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Returning network findings: An art gallery as a report-back in a rural community

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ABSTRACT

In health research, communities rarely receive findings in a form they can use. This problem is more complex in social network research, where findings are both relational and individual. The challenge compounds in rural, underserved settings, where low health literacy and limited exposure to scientific visualization severely constrain how results can be communicated. As part of a longitudinal personal network project on primary cancer prevention in rural areas, we developed an art gallery to return findings to the community. The installation was framed as a performative intervention that made relational structures visible, inviting awareness and reflection. It comprised seven digitally printed canvases and a three-dimensional network sculpture. Each item presented a level of social organization (personal network, household, community structure, socio-spatial concentration, and food culture) through designs intended for non-specialist viewers and supported by facilitation. The three-day exhibition attracted 103 visitors, all of whom rated its utility highly. It also revealed how the community reacted to findings about their rural context. This exploratory single-site study supports three lessons: linking each canvas to a single analytical level aided reading, the order of presentation helped viewers build a basic vocabulary for network visualization, and facilitation, more than the canvases alone, carried the interpretive work. Limitations include a single installation and ratings that seem to reflect acceptability and acquiescence rather than comprehension. Future work should directly evaluate understanding, compare reception across sites, and test refinements such as written legends. We describe a working approach, not a validated framework.

1. Introduction

In this paper, we address three interconnected challenges in (longitudinal) health community network studies that are inherent in reporting findings back. First, participating communities rarely receive the results (Poger et al., 2026). Second, in social network research, returning findings is even more demanding because of the data's inherently relational nature (Borgatti and Molina, 2005; Cronin et al., 2021). Doing so raises ethical concerns, among other issues (Tubaro, 2021). Third, data should be returned to communities in a meaningful and useful way (Emmons et al., 2023). Addressing these challenges is consequential for both communities and researchers. Communities gain support for discussion, reflection, and awareness-raising. Researchers act ethically, enhance their understanding of the fieldwork, and build (ongoing) rapport, which, in effect, improves data quality and increases community engagement (Sabatello et al., 2022).

We describe an art gallery comprising seven digitally printed canvases and a three-dimensional network sculpture, developed as part of an EU-funded longitudinal personal network study on primary cancer prevention (the 4P-CAN project). The project has been implemented since 2023 in a rural, underserved community to understand the social organization of behavioral cancer risk factors, including smoking,

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nutrition, vaccination, overweight, and physical inactivity. In September 2025, two days before the fourth wave of data collection, we exhibited the gallery in the village's community hall. Panel participants were among the visitors, but the gallery was not designed solely for them. Visitors also included residents not enrolled in the study, schoolchildren, and officials.

We frame the gallery as a "performative" intervention (Maya-Jariego, 2025). By rendering relational structures visible and interpretable to the community, the visualizations are expected to spark awareness and social comparison (i.e., the proximate conditions for behavioral change) rather than directly instruct or persuade viewers. The gallery is not a standalone intervention but a component of the larger EU-funded project. Returning research findings to the community as an intervention in itself is not new (Jasny et al., 2021). For instance, in rural cancer prevention settings, returning network visualizations to local actors proved useful for interpreting and acting on their own context (Carothers et al., 2022). We discuss the awareness-raising and performative functions of the network visualizations in Sections 2 and 5.

Arts and exhibition-based formats have already been used to return health research to the public and to stimulate self-reflection among viewers (Lapum et al., 2014; Russell et al., 2021). What remains relatively rare is the use of such formats to return network findings, and rarer still in rural, low (health) literacy settings, which is precisely the gap our paper addresses. Thus, our contribution is methodological and exploratory. We document the first attempt to use a gallery-based format to return longitudinal personal network findings to a non-specialist rural audience. We discuss the design choices behind each canvas and what we learned from facilitator observations and visitor reception. The aim is to record a working approach, identify what appeared to support interpretation in this setting, and draw insights and lessons for replication or refinement. We situate our pilot art gallery within the emerging body of work that uses network visualizations to support community engagement, reflexivity, and the meaningful return of network findings.

The remainder of the article reviews the three challenges that motivate the gallery (Section 2), describes the study context and the gallery design (Section 3), presents the artwork and visitor reception (Section 4), and closes with conclusions, limitations, and directions for future iterations (Section 5).

2. Background: three challenges in returning findings to communities

2.1. Report-back as reciprocity

In community health, longitudinal network studies generally provide evidence on relational structures and behavioral clustering (Anderson et al., 2022; Langener et al., 2023; Perkins et al., 2015). Usually, participants report information about their social ties and health behaviors across waves (measurements at different time points). What they receive back is rarely proportional to what they contribute, as the value returned is low. The researchers seldom return the findings to participants in forms suitable for community interpretation and use (Knerr et al., 2016; Long et al., 2017; Purvis et al., 2017).

This asymmetry has been documented in health research and in community-based participatory research (CBPR). Participants regularly report wanting access to study findings, yet researchers consistently disseminate results primarily through scientific publications (Cook et al., 2020; McElfish et al., 2019). The CBPR tradition views this as more than a communication failure. Dissemination is intrinsic to the reciprocal relationship between researchers and community partners (Chen et al., 2010). The same literature is candid about this predicament. Literacy levels, local culture, social environment, and format all shape how applicable returned results are in practice. In longitudinal studies, these difficulties carry particular practical weight. Continued participation across waves partly depends on participants experiencing the research relationship as reciprocal. Report-back is therefore not only a dissemination problem but also a condition for longitudinal sustainability (Hâncean, McCarty et al., 2026).

2.2. The relational demands of network report-back

Returning findings in social network research is more exacting than in most other research areas. The reasons are intrinsic to the data. Network findings are relational. They describe not individuals in isolation but positions, connections, and patterns within a collectivity. Returning such findings can render visible individual positions, structural absences, asymmetries among nodes, and the clustering of attributes across social ties. Tubaro (2021) elaborates on the methodological consequence. The return of network findings must be anticipated at the research design stage and differentiated accordingly, e.g., whether the findings concern personal networks, whole-network structure, or wider community patterns.

Anonymity in network studies is often incomplete. Network questions can be inherently sensitive, and the distribution of benefits from network analysis is ethically uneven across participants (Borgatti and Molina, 2005; Cronin et al., 2021; D'Angelo and Ryan, 2021; Kadushin, 2005). Molina and Borgatti (2021) situate this discussion within the broader delineation of what responsible practice in network research requires. Hence, returning network findings is not simply a problem of disclosure but of responsible translation.

When well designed, this translation can be more than an ethical obligation. Valente (2012) argues that choices among network intervention strategies should be guided by available data, the behavior of interest, and the social context. Therefore, returning results to participants is itself an intervention decision. Maya-Jariego (2025) identifies a specific mechanism: the performative use of network visualization. Making the social structure visible to community members stimulates awareness, comparison, and reflection, serving as an intervention in its own right. An art gallery can be performative in this sense. It can also function translationally, helping participants interpret the relational processes that underlie both the study design and the intervention logic. Further, Valente et al. (2015) note that network analysis can serve not only to design and understand programs but also to monitor and improve implementation over time.

The literature provides direct empirical support for the effectiveness of facilitated visualization as a vehicle for citizen (community) engagement. Knopf et al. (2014) show that network images elicit rapid, substantive participant responses when coupled with explanation and public discussion. Fuller et al. (2012) show that network feedback can open difficult conversations when participants have the capacity and opportunity to engage. Schiffer and Hauck (2010) demonstrate that meaningful participant learning derives from combining data collection with facilitated knowledge exchange. Therefore, we may conclude that network visualizations can serve as effective intervention components when embedded in a setting (e.g., an art gallery) that integrates image, explanation, and collective interpretation.

2.3. Cognitive and interpretive challenges in public settings

The third problem concerns whether visual access to network findings is sufficient for understanding them. Brandes et al. (2006) argue that network visualizations should be evaluated more by what they enable viewers to understand and less by their fidelity to the underlying data. Viégas and Donath (2004) advance a parallel argument for end-user visualizations. They contend that the single-graph paradigm is insufficient for the range of interpretive tasks supported by social network data. Fried et al. (2024) identify practical constraints for participant-facing tools: cognitive complexity and a mismatch between the represented structure and user perception. Experimental evidence reinforces this theoretical claim. Foucault Welles and Xu (2018) and Ren et al. (2019) show that different visual representations are associated with different cognitive tasks. The fit between representation and task

matters more than any general assumption about which format is superior.

Public exhibitions introduce an additional layer of complexity. Hinrichs et al. (2008) indicate that information visualization in public environments must be adapted to the conditions under which visitors attend, explore, and move. Additionally, (Ma et al., 2020) note that visual decoding (the cognitive interpretation of visual information) in these contexts is iterative and often incomplete without sustained support. Further, Valkanova et al. (2015) document the persistent tension between preserving structural complexity and enabling intuitive understanding in public displays. Walny et al. (2020) show that multiple modes of engagement are necessary when presenting complex data to general audiences. Taken together, these findings converge on a clear design requirement. Simplification alone is insufficient, and unmediated structural complexity fails. A structured setting in which multiple visual grammars are sequenced to support progressive interpretation is necessary. In other words, this requires a carefully ordered, step-by-step visual experience in which different configurations of visual grammar (such as colors, shapes, typography, and layout) help the viewer gradually and accurately understand complex information.

2.4. An exhibition-based response

Recent institutional recommendations (European Commission, 2025, 2026) insist that scientists devote more time to explaining their work to the public and that science should be inclusive and socially responsible. The gallery design reported in this paper is tailored to reflect researchers' ethical responsibility to report back and to address the three challenges outlined in this Introduction. The reciprocity argument underscores the obligation to return findings to the community. The relational nature of network findings implies that their return must be anticipated at the design stage and differentiated by the analytical level at which findings are reported (Tubaro, 2021). Accordingly, the design incorporates a performative intervention component oriented toward reflection and interpretation (Maya-Jariego, 2025). The gallery's items are both translated findings and elements of a participatory action research strategy (Maya-Jariego and Holgado, 2015). Lastly, the cognitive and interpretive demands of public visualizations impose multiple visual grammars. These grammars are calibrated to the specific level of relational structure and assembled in a guided setting to support progressive understanding.

3. Methods

3.1. Study context and data

This gallery is part of a larger EU-funded research project that uses CBPR to understand barriers to adopting existing primary cancer prevention measures in rural populations. Since 2023, we have been deploying a longitudinal personal-network design and implementing community-level interventions (workshops, seminars, health festivals, etc.) in an underserved rural community that mirrors most rural areas in the country. In particular, the village has limited access to primary care and health services, a high prevalence of chronic diseases, low-quality digital infrastructure, low (health) literacy, and limited use of digital (health) tools. Health resources are accessed predominantly through personal connections, with heavy reliance on pensions, subsistence agriculture, and informal economic activities. The most recent data show that among the 3808 residents aged 18 and older, most are female (2017, accounting for 53%), and 46% (1713) are 55 or older. An additional 522 residents are underage. The community benefits from two elementary schools, two family doctors, four churches, a community hall, and a community sports center.

In the project's longitudinal study, face-to-face personal network data collection began in September 2023, with 83 people enrolled in the baseline panel. Participant recruitment was guided by theoretical sufficiency. Since then, we have organized three additional waves: March 2024 (n = 94 participants), March 2025 (n = 89), and September 2025 (n = 87). Study participants (the egos) self-reported a wide range of health-related behaviors for themselves and their peers (alters). We used fixed (n = 25) and free-choice name generators to elicit alters. Across the four waves, we also collected several thousand ego-alter and alter-alter tie observations. Study participants (18 + years old) were recruited via link-tracing sampling from the village's residents. Residents lacking the capacity to consent and recent arrivals were ineligible to participate. Participation in all 353 interviews was voluntary and rewarded with non-monetary incentives (a free medical hotline number, annual blood tests, and free entry to community-level intervention events). The research team combined data collection with community immersion and extensive fieldwork. For the present paper, what matters is not the wave-by-wave details, but that this relational data was returned to the community in an interpretable form. The study's methodological framework is detailed in companion publications (Hâncean, Lerner et al., 2026; Hâncean, McCarty et al., 2026).

3.2. The gallery design

The design accommodated two intertwined functions. The first was *ethical*. The gallery returned findings to the community as a whole, not only to the study participants. This aligns with the principles of inclusive research and acknowledges that returning findings in a meaningful way is part of the reciprocal research relationship. We regarded data as collected from and with people, about people, and to be returned to people in a form they can engage with.

The second function was *performative*. The gallery invited visitors to recognize patterns in their social world and to discuss them with facilitators (the research team) and with one another. Notably, traditional dissemination is vertical and asymmetric: information is collected from a community, interpreted by experts, and then disseminated through channels the community neither controls nor accesses. By contrast, we drew on the CBPR tradition, which advocates a symmetric model that prioritizes dialogue, co-learning, and shared understanding.

When designing the gallery as an intervention component, "what we expected and why" stemmed from theory, our companion papers (Hâncean et al., 2025; Hâncean, Lerner et al., 2026; Hâncean, McCarty et al., 2026; Mihăilă et al., 2024; Oană et al., 2024) and fieldwork. Theory shows that returning the network to its members is itself an intervention decision (Jasny et al., 2021; Maya-Jariego, 2025; Valente, 2012; Valente et al., 2015). The gallery's content was based on published empirical findings. Specifically, the patterns illustrated in the canvases (e.g., assortativity) and the topics (e.g., smoking, vaccination, nutrition) were selected to reflect accurate information that mirrors local reality. The levels of social representation (personal networks, households, community), the geographic illustration of the risk factors, and the facilitated sequenced protocol were grounded in our fieldwork and in the local level of (health) literacy we assessed in a face-validity fashion. We did not expect a direct behavioral change from a single exposure, but rather that seeing one's own behaviors embedded in personal networks and geographic hotspots would spark social comparison and reflection. Yet normative information changes behavior only under specific conditions (Miller and Prentice, 2016). Further, when a harmful behavior is revealed to be widespread, the same information may reinforce it rather than change it (Cialdini et al., 1991).

The gallery was first installed at the village's community hall between 9 and 11 September 2025 (10:00 AM - 7:00 PM), just before the fourth wave of data collection began. The exhibition presented findings from the first three waves and made them available in a single, facilitated walkable setting. The installation displayed seven canvases and a 3D-network sculpture. The artwork posited that behavioral cancer risk factors are organized simultaneously across multiple social levels: the personal network, the household, the community's social texture, the local socio-physical geography, and cultural practices. Consequently,

any intervention program should focus not only on individuals (as standard prevention policies do) but also on constellations of actors that are non-randomly dispersed and connected, and on cultural institutions (such as traditional local cuisine).

The artwork was displayed in the main interior of the village's community hall. The 3D-network sculpture was installed in a dark, secluded viewing room, accompanied by dynamically projected traditional film footage, immersive background music, and rural imagery. The sculpture was mounted on a small rotating platform and illuminated by two colored projectors. Each artwork was accompanied by display cards listing the name, the project's visual identifiers, and a QR code linking to additional information.

Most visitors came in small groups and were guided by the research team, which followed a facilitation protocol. The protocol specified a common opening for each visit, the order in which the canvases were introduced, the topics, and the visual variables to be explained for each canvas. Viewers were instructed to move simultaneously from one canvas to another. Various prompts invited visitors to reflect on the patterns, with the aim of sparking collective discussions and reflexivity. The strategy was for facilitators to first explain the visual variables and the canvas topic, then ask open-ended questions to encourage viewers to look closely and form their own connections with the canvas. While looking at the canvases, any speculation about individual identities within the networks was redirected to the collective pattern. The protocol was designed to keep facilitation consistent across visits and to allow room for visitor-led questions and discussion. Conversations began at the entrance and continued from one canvas to the next. Visitors were free to ask questions, comment on what they saw, and connect the patterns to their own experience. Fig. 1 summarizes the structured interaction within the gallery. Each artwork provided viewers with both a dyadic and a polyadic (facilitated and not-facilitated) experience. The personal (Fig. 1a) and group (Fig. 1b) experiences co-existed alongside their facilitated counterparts (Fig. 1c-d) throughout the visit. This interaction structure was the infrastructure on which the awareness-raising and performative functions (described in Section 5) were expected to rest.

Field notes recorded the questions visitors asked and the canvases that sparked the most discussion. Practical constraints at the venue precluded a structured assessment of decoding difficulty. Visitors were nonetheless invited to rate the exhibition's utility on a scale from 1 to 10 using the free-entry tickets they received at the entrance. After privately assessing the gallery, they placed the tickets in a designated box. The question on the ticket read: "Please rate from 1 to 10 how useful you find this gallery in communicating the results of the research conducted so far in your community."

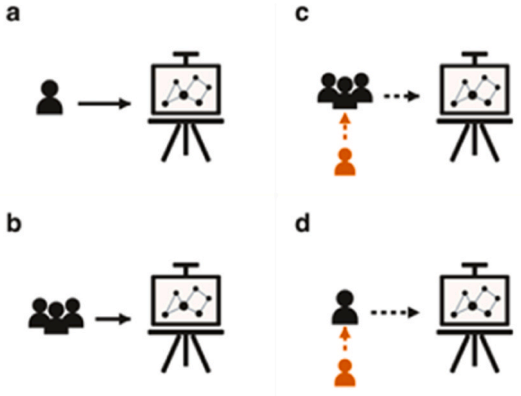


Fig. 1. The interaction structure between viewers and the artwork in the Art Gallery. Black silhouettes represent viewers, while orange silhouettes represent facilitators. Solid black arrows denote unmediated interaction with an artwork, and dashed orange arrows denote facilitation. (a) The personal experience of a viewer *V* with each artwork element (the canvases and the 3D sculpture), shaped by *V*'s socio-demographic profile, literacy, and local cultural knowledge. (b) The group experience, in which collective discussions before, during, and after the visit overlay the personal experience without erasing it. (c, d) The facilitated group and facilitated individual experiences (marked by dashed black arrows), respectively, which can co-occur.

Technical details on the software packages used to create the artwork are provided in the Supplementary Material (SM) (see Hâncean et al., 2026). The longitudinal study (including the art gallery) was approved by the Ethics Committee of the Center for Innovation in Medicine (INOMED Decision Nos. D001/09–06–2023, D001/19–01–2024, and D002/03–02–2025). Participation as a visitor was voluntary, and no entry records were kept that could link an individual to their behavioral data. The canvases displayed structural patterns without identifying any individual: no names, household information, or recognizable features appeared on any canvas. Visitors were informed at the entrance that they could decline to view any canvas or withdraw from a conversation at any time, without explanation.

4. Results

4.1. The digital prints

This section presents the rural gallery artwork, arranged in the order shown in the facilitated gallery. We first describe the underlying data and visual variables, then discuss what each item reveals about the level of social organization it represents. The seven canvases are shown together in Fig. 2, and the 3D network sculpture is illustrated in Fig. 3. The artwork appears at higher resolution in Fig. 1S-8S in the SM.

"Community texture" (Fig. 2a) depicts a hairball network of 2378 individuals and 30,359 social ties of various kinds: ego-alter, alter-alter, and link-tracing sampling ties (referee-referral chains). Orange nodes represent the 122 residents who participated in at least one interview during the first three waves. Blue nodes represent the alters they nominated. Across 266 interviews conducted in those three waves, participants provided information about 63% of residents aged 18 and over. Node size is proportional to degree (number of ties). Orange ties mark participant-alter relationships. Blue ties indicate alter-alter connections. The narrative for the visitors specified that the canvas shows the community as a single connected network, revealing how prevention messages could circulate and which residents could spread them efficiently. The role of the image was to introduce basic network vocabulary (nodes, ties, relevance for the community, visual variables).

"Reveal the hidden" (Fig. 2b) presents a stylized link-tracing sampling visualization of 261 individuals and 298 ties, generated through chained referrals from six independently selected participants (seeds). Five seeds (electric yellow) participated in the study, while the sixth (electric red) did not. Of the 261 individuals reached, 122 participated in at least one wave, four could not be located, 12 were unavailable, five refused, and 118 were nominated but not contacted. Edges in electric orange, yellow, and cyan indicate the recruitment paths. The force-directed layout emphasizes the branching of recruitment from each seed. The canvas shows that 63% coverage of the adult resident population was achieved from six starting points through chained referrals. The electric palette is a deliberate departure from the warm-cool encoding used elsewhere in the gallery and marks this canvas as a representation of method (recruitment). The picture illustrates the sampling methodology and explains how we used network ties to collect the data.

"Nutrition panoply" (Fig. 2c) is a collage of 83 personal networks (collected in Wave 1), one per respondent. It shows salt-rich processed-food intake within each respondent's close social circle. Orange nodes mark frequent consumption (daily or weekly), while blue nodes mark less frequent consumption. The 83 networks are arranged from the highest concentration of frequent consumers (top-left) to the lowest (bottom-right). This ordering is a design choice. In our gallery narrative, we noted, as a research finding, that the canvas demonstrates strong

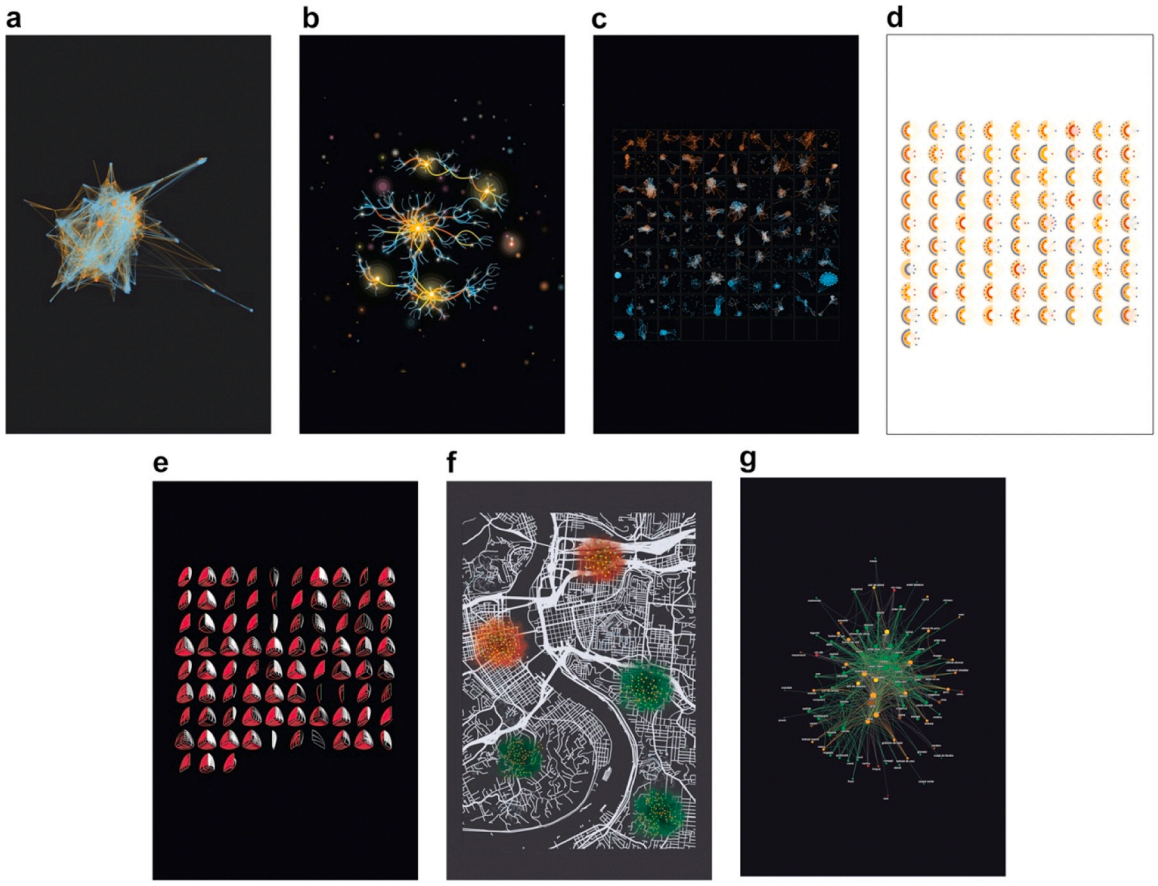


Fig. 2. The canvases of rural gallery artwork, in the order encountered by visitors to the exhibition. (a) *Community texture*: hairball network of 2378 individuals and 30,359 ties, with orange nodes for study participants, blue nodes for nominated alters, and node size proportional to degree; (b) *Reveal the hidden*: stylized link-tracing sampling visualization of 261 individuals and 298 ties originating from six seeds, with electric colors marking the link-tracing network; (c) *Nutrition panoply*: 83 personal networks ordered by frequency of salt-rich processed-food consumption, with orange nodes for frequent consumers and blue nodes for less frequent consumers; (d) *Inoculation*: collage of 82 ego-grams of perceived vaccination status (red = unvaccinated, blue = vaccinated), split between household members (yellow half) and non-household contacts (orange half); (e) *Ties in smoke*: series of 83 hive plots arranging respondents' close contacts along three axes by smoking status (red = smoker, blue = former, green = never; darker shades for men, lighter for women), with red ties marking exposure to smoking; (f) *Geography of risk*: socio-spatial map approximating the community's overlaying behavioral-risk hot spots on the village geography, with red zones for unhealthy geo-spaces and green zones for protective ones; (g) *Alchemy of ingredients*: ingredient-co-occurrence network of traditional Eastern European cuisine, with nodes colored by food category (green = produce, orange = meat and dairy, brown = grains, yellow = oils, red = alcohol) and edges linking ingredients frequently used together in recipes.

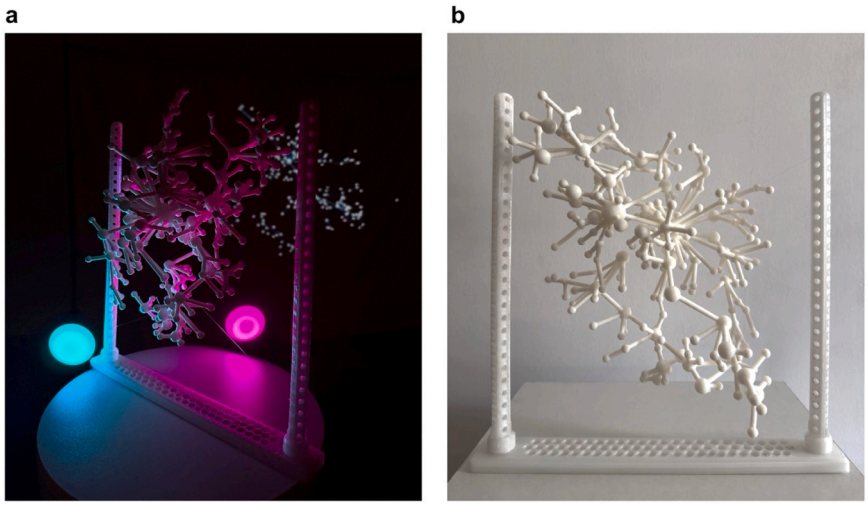


Fig. 3. The 3D network sculpture displayed as part of the rural gallery artwork. The sculpture depicts a selection of the link-tracing chains used for community sampling. It contains 125 nodes and 196 edges. The size of the nodes is proportional to their degrees. (a) The image shows the sculpture as it was displayed in the secluded viewing room, mounted on a rotating platform (a small stage) and illuminated by two colored projectors. (b) The image shows the sculpture as a stand-alone item.

dietary similarity within close circles, i.e., frequent consumers of salt-rich foods are in networks dominated by other frequent consumers. Conversely, infrequent consumers are in predominantly blue networks. The canvas also reveals mixed (orange-blue) networks as potential entry points for change.

"Inoculation" (Fig. 2d) is a collage of 82 ego-grams, one per ego, depicting each alter's perceived COVID-19 vaccination status based on the respondent's self-report. Each ego-gram is a pie chart divided into two halves: the orange half represents contacts outside the household; the yellow half represents contacts within the household. Red nodes mark alters the respondent believes are unvaccinated; blue nodes mark alters known to be vaccinated. Red ties indicate very close emotional relationships; blue ties indicate weaker closeness. The data are drawn from the first wave (the 83rd respondent did not provide sufficient information for the visualization). In situ, we emphasized that vaccination decisions cluster within households and close emotional circles and are not randomly distributed across the community. We also suggested that this pattern likely applies to smoking, diet, and screening uptake. This was the first canvas to convey health-related findings.

"Ties in smoke" (Fig. 2e) is a collage of 83 hive plots (based on Wave 1 data), with each respondent's close contacts arranged along three axes defined by smoking status. Red nodes mark current smokers, blue nodes mark former smokers, and green nodes mark individuals known never to have smoked. Within each color, darker shades identify men and lighter shades identify women. Red edges trace social pathways of smoking exposure (smokers to non-smokers and former smokers, including passive smoking). White edges trace potential channels for cessation support (from non-smokers to former smokers). We told visitors that the image makes visible the relational architecture of tobacco-related risk and locates former smokers as potential agents of change within otherwise smoking-dense networks. Smoking status is encoded as a discrete three-category variable (smokers, non-smokers, and former smokers). The intensity of current smoking and the duration of past smoking are not represented. The canvas illustrates, per the findings, how smoking organizes in social space: some respondents sit in networks of dense red ties, while others sit in networks where smoking is socially isolated.

"Geography of risk" (Fig. 2f) approximates a socio-spatial map of the community. It overlays behavioral risk hotspots onto the village's geography. Red zones mark areas where unhealthy behaviors (smoking, frequent alcohol consumption, salt-rich diets, physical inactivity) cluster, such as the weekly village fair and the local food shop. Green zones mark areas where protective behaviors cluster, such as the two elementary schools and the community sports hall. Within each zone, orange nodes mark individuals with one or more harmful habits, while green nodes mark individuals adopting protective behaviors. Due to ethical concerns, the map is a stylized approximation of the village. Spatial positions reflect the residential clustering of behaviors rather than precise coordinates. The canvas argues that behavioral risk is concentrated in specific socio-spatial areas. We also highlighted to visitors that the image makes the territorial dimension of risk visible and identifies green zones as community-level models from which protective behaviors could be amplified outward. The red-green dichotomy collapses four distinct behaviors (smoking, alcohol, diet, inactivity) into a single visual axis (for example, a resident may carry one risk factor while sitting in a multi-risk zone).

Finally, "The alchemy of ingredients" (Fig. 2g) presents an ingredient co-occurrence network derived from a corpus of traditional Eastern European recipes (Ahn et al., 2011). Nodes represent individual ingredients, colored by food category: green for fruits and vegetables, orange for meat and dairy, brown for grains, yellow for oils, and red for alcohol. Edges connect pairs of ingredients that frequently co-occur in recipes. The force-directed layout clusters ingredients used in many shared dishes and pushes those in narrowly bounded combinations to the periphery. The canvas shows that vegetables and fruits co-occur with nearly every other category, while alcohol occupies more peripheral positions. We emphasized to visitors that network analysis can also make the relational architecture of food culture visible. In this context, nutritional change may involve redirecting combinations rather than substituting individual items. This is the only canvas in the gallery that does not draw on specific community information.

The sculpture (Fig. 3) mirrors the second canvas (Fig. 2b) but in a three-dimensional format. It is located in the dark, secluded viewing room. Printing details and a higher-resolution image of the sculpture are available in the SM. The sculpture's role was to conclude the viewers' tour on an educational note: to revisit, in another format, key network concepts (node, influence, connectivity, and structure).

The seven canvases were not an arbitrary selection. The exhibition presented published empirical findings to communicate validated results and avoid making new claims. Each canvas was designed with an explicit translational objective and tied to one level of social organization where the behavioral risk factor is organized. We built on the idea that communicative visualizations are best conceived as learning problems that require designers to navigate cognitive (Franconeri et al., 2021), affective (Lee-Robbins and Adar, 2023), and aesthetic objectives (Cawthon and Vande Moere, 2007). Two canvases ("Community texture" and "Reveal the hidden") were methodological and built a basic network vocabulary. The other five illustrated the cultural practices and risk factors embedded in personal networks, households, community structure, and local socio-geography.

We tested various layouts suited to our data structure, including node-and-line diagrams (the standard in social network analysis), ego-grams (specialized visualizations for ego-networks), and hive plots (imported from bioinformatics). We limited each canvas to a single message. We tuned visual variables (node and tie size and color, background) to ensure each message was legible. We alternated social levels and displayed each risk factor both individually and in combination. The rationale was to convey that behaviors are embedded in social contexts, that risk factors co-occur, and that they are geographically situated. Accordingly, in "Geography of risk", we combined the four risk behaviors (smoking, drinking, diet, and inactivity) into a single red-to-green scale. The message there concerns the spatial co-occurrence and concentration of risk. Other candidate displays (e.g., alter-level dashboards or one longitudinal panel per behavior) were considered but set aside to preserve legibility and to fit the facilitated walking sequence.

On a temporal basis, "Community texture" is built from the first three waves (266 interviews). In contrast, the behavior-specific canvases ("Inoculation", "Nutrition panoply", and "Ties in smoke") draw solely on Wave 1 data. "Reveal the hidden" depicts the recruitment (link-tracing sampling) chains, and "Alchemy of ingredients" is the only canvas that does not use community data, as it is derived from a corpus of traditional recipes. The choice to use mostly cross-sectional Wave 1 displays was deliberate. Longitudinal network visualizations require the viewer to track a changing topology and attributes while maintaining a stable mental map. These demands are considerable, as outlined in the literature on dynamic graph challenges (Beck et al., 2014; Filipov et al., 2024). While non-experts can intuitively recognize basic visual features in static personal networks, such as size and isolates (Kennedy et al., 2011), tracking complex temporal changes remains a heavy cognitive burden (Archambault and Purchase, 2013). For a low (health) literacy audience, and given the facilitated walking format, a single-wave cross-section ensures straightforward canvas interpretation. Table 1S (SM) summarizes, for each canvas, the level of social organization, the data source (and wave), the visualization type, and the translational goal.

4.2. Participation and feedback

4.2.1. What viewers asked and discussed

Visitors' reception of the gallery was documented in field notes. The notes were handwritten at the end of each day by the seven researchers who staffed the gallery. Specifically, three researchers facilitated the presentation of the canvases, two managed visits in the dark room, and

the other two managed the exhibition entrance. The notes varied in scope and were consolidated into a single thematic synthesis after the exhibition.

Two canvases drew sustained attention from the largest share of visitors. The canvas titled "Ties in smoke" (Fig. 2e) was consistently identified as the most engaging. Its bright red palette, the repetition of the same visual template across personal networks, and the layout's implicit "spot-the-difference" structure invited visitors to compare personal networks closely. The strong red signal led many visitors to interpret the canvas as depicting something harmful ("damaged human lungs") before any explanation was offered, aligning with the intended message (i.e., smoking is a harmful habit). The canvas titled "Reveal the hidden" (Fig. 2b) was the second most engaging: adults and children alike compared the layout to electrical wiring or neurons, and the electric palette made it visually distinct from the rest of the gallery. "Inoculation" (Fig. 2d) drew comparable interest, sharing the bicolor logic that made "Ties in smoke" immediately readable. The "Alchemy of ingredients" canvas (Fig. 2g) generated extensive discussion among adult visitors about regional cooking traditions and the unexpected central position of vegetables in the recipe corpus.

According to the field notes, three recurring themes emerged. First, viewers located themselves and their kin within the structure (e.g., "*These dots are the whole village, relatives and all. That big dot must be the mayor.* […] *I think that's everyone on my street. We all eat the way people do in the countryside* […] *Look, the doctor has turned us into art.*"). Second, viewers reacted to stigmatized behaviors, such as smoking (e.g., "*This painting looks like a sick person's lungs* […] *See, this is how you die without even realizing it. Without ever smoking. Because of other people* […] *I've always known that the company you keep can be bad for you. Now science has proven it.* […] *These paintings should reach as many people as possible in our village, to understand why this project is important, why health is important*"). Third, viewers negotiated the tension between local practices and medical messages, especially regarding processed food intake (e.g., "*We eat like country folk. You can't live on avocado alone as you'll be starving afterwards.* […] *If I raise the pig myself and make the drink at home, then everything is completely natural and healthy. There's no way it can make you sick. It's not store-bought.* […] *We eat what our grandparents and ancestors used to eat. Why is it unhealthy now if it was considered fine in the past?* […] *You shouldn't take everything your doctor tells you. Some doctors tend to exaggerate.*"). These reactions underscore how the guided format encouraged viewers to interpret the visual content and relate it to their community, and complement the utility ratings.

The most frequent question across all canvases was a variant of "What does this represent?" that addressed color codes, node size, edge type, and panel structure. A second, less frequent but methodologically significant question asked for the canvases' arguments, i.e., "What does this tell us?" Visitors also asked about the identities of large or central (or peripheral) nodes, speculating which residents they might correspond to (e.g., the mayor, priests, etc.), and about the logistics of producing and transporting the canvases.

The sequence of canvases in the walking order appears to have served as a guided introduction to network reading. "Community texture" (Fig. 2a) and "Reveal the hidden" (Fig. 2b), the first two canvases visitors encountered, were structurally simple and asked little of the viewer beyond recognizing that a network consists of points connected by lines. Facilitators reported that comprehension of the more complex canvases later in the sequence was noticeably easier for visitors who had absorbed the basic vocabulary of network visualization from these opening images.

Some visitors reported recognizing themselves or their close contacts in the displayed patterns, most often in the "Nutrition panoply" (Fig. 2c), where dietary similarity within close circles was visible at a glance. A subset of these visitors expressed mild surprise at how closely their dietary habits matched those of those around them. A small number of visitors asked to see their own personal network specifically. Facilitators acknowledged this curiosity but explained that individual networks could not be displayed for ethical reasons. Many viewers valued the group discussion because comparing different perspectives helped them understand the data much better than looking at it alone.

Two suggestions for the gallery's next iterations were repeated. The first was to include a written legend on each canvas summarizing the visual encoding. At a minimum, this should include the color codes and, ideally, a brief two-column glossary distinguishing the conceptual grammar (what the data represent) from the visual grammar (how they are encoded). The second was to provide a brief narrative or storyline for each canvas, written in non-academic language, that visitors could read at their own pace. Per the design, we omitted a written legend so that viewers would form a first impression from the artwork alone, consistent with the performative intervention mechanisms.

Additionally, we observed two aspects. First, facilitator presence was not optional. Several visitors said they would consult the QR-coded digital archive at home after the visit, but the facilitator-led conversation appeared to do most of the interpretive work. The in-gallery experience would have been substantially poorer without it. Second, comprehension was noticeably easier for visitors who were already participants in the longitudinal panel than for those with no prior exposure to network ideas (schoolchildren and non-participants).

4.2.2. The utility ratings and their limits

The gallery was visited by a diverse audience of 103 people, giving us the opportunity to use the artwork to share results with the community. On the first day, due to bad weather, we welcomed only five visitors (residents enrolled in the study panel). On the second day, we had 57 visitors: participants in the study panel (11), residents not participating in the longitudinal study (42), and officials representing local, regional, and national authorities (four). On the third day, there were 41 visitors: residents not participating in the study (eight), study participants (two), pupils in classes 1–4 (19), and pupils in classes 5–8 (12). Most people attended the event in small groups (between five and 12 people). Additionally, one of the two local elementary schools introduced a visit to the art gallery as a special school activity on September 11. For various reasons, most of the baseline panel members could not attend the gallery (i.e., only 18 of 83).

Table 1 presents event ratings across visitor groups. Free-entry tickets were distributed at the entrance (n = 103) and returned in a designated box at the exit (response rate 100%). Each ticket contained a single rating on a 1–10 scale in response to the prompt described in Section 3.2. The mean rating was 9.81 (SD = 0.54), the median was 10, and the range was 7–10. Eighty-seven of 103 respondents (84.5%) gave the maximum rating, and no respondent rated below 7. The mean exceeded 9.5 in every group, and the median was 10. The data do not allow us to compare how different groups rated the event.

Field notes suggest that the gallery functioned as an active, communicative space rather than a passive display. Viewers asked

Table 1
Utility ratings of the rural gallery artwork by visitor group, 9–11 September 2025 (n = 103). Visitors rated the gallery on a 1–10 scale in response to the prompt: "Please rate from 1 to 10 how useful you find this gallery in communicating the results of the research conducted so far in your community". Ratings were submitted privately in a designated box at the gallery exit. SD denotes the sample standard deviation.

Group	n	Mean	SD	Median	Min	Max
Pupils (classes 1–4)	19	9.63	0.81	10.00	7.00	10.00
Pupils (classes 5–8)	12	9.58	0.90	10.00	7.00	10.00
Study participants	18	9.83	0.38	10.00	9.00	10.00
Residents not registered in the study	50	9.90	0.30	10.00	9.00	10.00
Officials (representatives of local, regional and national authorities)	4	10.00	0.00	10.00	10.00	10.00
Total	103	9.81	0.54	10.00	7.00	10.00

questions and discussed the artwork. This engagement suggests that the exhibition prompted reflection. However, whether this reflection translated into actual behavioral change remains unproven. Because our study was not designed to measure behavioral changes or reflection directly, we avoid overclaiming. Instead, we highlight the need for direct assessment methods in future investigations.

5. Discussion

5.1. Lessons learned after the pilot exhibition

First, the gallery demonstrated that returning network findings to a non-specialist rural population is feasible. In three days, the exhibition attracted 103 visitors from diverse groups, in a small rural community, all of whom rated it highly. Yet the ratings appear to reflect visitor engagement rather than comprehension. Second, exhibiting a single level of social organization made the canvases easier to read. Third, the order mattered: the two simplest canvases came first to teach visitors a basic network vocabulary that helped them follow the harder ones later. Fourth, the facilitators did most of the explaining. Visitors who said they would look at the online archive at home relied on the in-person conversation instead. Fifth, we note an important distinction between data accuracy and aesthetic design (Brandes et al., 2006). The canvases that drew the most attention were the most eye-catching, not the ones that stayed closest to the data. The bold red of "Ties in smoke" led many visitors to read "harmful" and compare it to human lungs before anyone explained it.

Further, one of the most popular items, "Reveal the hidden", shows how people were recruited into the study, not any health behavior. In other words, what pulled visitors in was striking design, not accuracy. Thus, this is a tension that this kind of report-back will have to manage in the future. Aesthetic salience and legibility, not analytical fidelity, seem to have driven engagement. Lastly, in this exhibition, the canvases that engaged visitors most strongly did so largely through visual salience (palette, repetition, layout), which operated independently of how accurately each canvas represented the data. Salience appears to initiate the performative effect: it draws attention and prompts an immediate idea. But because salience can pull viewers toward over-reading or misreading the underlying data, accuracy cannot be sacrificed to obtain it. Therefore, report-back should not favor striking design over accuracy. The two must be designed together. And facilitation is needed to keep the salience-driven first reading aligned with what the data actually show.

5.2. Raising awareness of relational patterns

The interaction structure in Fig. 1 prompted several forms of awareness. First, viewers recognized how their community functions (e.g., all inhabitants are connected, and no one is isolated, though some are better connected than others). Second, the gallery visit highlighted the distinction between harmful and protective behaviors (e.g., smoking and processed food intake versus vaccination). Third, it exposed the tension between local cultural practices (how people eat locally) and medical expertise (the harm of processed food intake). Viewers also acknowledged the exhibit's dual nature: how art operates alongside the cognitive challenges posed by network visualizations. Given the facilitation protocol, we expect these forms of awareness to have emerged at both the individual level (the situated experience of each viewer) and the collective level (the shared, facilitated discussions among viewers). Our expectations align with evidence that, even in geographically isolated and low-health-literacy rural populations, visualizing one's personal network produces thoughtful, health-promoting reflections (Eddens et al., 2017). Furthermore, reporting research findings back to a rural community can build the critical understanding necessary (though not sufficient) for action (Campbell et al., 2012). While scaling this awareness to the community level (e.g., its circulation within families and workplaces) is plausible, our paper is limited in its aspirations, and we did not plan to measure it.

5.3. The performative value of the network visualization

Beyond describing the community to itself, the network visualizations were expected to be consequential. First, we acknowledge that the gallery presents behaviors with varying degrees of social visibility. Smoking is more visible than food intake. Vaccination is largely a familial experience (vaccination decisions are clustered in households), whereas network centrality (central actors in the community's social texture) is hidden. Interacting with the canvases was a learning process. Viewers had access to scientific information about the spread of various risk factors within their community, which they could use to evaluate the degree of cultural consonance they display (Edberg and Krieger, 2020). For instance, a viewer V may consume processed food daily and, at the gallery, learn from the canvases the true spread of this behavior within the community. If there is alignment (high cultural consonance), this may reinforce the behavior, rendering standard public health messages ineffective. This individual or collective reflection, shaped by facilitation and discussions among viewers, is the performative mechanism through which the visualization may promote dialogue and, potentially, change. A similar dynamic was reported for a shared data sculpture on dietary choices, which facilitated understanding, reflection, and discussion through social comparison within a small community (Sauvé et al., 2020). A related idea is advanced by Vassilev et al. (2019), who found that change occurred only when three conditions were met: what the person was ready to do, what their network could provide, and what the local setting made possible. In our case, harmful habits are clustered (such as smoking, processed food intake, and vaccine hesitancy), so two of the three conditions are typically not met. We therefore read the network report-back not as a sufficient intervention on its own, but as a component whose performative value is realized when paired with network- and community-level support.

5.4. Limitations

Our paper presents an exploratory implementation of an art gallery. Thus, the following limitations should be viewed in this light. First, the reception evidence comes from a single primary installation in a single rural community. Second, the utility ratings are near the ceiling (mean 9.81, median 10). Given our audience's profile, this is not surprising. Visitors with low health literacy, little prior exposure to scientific visualizations, and limited experience attending galleries are particularly prone to acquiescence and ceiling effects when asked to provide a single 1–10 score (Zhao and Mao, 2025). Additionally, our evaluation is susceptible to social desirability bias. Viewers who liked their facilitators may have rated the gallery highly or expressed engagement simply out of a sense of obligation. We therefore interpret these ratings as evidence of acceptability and goodwill, rather than comprehension or impact, and do not use them to compare visitor groups. Perhaps a more in-depth exploration (such as focus groups or interviews) would have better assessed participants' actual understanding of the scientific findings. Third, the field-note synthesis is qualitative and consolidated post-exhibition from facilitator notes, and it did not use systematically coded records. While this captures recurring themes, it does not show their distribution across different visitor types. Finally, the gallery is a pilot project that depends on custom design and on-site facilitation. Because both are costly and labor-intensive, this approach remains difficult to apply widely or repeatedly without substantial resources.

5.5. Future directions and recommendations for similar galleries

Future work may pursue several directions. First, a more systematic assessment of decoding (such as structured exit interviews, comparative decoding tasks across audience types, or facilitator-rated comprehension

scales) could provide empirical evidence on which canvas-grammar pairings transfer best across visitor profiles. Second, two suggested refinements could be incorporated without altering the existing framework: a short written legend on each canvas and a brief, plain-language storyline. These additions could then be evaluated against the no-legend version reported here. Third, documenting the reception of each canvas in alternative rural communities would test its transferability and inform audience-specific design recommendations. Fourth, the exhibition could actively promote interaction through games and activities. For example, the 3D network sculpture could be extended into mobile artifacts that visitors move through and interact with.

Additionally, future initiatives should consider key curation and design principles. Regarding the number of displayed items, choosing seven was a deliberate narrative and design decision in our case. This number represented the smallest set capable of spanning the necessary levels of social organization while keeping the facilitated tour at a comfortable length. We do not claim seven is ideal. Additional displays could plausibly enhance the viewer experience. For future initiatives pursuing similar forms of research report-backs, we recommend transitioning to rigorous design testing. Specifically, researchers should start with the core translational message and audience, then actively co-design and iterate the displays alongside community members with varying health literacy levels (Arcia et al., 2016; Chau et al., 2024). Most importantly, future projects should focus on comparing alternative display sets to assess recall, accurate interpretation, and delayed retention, rather than relying on satisfaction alone (Burns et al., 2020).

When exploring exhibition delivery, interactive artwork offers a promising direction. Yet its effectiveness must be tested empirically. Research shows that interactive or animated graphics do not always outperform static ones for comprehension, and the benefits of interaction depend heavily on the specific task (Filipov et al., 2024; Lee et al., 2021). This may be especially true in settings with low-quality digital infrastructure, where screen-based, layer-toggling displays are less appropriate than situated, physical formats, such as the 3D-printed network sculpture we used (Perovich et al., 2021). Based on our experience, we recommend that future research (a) experiment with letting viewers toggle digital behavioral layers when infrastructure allows, (b) extend static canvases into tangible, movable artifacts that viewers can physically manipulate, and (c) experimentally evaluate this interactivity while co-designing it with the community (Chau et al., 2024).

Conducting thorough design and format evaluations requires a pragmatic methodology tailored to real-world fieldwork constraints. Future assessment frameworks must explicitly account for the size of the field research team, participants' strict time constraints, rigid ethical boundaries to preserve complete individual anonymity, and limited local digital infrastructure. To address these constraints, we propose three low-burden, anonymous solutions. First, unobtrusive observation can be used to systematically track visitor circulation paths and dwell times (Serrell, 1997). This allows researchers to code observable behavioral patterns directly as indicators of engagement and conceptual learning (Barriault and Pearson, 2010; Corral et al., 2021; Fu et al., 2019). Second, embedded feedback mechanisms (such as anonymous token ballots, structured pictorial prompts, or communal graffiti walls) can integrate data collection into the physical exhibition space, mitigating the social desirability biases inherent in traditional questionnaires (Archer et al., 2021; Wilsey, 2012). Third, natural conversations (e.g., group discussions, shared problem-solving sparked by the artwork) can serve as real, valuable research data (McDavitt et al., 2016).

CRediT authorship contribution statement

Marian-Gabriel Hâncean: Writing – review & editing, Writing – original draft, Visualization, Supervision, Software, Methodology, Investigation, Formal analysis, Data curation, Conceptualization. **Marius Geantă:** Writing – review & editing, Writing – original draft, Validation, Project administration, Methodology, Funding acquisition, Conceptualization. **José Luis Molina:** Writing – review & editing, Writing – original draft, Validation, Methodology, Conceptualization. **Bianca-Elena Mihăilă:** Writing – review & editing, Writing – original draft, Visualization, Methodology, Data curation, Conceptualization. **Bogdan-Adrian Vidrașcu:** Writing – review & editing, Writing – original draft, Visualization, Data curation. **Cosmina Cioroboiu:** Writing – review & editing, Writing – original draft, Resources, Project administration. **Jürgen Lerner:** Writing – review & editing, Writing – original draft, Validation, Methodology.

Ethical approval and informed consent

All research procedures complied with the Declaration of Helsinki and the European General Data Protection Regulation (GDPR). The study was approved by the Ethics Committee of the Center for Innovation in Medicine (EC-INOMED Decision No. D001/09–06–2023, No. D001/19–01–2024, and No. D002/03–02–2025).

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Declaration of Competing Interest

The authors declare no competing interests.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at doi:10.1016/j.socnet.2026.08.005.

Data availability

The Supplementary Material, which contains the artwork in higher resolution as well as technical details on its production, is available in the Zenodo data repository as: Hâncean, M.-G., Geantă, M., Molina, J. L., Mihăilă, B.-E., Vidrașcu, B.-A., Cioroboiu, C., et al., 2026. Supplementary Material for the Rural Gallery Artwork. Zenodo. https://doi.org/10.5281/zenodo.22001563.

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