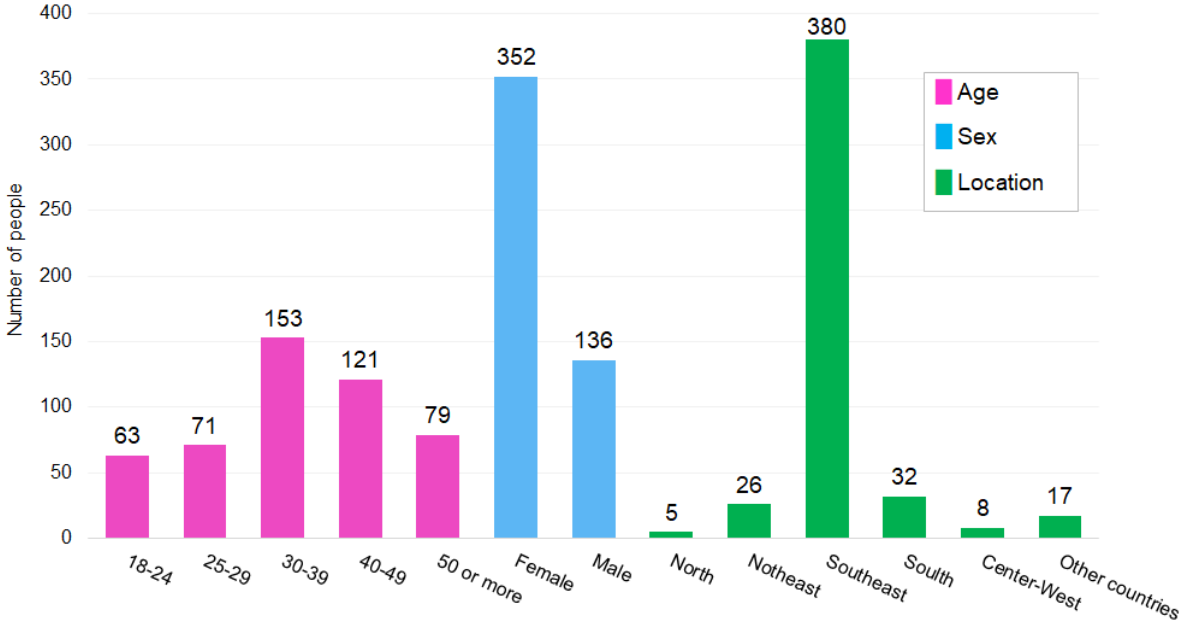


Figure 2: Graph relating level of education and field of knowledge.

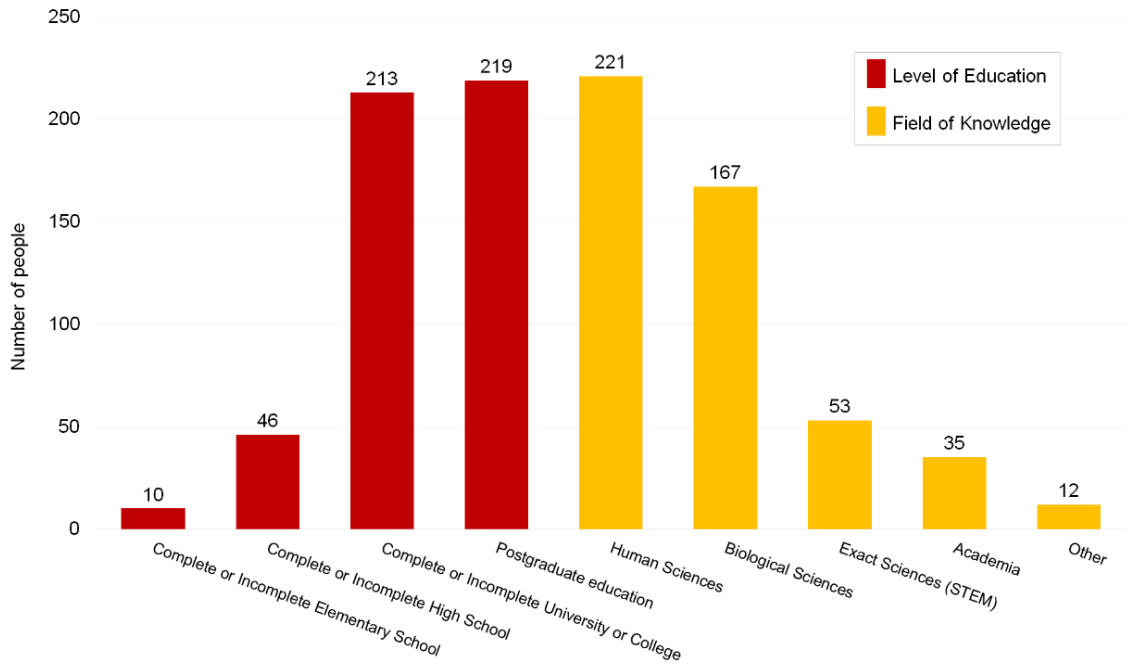
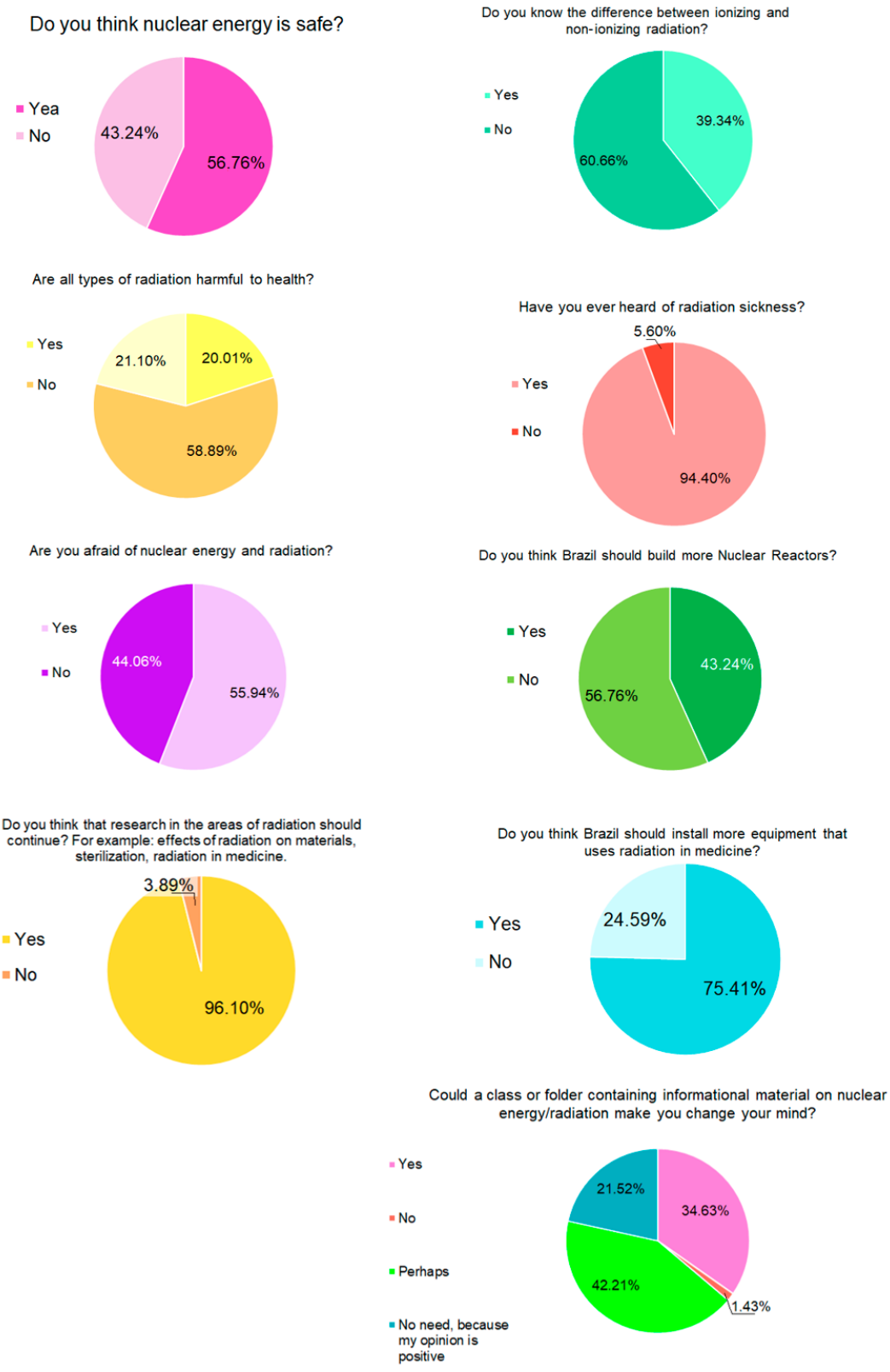


Figure 3: Graphs showing the results of the Yes/No questions.



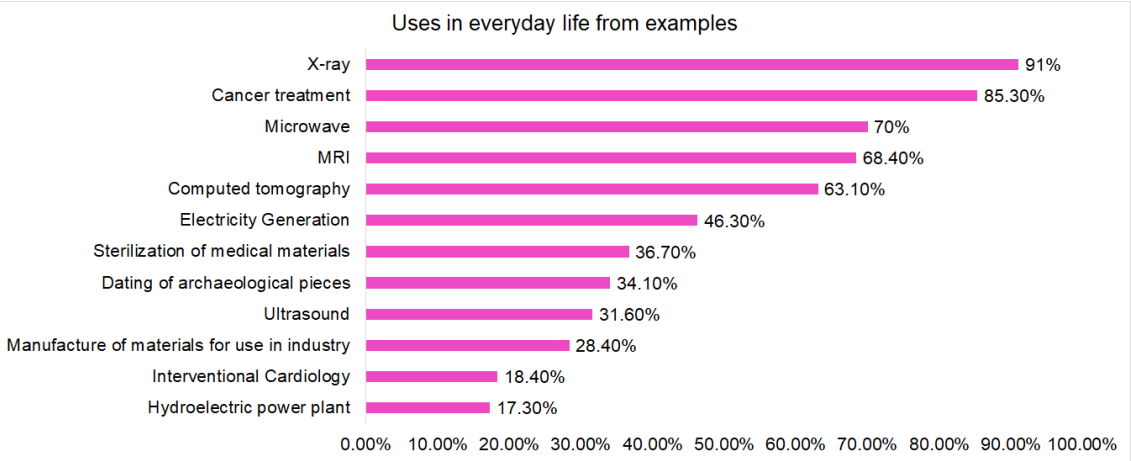
The second part of the nuclear energy quiz, in the first question “Do you know what nuclear energy is?” only 12.71% of the answers were “no” and 72.13% “I know a little”. The question: “Do you know the difference between ionizing and non-ionizing radiation?” shows that 60.66% do not know the difference, both questions indicate that most are not from the nuclear field and the knowledge people claim they have is not broad. There is a contradiction in the fact that a majority of 58.89% do not know whether radiation is harmful to health and 20.01% do not think it is harmful at all, but 94.4% have heard about diseases caused by radiation.

The fourth and final part of the questionnaire is aimed at verifying the feelings and opinions of respondents about the use of nuclear energy for peaceful purposes. Although most respondents are afraid of nuclear energy and radiation, 55.94% and 55.76% do not think that Brazil should build more nuclear reactors, 56.76% of people think that nuclear energy is safe. In questions involving the area of research and medicine, the opinion is more positive, with 96.10% answering that research in the areas of radiation should continue and 75.41% that Brazil should install more equipment that uses radiation in medicine. Although most respondents are afraid of nuclear energy and do not support the construction of more nuclear reactors, they support the use of radiation for medicine and research.

The question “Could a class or folder containing informative material on nuclear energy/radiation make you change your opinions?” only 1.43% answered “no” and 21.52% answered that the opinion was already positive, 76.84% answered yes or maybe. This majority interested in obtaining more information about nuclear energy.

The third part of the questionnaire tests people's knowledge about radiation and 109 people answered that they do not know the use of radiation in our daily lives, 61 answered yes, but did not cite examples and 256 people wrote examples related to the diagnosis and treatment of diseases. Other uses were mentioned, such as electricity (60 people), solar energy (19 people), food (12 people). Magnetic resonance imaging by 18 people and microwave oven by 48 people were well remembered in this question and in the next (“Cite any use of nuclear energy and/or radiation in our daily lives). It is known that MRI does not use ionizing radiation, and microwaves use low-frequency electromagnetic radiation, of the same type used in radios. [12]. Results can be seen in figure 4.

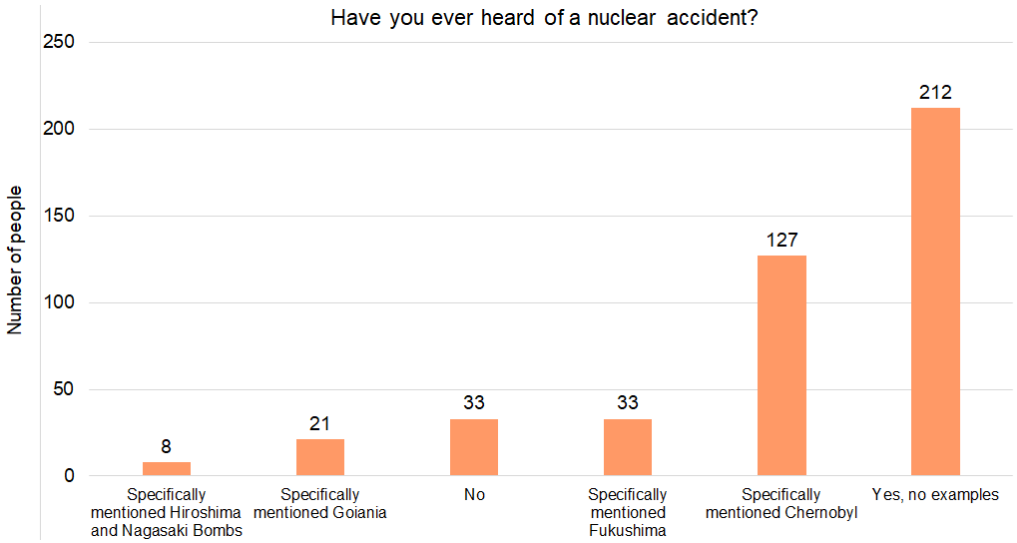
Figure 4: Results selected by the participants as daily uses of radiation.



Still in Figure 4, other incorrect answers were indicated, such as ultrasound by 31.60% and hydroelectric power plant by 17.3%, demonstrating in general the lack of information about nuclear energy applications.

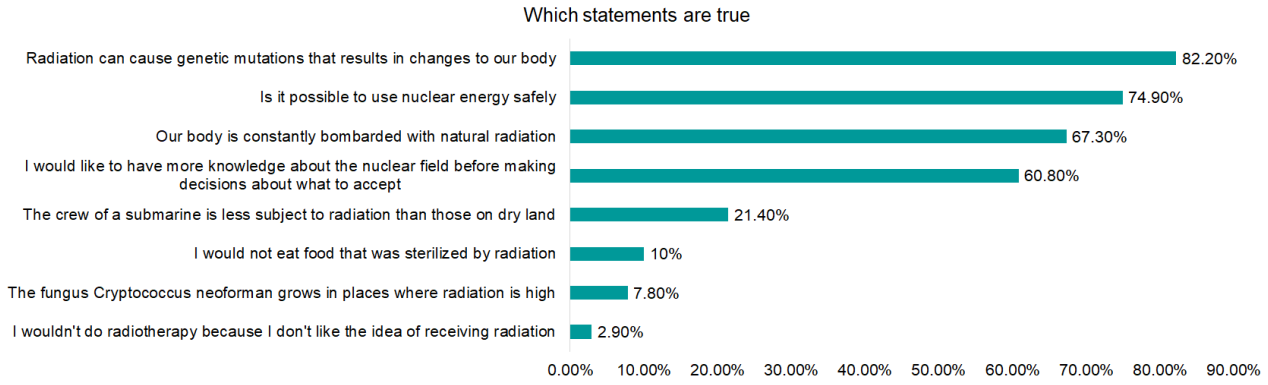
In the question about nuclear accidents, only 33 people answered that they had never heard about it and 215 answered yes, but did not cite examples. Among the accidents remembered are Chernobyl, Fukushima, Goiânia and 8 people specifically mentioned the nuclear bombs in Hiroshima and Nagasaki, which despite not being accidents, shows how nuclear energy is still associated with these events (figure 5). Note the low number of people that mentioned the Goiânia accident.

Figure 5: Answers to the question "Have you ever heard of a nuclear accident".



Some curiosities and statements were mentioned in the questionnaire to mark only the true alternatives (figure 6). Of the total, only 7.80% people believe that a fungus can grow in places where radiation is high, such as Cryptococcus neoforman that grows in Chernobyl and 21.40% do not believe that the crew of a submarine is less subject to radiation than those on dry land subject to natural radiation. But of those interviewed, 82.2% indicated that is true that radiation can cause changes in our body, 74.90% believe that it is possible to make use of nuclear energy safely, 67.30% that our body is bombarded by natural radiation. In alternatives placed to verify the opinion of the interviewees, 60.80% would like to have more knowledge about the area before making decisions about what to accept, showing interest in the subject, a minority of 10% would not eat food sterilized by radiation and only 2.90% would not undergo radiotherapy, showing greater acceptance.

Figure 6: Graph with the results of the question: Tick only the alternatives that you know to be true.



The question “Do you know the half-life of Cobalt-60 (do not google it, this is a control question)” was inserted to verify the bias of the questionnaire, determining participants from the nuclear area. Most of 409 people answered "no" and 32 people answered correctly (≈5.36 years). These data indicate that most participants do not work in the area.

3.2. Statistical analysis

More Reactor X Change Opinion

The hypothesis that people with a positive opinion about nuclear energy are more favorable to the construction of nuclear reactors in Brazil was tested. After applying the Fisher test, the variables “Do you

think Brazil should build more nuclear reactors?" correlated with "Could a class or folder containing informational material on nuclear energy/radiation change your opinions?" showed a correlation with p <0.001 and the result agrees with the formulated hypothesis. Results are shown in figure 7.

Figure 7: Graph correlating More Reactor X Change Opinion.

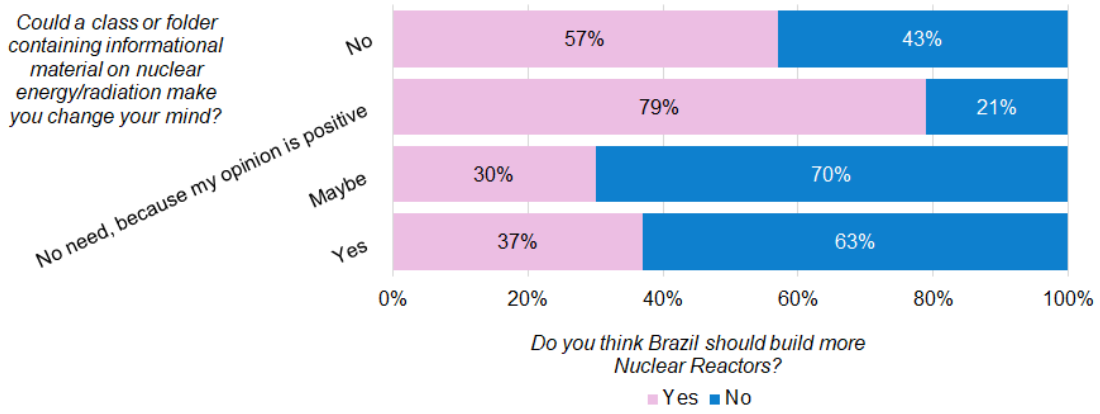
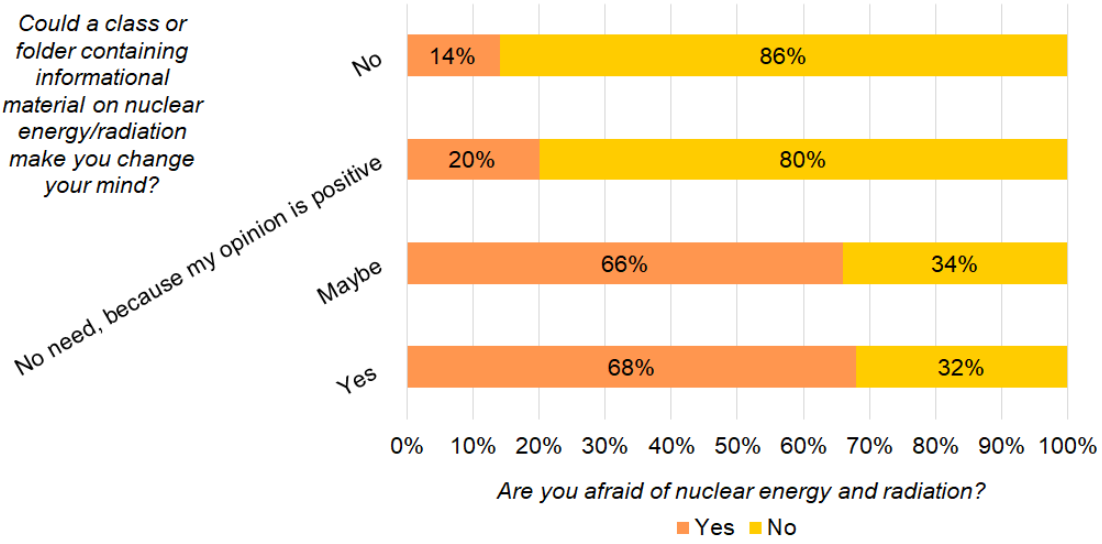


Figure 7 shows that from all the people that answer YES stating that information materials could change their minds, 63% answered that Brazil should not build more nuclear. This should that there is a need for instructive actions since they are very likely to bring more people to accept nuclear energy.

Fear of Radiation X Change Opinion

The correlation between "Fear of radiation" and "Could a class or folder containing informative material on nuclear energy/radiation make you change your opinions?" showed a positive correlation in Fisher's test p<0.001. Results are shown in figure 8.

Figure 8: Graph correlating Fear of Radiation X Change Opinion.



From the people saying YES to changing their mind, there are 68% answered that they are afraid of nuclear energy and radiation. This reinforce the need for instructive actions since they are very likely to bring more people to accept nuclear energy.

3.3. Discussion

Despite the advances and benefits of nuclear technology, in most countries their education and training are declining. According to the Organization for Economic Co-operation and Development - Nuclear Energy Agency (OECD-NEA), students in associated university courses are less and less going to the nuclear area, due to numerous factors such as the lack of investments in the area, aging research facilities, reductions in nuclear energy funding by the governments, and, mainly, the negative public perception of the area. If measures are not taken, there will soon be a shortage of professionals to operate nuclear reactors and carry on with important research for technological advancement. [13]. In order to attract these future professionals, initiatives are needed to publicize the applications of nuclear energy, with an increase in class hours in the school curriculum and the formation of specific university courses in the area.

The enormous contribution of nuclear energy in medicine is recognized even though its mechanisms are poorly understood. Brazil faces access problems from diagnosis and therapy, to

research funding. For example, the Brazilian Multipurpose Reactor (RMB) can give autonomy to the country in the production of several radioisotopes and expand national capacity in research into nuclear techniques. With the RMB, Brazil would supply the entire domestic market with most of the necessary radioisotopes, whether for medical, industrial applications, or for general uses in the environment and agriculture. It would also have the possibility to test and qualify nuclear materials and fuels [14].

Vital to meeting the need to improve science education is the involvement of scientists in collegiate partnership with science educators. Potential partners in education include educators working in classrooms, museums, aquariums, planetariums, and other organizations that develop educational products and programs. Successful partnerships draw complementary talent and expertise from each partner and provide the opportunity for each to develop additional capabilities. Both parties can increase their awareness and mutual appreciation as professionals in allied spheres of enterprise, expand their skills in co-creating effective science learning experiences, and develop confidence in playing leadership roles in science education reform. This mutual professional development is the main advantage of partnerships between scientists and educators, and while this is good and valuable for science education, it is not easy to achieve. Good partners must strive to address the natural challenges and cultural differences that may arise in a way that is accountable for the ultimate needs of students. [15].

The evaluation of public perception carried out in this work showed as its main result that the interviewees would be willing to change their opinion about nuclear energy if they were educated on the subject. Special materials should be developed, seeking to achieve this goal by educating in a relaxed way about interesting topics present in people's daily lives.

4. CONCLUSIONS

Despite many of the participants are people with higher education and from the Southeast region of Brazil, through social media it modestly reached representatives of other Brazilian regions. Most of participants are in the Human Sciences, a public without specific knowledge about radiation, important to verify their opinions and knowledge.

Most of the interviewees have little knowledge about radioactivity, they have heard about nuclear accidents and despite being afraid and not supporting the construction of nuclear reactors in Brazil, they showed a good acceptance of its use in the medical and research demonstrating interest in obtaining more knowledge in this area, validating the booklet as a source of information.

The most important result was achieved by the statistical analysis, showing that over 60% of the participant are willing to change their negative view of nuclear energy and radiation if they receive more information about it.

As future work, we are preparing an educational booklet on the topics: The atom and radioactivity, Types of Radiation, Radioisotopes and Nuclear Medicine, Radiology, Nuclear Bombs, Nuclear Accidents, Nuclear Power Plants, Unusual Uses of Nuclear Energy, the Future. Once ready, it will be published for free in the website 61a7139be421d.site123.me .

REFERENCES

[1] OKUNO, E. **Radiação: efeitos, riscos e benefícios**, 1a ed.São Paulo: Oficina de textos, 2018.

[2] JENKINS, E. W. Public understanding of science and science education for action. **Journal of Curriculum Studies**, v.26, p.601-611, 1994.

[3] BARRAGÁN, P., MORTIMER, E. F. and LEAL, A. A. Avaliação preliminar sobre o conceito de Radiação e suas tecnologias: ideias informais de estudantes do ensino médio., In: **Encontro Nacional de Pesquisa em Educação em Ciências**, 2009, Florianópolis-SC. Annals of Encontro Nacional de Pesquisa em Educação em Ciências.

[4] LOBO, B. M. **Proposta de uma metodologia para divulgação da tecnologia Nuclear**, Mestrado em Tecnologia Nuclear: Mestrado em Tecnologia Nuclear. Universidade de São Paulo, 2017.

[5] SLOVIC, P. The perception gap: Radiation and risk. **Bulletin of the Atomic Scientists**, v.68(3): 67-75, 2012.

[6] PARK, B. J. Analysis of Public Perception on Radiation: with One Year after Fukushima Nuclear Accident. **Journal of Radiation Protection and Research**, v.37(1): 1-9, 2012.

[7] Wieland, P.; Steinhaeusler, F.; Xavier, A.M.; Unterbruner, U. Public perception of radiation safety - a case study in Brazil. In: **Goiania, ten years later**, https://inis.iaea.org/collection/NCLCollectionStore/_Public/30/008/30008075.pdf?r=1, 1998.

[8] FALEIROS, F., KÄPPLER, C., PONTES, F., SILVA, S., GOES, F. and CUCIK, C. Uso de questionário online e divulgação virtual como estratégia. **Texto Contexto Enferm**, v.25(4): e3880014, 2016.

[9] CONSELHO NACIONAL DE SAÚDE. **Resolução do Conselho Nacional de Saúde 510/2016.**, https://bvsms.saude.gov.br/bvs/saudelegis/cns/2016/res0510_07_04_2016.html 2016.

[10] GUIMARÃES, A. M. Estatística: Teste Exato de Fisher e Teste de Qui-Quadrado usando R, 2019. Available at: <https://medium.com/omixdata/estat%C3%ADstica-teste-exato-de-fisher-e-teste-de-qui-quadrado-usando-r-4ee496da37fc>. Last acessed: 24/03, 2022.

[11] JAMOVI. The jamovi project (Version 2.2), 2021. Available at: <https://www.jamovi.org>. Last acessed: 05/05, 2021.

[12] BROWN, J. Afinal, é perigoso esquentar comida no micro-ondas?, 2020. Available at: <https://www.bbc.com/portuguese/internacional-53494257#:~:text=diferentemente%20dos%20aparelhos%20de%20raios,qu%c3%admicas%20para%20danificar%20o%20dna>. Last acessed: 20/03, 2022.

[13] NUCLEAR ENERGY AGENCY ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT. Nuclear education and training. Cause for concern? A summary report., 2000. Available at: < https://www.oecd-nea.org/upload/docs/application/pdf/2019-12/nea2428-education.pdf>. Last acessed: 2022.

[14] PERINI, E. A. **Desenvolvimento de instalação para processamento de radioisótopos de utilização médica**, Tese (Doutorado): Tese (Doutorado). Instituto de Pesquisas Energéticas e Nucleares, 2020.

[15] MORROW, C. The Role of Scientist-Educator Partnerships in Improving Science Education, In: **Proceedings of the Australian-American Fulbright Symposium, https://ui.adsabs.harvard.edu/abs/2002seip.conf....3M/abstract**, 2002, Hamilton Island, Australia. Annals of Proceedings of the Australian-American Fulbright Symposium, https://ui.adsabs.harvard.edu/abs/2002seip.conf....3M/abstract.

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