**Input on gender and toxics**

**The Psychological Impact of Per- and Poly-Fluoroalkyl Substances (PFAS) Pollution in the Veneto Region, Italy**

Marialuisa Menegatto and Adriano Zamperini, social psychologists at FISPPA Department, University of Padova (Italy)

marialuisa.menegatto@unipd.it

adriano.zamperini@unipd.it

**The context.** For decades, residents of an extensive territory of the Veneto Region have been exposed to high levels of per- and polyfluoroalkyl substances (PFAS) by way of contaminated ground (bore), town water, and local produce, and other exposure pathways. On the basis of a risk gradient of contamination, the affected territories were divided into 4 areas: Red (of maximum exposure, where a human biomonitoring (HBM) was activated), Orange, Yellow, and Green.

PFAS are highly resistant to biological, chemical, and photochemical degradation and are of serious concern to human and environmental health. They can be defined as “endocrine disruptors” exogenous substances that might affect the endocrine system, compromising many of the processes of the human body. Mounting scientific and clinical evidence has found that adverse physical and psychological health outcomes across all life stages are associated with PFAS exposure, including reduced kidney function, metabolic syndrome, thyroid disruption, cancer, adverse pregnancy outcomes, and chronic distress. It is confirmed that mothers passe the toxic substance on to developing fetuses through the placenta and on to babies through breast milk with negative health consequences on children which often leads them to early disease especially in adolescence, such as the appearance of high levels of cholesterol, with adoption of pharmacological therapy, thyroid disorders with alterations in menstrual cycle in girls, and low fertility levels in male youths.

**The research.** Since 2019, we are working in a mixed-methods community health resilience (CHR) research project, currently in progress, based at the University of Padova (Italy) (FISPPA Department). This research project is designed to investigate psychosocial risk factors, psychological discomfort, community conflicts, and resilience strategies among the population of those areas of the Veneto Region (Italy) that have been exposed to PFAS pollution. The study included numerous visits to communities polluted by PFAS, during which we conversed with formal and informal leaders and engaged in many forms of observation. In combination with the existing literature on environmental pollution and an analysis of government documents, these visits to communities informed the development of the topics covered in the interviews and questionnaire.

**The findings.**

**The first step.** The purpose of the first step of our study was to investigate the chronic exposure contamination (CEC) experience of parents who lived in the red area, the area of maximum exposure. Little is known about the psychosocial impact on people who live in polluted areas, and its consequences for the parental role, especially in mothers, have been neglected. Our findings show that PFAS CEC experience is a process whereby parents need to move from the shock of discovery to adapting to the new situation in order to incorporate a change into their daily life, especially in regard to children. Two emerging aspects that characterised the process as a constant were uncertainty and health concerns, while role strains could be a stress source in the context of CEC. We suggested introducing the notion of chronic role strain (CRS).

Overall, CEC contamination is characterised by uncertainty and health concerns. In the specific case study investigated here, parents reported that they felt violated and deprived of the skills (including information) to deal with the situation, thus feeling a sense of helplessness. In addition, the parental role was overloaded with thoughts of behavioural self-blame for failing to protect children against exposure to pollutants in the past. Moreover, mothers lived, and live, with the inner anguish of their awareness that they had passed on PFAS to their children during pregnancy and breastfeeding.

The very fact of being forced to live with PFAS means that these role strains become a relatively stable presence in the life of these parents, increasing their power to interfere with the way parents think about themselves and their own roles. The greater presence of mothers than fathers among the participants in this study on the one hand confirms the higher concern among the female gender generally encountered in the literature concerning environmental pollution and, on the other, points out that those who, due to gender and cultural characteristics, are invested with the social role of caring for offspring are more affected by the psychological impact of environmental pollution, perceiving a strong parental tension and consequently taking action. An indirect confirmation of this tension of the parental role is also given by the high levels of agreement among parents when the Veneto Region first called on them to participate in the health surveillance program to monitor the presence of PFAS in the body.

**The second step.** The purpose of the second step of our study was to investigate the experience of residents who lived in orange area, the area excluded from the human biomonitoring (HBM). Overall, the findings revealed that experiencing contamination causes a negative psychosocial impact on the residents’ lives; difficulty accessing information; living with uncertainty, caused by the lack of institutional and health support and medical consultation; a sense of abandonment; difficulty managing preventive and protective actions; and the deterioration of relationships, on the basis of the social comparison with residents of the Red Area, to whom HBM was granted and where the concept of health ostracism has emerged.

In the PFAS contamination phenomenon, recognising the residents who are exposed, and thus, at risk of developing pathologies, is very important in terms of public health policy. Our study suggests that this recognition starts from and passes through access to HBM as a tool to know the contamination levels in one’s own body and decide on further actions. In this case, HBM may help reduce discomfort caused by health ostracism by informing people of their chemical exposure, restoring some trust in public institutions, collectively leveraging results to support advocacy that promotes broader health efforts to fully understand the experience of the contaminated population, and promoting more protective actions and regulations. In addition, we believe that offering institutional answers and information under the auspices of interactive communication with residents is also crucial considering that PFAS contamination in the Veneto Region is considered a technological disaster in terms of the size of the contaminated territories, number of citizens exposed, and time. PFAS are considered forever chemicals; they build up in bodies over time and persist in the environment, leading to chronic contamination. During crises and disasters, interactive communication is an important way to build trust and reassure the people involved. Consistent with the wider literature on this topic, our results confirmed that the experience of environmental contamination is stressful, but intervention approaches and public health responses can make a difference in mitigating the impact on a population. Finally, this study raises questions that might prove useful avenues for future research, for example, examining the PFAS experience of mothers, and mothers belonging to marginalised groups, identifying the unique characteristics of their experiences, and investigating the role of HBM and its implications for PFAS-exposed people, to gain better information and effectively tailor solutions to populations’ needs.

We hope that knowledge about this emerging worldwide problem, emerged by our studies, will be developed and increased to make PFAS contamination a condition that can be efficiently managed and promote the development of an integrated approach to residents, thereby mitigating discomfort. Public health actions can have an important impact on distress in contaminated communities.

Sincerely,

Marialuisa Menegatto and Adriano Zamperini

**References:**

Menegatto, M.; Lezzi, S.; Musolino, M.; Zamperini, A. The Psychological Impact of Per- and Poly-Fluoroalkyl Substances (PFAS) Pollution in the Veneto Region, Italy: A Qualitative Study with Parents. Int. J. Environ. Res. Public Health 2022, 19, 14761. https://doi.org/10.3390/ijerph192214761

https://www.mdpi.com/1660-4601/19/22/14761

Menegatto, M.; Zamperini, A. Health and Psychological Concerns of Communities Affected by Per- and Poly-Fluoroalkyl Substances: The Case of Residents Living in the Orange Area of the Veneto Region. Int. J. Environ. Res. Public Health 2023, 20, 7056. https://doi.org/10.3390/ijerph20227056

https://www.mdpi.com/1660-4601/20/22/7056