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The role of visual images in urban planning for health equity

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Introduction

Since the start of this century the role of urban planning for public health has increasingly been acknowledged, and important conceptual work has been carried out on the relationship between both disciplines (Northridge *et al.* 2003, Corburn 2009, Rydin *et al.* 2012, Giles-Corti *et al.* 2016). There is clear evidence that if we want to improve and promote health, we need to implement policies that tackle the social determinants of health, and that many of those determinants have a place-based component (Kindig and Stoddart 2003, Galea *et al.* 2005). Simultaneously, building on environmental and spatial justice theories, the unequal spatial distribution of benefits and burdens, and related health inequities, have been evidenced (Pearce *et al.* 2010, Friel *et al.* 2011, Walker 2012, Wolch *et al.* 2014). While there is agreement that urban planning in general is very important to tackle health inequities (Northridge and Freeman 2011), many open questions remain on how exactly urban planning can contribute to this goal.

The importance of the urban built environment as a determinant of health equity, and the diversity of disciplines and actors involved in taking action, led to the establishment of a three-year international working group of academics and practitioners on 'Urban Planning for Health Equity' within the 'German Academy on Territorial Development in the Leibniz Association' (ARL) in September 2022.[1] As members of this working group, we argue that finding modes of communication which are understood by different disciplines, stakeholders and communities is one of the biggest challenges to bridging the implementation gap between knowledge and action. Consequently, we think there is a huge untapped potential using visual communication to convey how urban planning can contribute to health equity.

With this commentary we want to further a conversation on the role of visual images in urban planning for health equity. When using the term health equity, we refer to those social differences in health status that are avoidable, unfair and unjust (WHO 2019). However, to judge which social inequalities in health are avoidable, unfair or unjust – and require policy intervention – we need to understand better the patterns of, and connections between, health inequalities, social inequalities and environmental determinants of health. While we underline the importance of mapping these inequalities, we believe we should take a broader, action-oriented perspective and look at the whole spectrum of visual communication methods (diagrams, sketches, drawings, charts, maps, renderings, physical and virtual models, photos and videos) that can help us understand the impact of the built environment on health equity and support the implementation of health equity concerns in urban planning practice. We identify five specific reasons why this topic is important:

(1) *To understand spatial connections*: The pathways from built environment characteristics to health outcomes are very complex, ranging from direct exposure to environmental pollution to indirect effects of the built environment on promoting or discouraging healthy behaviour and lifestyles. The health equity perspective only adds to this complexity. There is a lot of research evidence and conceptual work available that uncovers these relationships and presents ideas for effective urban planning strategies and health impact assessments. However, bringing across this often very abstract information and statistics to planning practitioners is a challenge. Therefore, it is crucial to develop visualisation tools that help us

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understand the spatial component of health inequalities and health inequity to inform planning processes.

(2) *To support decision-making*: There is an urgent need to improve the availability and accessibility of data to better serve what is needed in practice and to support decision-making in local contexts of urban planning. To overcome the risk of data overload we need visualisation tools that provide clear information and filter out irrelevant data, while providing integrated reporting at different scales. With such tools we can not only make better planning decisions and substantiate them, but we will also be better prepared for swift responses from urban planning to disasters such as floods and pandemics.

(3) *To gain momentum*: Visual images are important tools to raise awareness and health literacy in the community and among policymakers and planners. They can help to establish the topic of health equity in planning practice and increase public support for relevant planning strategies. However, visual images can also be misused to support counternarratives and to confuse and misinform people. Therefore, we need a deeper understanding on the actors and networks that produce visual images to gain the right momentum.

(4) *To explore the potential of new techniques*: There is untapped potential from new technologies. For example, Generative Artificial Intelligence is becoming more accessible and could allow to produce maps that make use of available data and reveal patterns. However, it is important to improve mapping and data literacy for planners and public health professionals to be able to benefit from this new field and avoid misinterpretation. Another interesting field with potential is Virtual Reality, which could help visualise different future scenarios.

(5) *To support knowledge exchange and collaboration*: There is a widening gap across European countries in terms of capacities, budget, knowledge, legal framework and culture for visualizing health inequalities and health inequity. For example, whereas the Netherlands or the United Kingdom are very active in collecting data and making it available to the public, in Portugal the cost of collecting the required data is high, and in Germany a restrictive interpretation of data protection plays an important role. Therefore, it is difficult to study and/or visualize similarities and differences in urban health inequalities even between cities in Europe, let alone worldwide. It is crucial to start a conversation on how to overcome these barriers and develop a road map to strengthen the production and use of visual images in urban planning for health equity in a European perspective and other global contexts.

To further this discussion, we present here a preliminary overview of different ways to visualise social inequalities in health and health inequity, relevant for urban and spatial planning, supported by examples. This exploratory, and thus non-exhaustive, overview shows that visualisation of health inequalities and health inequity can be connected to different stages in an idealised spatial planning process that supports health. A generic conceptualisation of this has been developed by UN-Habitat presented as a diagram in 'Integrating health in urban and territorial planning' (UN-Habitat and WHO 2020) (see Figure 1 and Box 1). This diagram indicates the role that health and health data can play, as an input for each phase of the planning process. The four phases are: diagnosis, formulation, implementation and monitoring. It is important to note that in this framework planning should be interpreted in a broad way, encompassing a wide variety of activities, involving built environment professionals, communities and other stakeholders. We argue that visual images of health inequalities and health inequity are vital to every phase of the planning process.

In the next section we will present an exploratory categorisation of examples of visualisation that contribute to promoting health equity with the urban planning practice. This is followed by some general observations, after which we conclude with critical questions that invite further debate.

Dimensions of visual imagery

We carried out an exploratory analysis to collect examples of visualisation and image-based tools that have a focus on health inequalities or health inequity and are relevant for urban planning. In our search we consulted health and planning experts and looked into academic literature, grey literature, policy documents, and websites. This analysis is by no means exhaustive or systematic but aims to give an overview of the variety of visualisation tools that can support the implementation of health equity concerns in urban planning practice.

Box 1. Health as input for the four phases of the planning process

Urban planning and all involved activities should ideally move through four distinct phases in an iterative cycle (UN-Habitat 2018, p. 16). These generic stages can be recognised world-wide.

1. Diagnosis – Urban and territorial diagnosis is where key evidence is collected to set the foundation for the choices and decisions to be made by the stakeholders throughout the planning process. As planning is evidence-based, it is in the diagnostic phase of the cycle that an understanding of the context's development, challenges and opportunities can be identified, goals can be defined, and stakeholders can be mapped
2. Formulation – The formulation phase is the development of the roadmap between the definition of the policy problem(s) and the attainment of the policy goal. It is the point in the process where policy options are evaluated, transformed into plans and designs, and decisions are made regarding the way in which the policy goals will be achieved.
3. Implementation – The implementation phase is where the plan is put into action. It is important here to make all stakeholder's roles and responsibilities in implementing the plan clear, and to ensure that all stakeholders have the capacity (human, financial and institutional) to carry out these tasks.
4. Monitoring and Evaluation – Monitoring and evaluation should not be thought of as the 'last' phase but, instead, should be undertaken throughout the planning process. Evaluation is an opportunity to review the gains made so far and study shortcomings. It not only provides a measure of the success or failure of planning, but also gives guidance on opportunities to do better. Lessons learned from the evaluation of outcomes and of the process can feed back into the policy cycle and promote an iterative policy design. The information from these activities should feed directly into diagnosis.

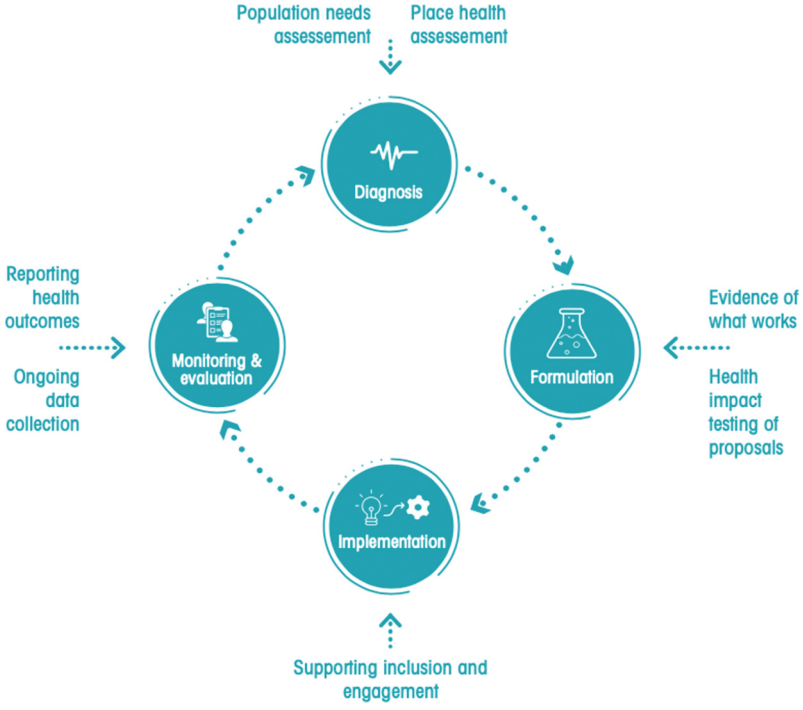

Figure 1. Health as an input for each of the four phases of the planning process (UN-Habitat and WHO 2020).

We want to make clear that visualisation tools should be part of a broader shift in the way of thinking and planning if we want to effectuate the implementation of health equity concerns in planning practice. The power of visualisation tools relies entirely on how and by whom they are used. Visualisation tools should not merely be seen as tools to convey expert knowledge to a wider public. Instead, they can contribute to transdisciplinary thinking and collective decision-making on urban health challenges, through enabling interpersonal communication for the creation and sharing of different kinds of knowledge on a shared concern (Lawrence 2022). Furthermore, this shared concern is situated in a specific cultural, institutional and political context, and the value and contribution of specific visualisation tools will thus vary for each case (Lawrence 2021).

Based on our review, we present six dimensions in which visual images can impact urban planning and inform decision making (Figure 2). Each dimension describes a characteristic strength of a visual image and is accompanied by a short 'credo' that summarizes its specific purpose, role in the planning process and/or methodological focus. The dimensions are

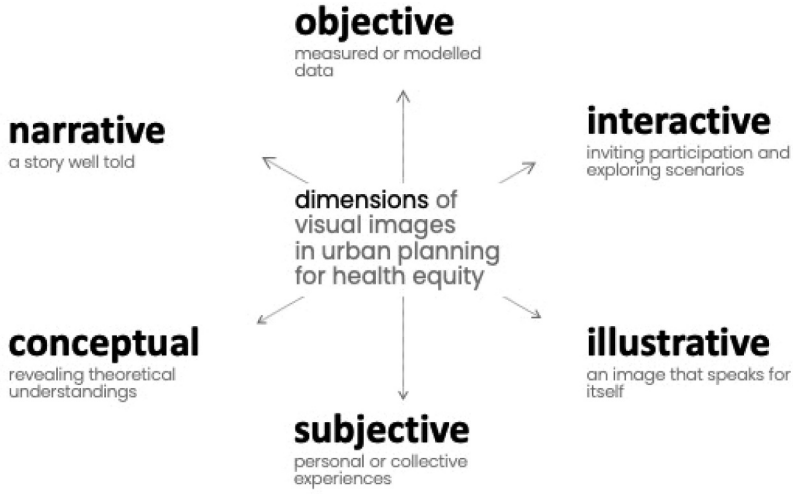

Figure 2. Different dimensions of visual images in urban planning for health equity.

organized in pairs, i.e. objective and subjective; narrative and illustrative; conceptual and interactive. We choose to use the word dimensions, and not categories, to emphasize that most examples have distinctive strengths but can serve different purposes at once. To illustrate our overview, we present a few examples in more detail.

Objective – measured or modelled data

An important dimension to start with is one we call 'objective', as it is transparent on what measurements and models of data these visuals are based. This dimension refers to all kinds of map-based (online) tools or monitors that present relevant quantitative (or objective) spatial data. Almost every national or regional planning authority in Europe administers a geoportal where spatial data can be accessed, and this always includes environmental data that are relevant for health. Examples are the *European Environment and Health Atlas*[2] (international level), the *Atlas Leefomgeving*[3] in the Netherlands (national level), the *Monitor Leefkwaliteit*[4] in Flanders (regional level) and the *Geoportal Kanton Basel-Stadt*[5] for the Swiss city of Basel (city level). These tools provide easy access to data layers on topics such as air quality, noise pollution, or availability of green space. This allows for a broad indication of inequalities in environmental quality, that could influence people's health.

In some of those tools, layers on socio-economic or demographic variables can be consulted, which gives more insight into inequity issues. Sometimes a simple overlay of environmental and socio-economic layers is presented, allowing for an identification of environmental (health) inequalities. Other mapping tools go one step further and combine data in an environmental equity (or justice) analysis, usually developing new indicators. A good example is the *EJScreen*[6] tool developed by the US Environmental Protection Agency (EPA), which presents 13 environmental justice indexes that combine environmental with socio-economic information. The EPA uses it to screen for areas that may require further attention, analysis or outreach as EPA develops programs, policies and activities focussing on environmental justice.

Another example is the *Berlin Environmental Justice Atlas* developed by the Berlin State Government (see Box 2), which presents five core indicators (air pollution, green space supply, noise burden, thermal burden, social disadvantage) and three integrated multiple burden indicators. It forms the basis for integrated strategies and measures at the interface of urban development, environment and health in the state of Berlin.

A final example of a multiple burden analysis tool is the *Spatial Urban Health Equity Indicators Model (SUHEI model)*, an indicator model that serves as a decision-making basis for health-promoting urban development with special equity considerations, and that is used by local practitioners in Germany (Flacke *et al.* 2016).

Except for the last one, all mentioned tools are managed in a top-down way by planning or environmental departments, with limited or no possibility for citizens or other stakeholders to contribute their perceptions or citizen-based data. All the same, a big advantage is the public accessibility of most tools, giving citizens the chance to become knowledgeable

Box 2. Environmental Justice Atlas Berlin

The *Environmental Justice Atlas Berlin*[7] (Figure 3) was developed by the Senate Department for Urban Mobility, Transport, Climate Action and the Environment of the State of Berlin. It presents five core indicators: four environmental ones (air pollution, green space supply, noise burden, and thermal burden) and one social disadvantage index. For every indicator a classification in three categories is made, at the level of planning areas (low, medium, high). Based on those five core indicators, three integrated multiple burden indicators are calculated: (1) a multiple burden indicator for the four environmental indicators, which counts how often a planning area falls in the worst of the three categories of the four environmental indicators (so the maximum is a fourfold burden); (2) a multiple burden indicator that adds the social disadvantage core indicator to the environmental indicators as an additional fifth indicator (so the maximum is a fivefold burden); and (3) a multiple burden indicator overlaying the environmental and social stress factors with the number of affected persons and the identification of planning areas with a predominantly residential character, in order to prioritise action.

By limiting itself to only five indicators and three indices, the Environmental Justice Atlas informs citizens in a clear and understandable way. In addition, the tool is instrumental in guiding the State of Berlin in a new direction in environmental policy. The environmental burden analysis forms the basis for integrated strategies and measures at the interface of urban development, environment and health. These integrated strategies should drive forward ecological sustainability actions and create healthy residential conditions for all. The planning administration also states that the definition of thresholds and the weighted combination of indicators on noise, air quality, bioclimate and green space provision has led to a clarification of the vague legal concept of health, which is thus supposed to gain relevance for urban development processes and environmental planning. This approach is also adopted by several Berlin districts. For example, the district of Friedrichshain-Kreuzberg has used the environmental justice analysis to support strategies on transport reduction and to provide argumentation to produce a healthy environment in this neighbourhood.[8] These examples show that the tool is not only used for diagnosis, but that it can also contribute to the formulation of policies (e.g. through its prioritisation mapping), as well as support monitoring and evaluation.

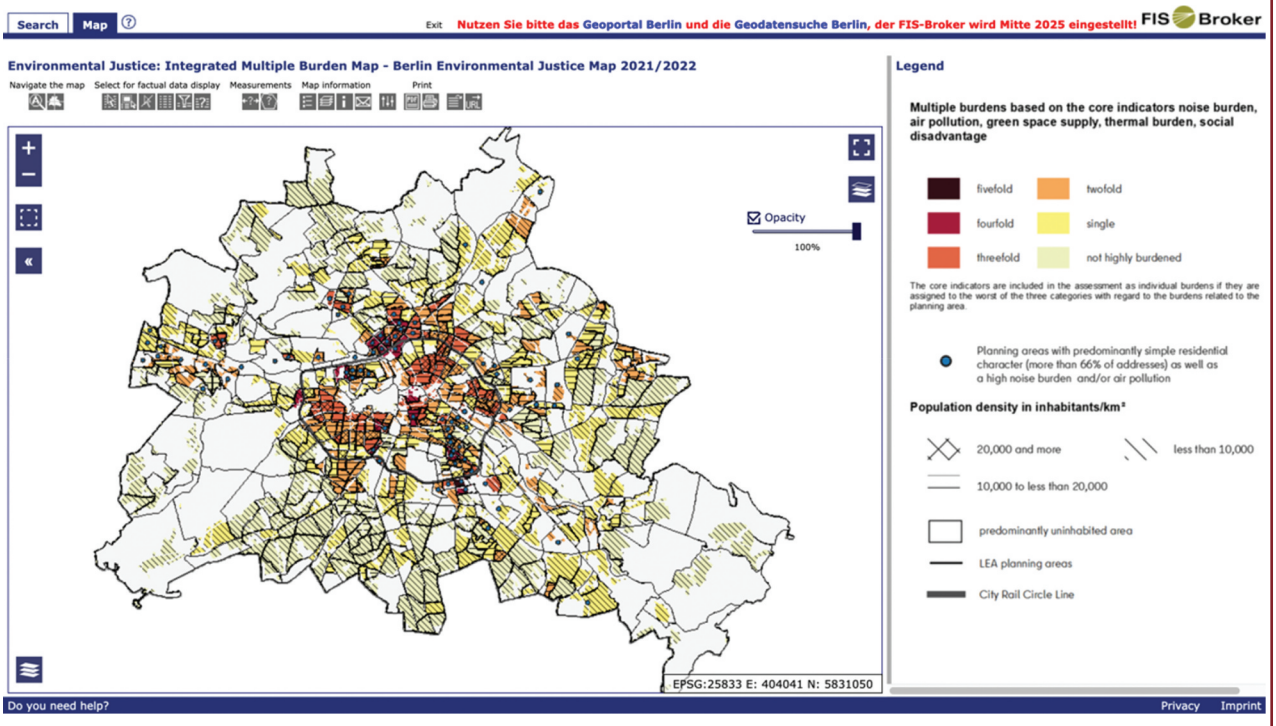

Figure 3. Environmental justice Atlas Berlin - Integrated multiple Burden Map identifying residential areas that are heavily burdened (based on screenshot[7]).

on the environmental quality in their own regions and neighbourhoods and compare it to other places. While there is little evidence for concrete policy impact of the first group of 'simple' mapping tools, the link to policymaking is evident for some of the more elaborate tools presenting environmental equity or justice indicators. In relation to the four phases of the planning model these tools are mainly relevant for diagnosis, monitoring and evaluation but can also be used for formulation (e.g. prioritisation).

Subjective – personal or collective experiences

A second dimension focuses on tools that help with visualising a more subjective (bottom-up) perspective on environmental inequalities and health equity. There are a range of qualitative field work tools to collect data and visualise subjective and collective experiences: photos, mental maps, sketches, walking interviews, doorbell analysis, etc. In combination with mapping, the gathered health-related knowledge and information can be placed in a spatial context and put in relation to each other. These 'mappings as joint spatial displays' make overlaps of variables or gaps in relation to health determinants and health equity visible (Marguin *et al.* 2021).

Space Syntax is a method to measure and visualise spatial characteristics in connection to a collective experience of a place, such as connectivity ('how well can I access a space/street in a given configuration?'), integration (related to through movement, i.e. 'how likely is it to bump into someone?') and intelligibility ('how easy can I understand and navigate a building layout/street network?'). Using Space Syntax, researchers have pointed to inequalities in health-related experiences of the built environment such as neuronal stress processing (Dimitrov-Discher *et al.* 2023), or the lack of access to quality green space and play areas for refugee children (Chen and Knöll 2024).

In addition, some mapping and visualisation tools in this context are not only a way of presenting or analysing collected qualitative or quantitative information, but also a participatory way of generating material. Different data collection strategies that are not limited to language (spoken or written), such as community participatory mappings, photovoice or citizen drawings, enable groups with different abilities to participate in the research and to contribute and visualise their specific local knowledge (for more information on Photovoice, see Box 3).

We also see a wide range of digital participation, visualisation and data collection strategies. An interesting example are prototypes of digital games combining geo-location and bio sensors (heartrate, galvanic skin response) with on-screen storytelling. This has been shown useful to engage young people to create a wish-list for healthy urban environments supporting the participation of a demographic that is often overlooked in urban planning processes (Knöll *et al.* 2014, Knöll 2018).

The subjective dimension is mainly relevant for the planning phases of diagnosis (assessment of needs) and implementation (supporting inclusion and engagement).

Interactive – inviting participation and exploring scenarios

The third dimension generally refers to spatial decision support tools composed of a geographic information system technology, data analytics and decision-support functionalities that help analyse and visualize health inequalities, and thereby assist decision-makers in understanding and addressing health equity within a specific geographic context. In principle, a spatial decision support system goes beyond interactive mapping by providing tools for analysis, modelling or scenario planning in order to aid decision processes. While interactive mapping provides a user-friendly map interface where users can explore and interact with different layers of social and environmental data for understanding health equity, spatial decision support tools leverage a flexible and interactive model, building on spatial data and analysis to guide decision making processes. These tools help the user to explore the solution space by using the knowledge of stakeholders, data and models in the system to generate alternatives or scenarios through a user-friendly interface for visualisation.

A good example is the *healthyregionseurope*[9] platform that was developed within the scope of the project EURO-HEALTHY in the form of a WebGIS and with the involvement of several stakeholders (Santana *et al.* 2020). The platform consists of a Population Health Index model that uses evidence on the multiple dimensions affecting population health (demographic, social, economic, physical and built environment, lifestyles, health care, etc.). The model takes into consideration the health outcomes and the health determinants against which the population health of each EU region and municipality is evaluated in multiple areas of concerns and dimensions. The platform consists of an interactive simulation tool that allows to test three typologies of policies and analyse their differential impact on the population health scores and geographical health inequalities, thereby supporting the stakeholders and decision makers in the decision-making process.

Another approach, developed by Shrestha *et al.* (2018), uses the interactive *MapTable* as a platform for involving stakeholders in face-to-face workshops as part of a joint decision-making process (Figure 5). An interactive and flexible model allows stakeholders to simulate the impact of changing environmental standards, as well as the cumulative impact of several environmental

Box 3. Photovoice

Photovoice is a qualitative research method through which different -often marginalised and underrepresented- groups are invited to document and critically reflect on their everyday experiences with the local environment by taking photographs (Köckler *et al*. 2024). Following a specific question, photos are taken and discussed afterwards with a large degree of freedom to let the participants express their perception. The so-called SHOWED method is often used to discuss photos in a structured way leading from observation to recommendation for action. SHOWED stands for: (a) What do you See in the photograph?; (b) What is Happening in the photograph?; (c) How does this photograph relate to Our lives or other community members?; (d) Why do these issues currently Exist within your community?; and (e) What can we Do about these issues? (Annang *et al*. 2016). Digital tools can support photovoice activities, especially since mobile phones with geolocation are accessible for many people. Therefore, a clear location of the photos is possible and can be easily presented in maps. The map in Figure 4 shows results of a photovoice activity with people with diverse abilities evaluating places in their new housing environment as positive (green) or negative (red) (Köckler and Simon 2020). Another exemplary study uses photovoice to identify (unequally distributed) opportunities and barriers in the built environment that promote children's play, physical activity, and social interaction (Allport *et al*. 2023). A photovoice activity often ends with an exhibition of the photos to result in further debate with a wider audience.

Figure 4. Poster showing the photovoice results of an evaluation of a shopping street by a group of diverse abled people that are moving to this neighbourhood (source: Köckler, H., presentation on photovoice in urban health digiSpace: https://urbanhealth-digispace.de/physical-activity-and-photo-voice).

burdens and benefits. Results are visualised through maps which can then be further used by the stakeholders to decide upon the program area where resources are attributed to, using a sketching tool.

By supporting policymakers and stakeholders in the decision-making-process and modelling the impact of different scenarios, this dimension is strongly linked to the formulation phase of the planning process, with connections to the diagnosis phase as well.

Conceptual – revealing theoretical understandings

The fourth dimension is about graphical representations of conceptual models for urban planning interventions to promote health and health equity. By mapping the system of built environment characteristics, social and economic characteristics, health determinants and health outcomes, these conceptual models show the possibilities for intervention.

Some of these models have a clear focus on health equity, such as the *Health Equity Measurement Framework* (Dover and Belon 2019). It shows how social position and material circumstances interact with each other and with health policy, and eventually lead to health outcomes. Environment takes a central spot in this framework and is defined by both material circumstances and social context and is linked to other factors such as health-related behaviour and psychosocial stressors. Another framework, that is even broader in its scope, is the WHO's *Conceptual Framework for Action on the Social Determinants of Health* (2010). While also pointing at material circumstances such as living and working conditions, and food availability, the framework makes the connection to public policies on education and social protection, apart from health policy.

While these two frameworks originated in the public health domain and remain quite abstract, other frameworks were developed by planners and geographers and focus more on the spatial aspects that can be influenced by planning. Three well-cited examples are the *Planning Healthy Cities Conceptual Framework* by Northridge *et al.* (2003), the *Shaping Cities for Health Framework* by Rydin *et al.* (2012), and the *Conceptual framework for the relation between urban and transport planning, environmental exposures and health* by Nieuwenhuijsen (2016). While those frameworks clearly show the scope of interventions that can have an impact on health, the issue of equity is not touched upon.

Figure 5. Stakeholders engaging with the interactive model on the MapTable for joint decision-making on cumulative burdens (source: Shrestha *et al.* 2018).

Finally, there are a few examples of frameworks developed by academics that focus on the spatial determinants of health inequalities, such as the work of Diez Roux and Mair (2010) and Borrell *et al.* (2013). These frameworks show how physical environments interact with social environments, conditioned by residential segregation and structural social inequalities, leading to different health inequalities. While these frameworks are clearly concerned about health inequity, they remain rather abstract and do not immediately show clear routes for intervention.

Ideally, these conceptual frameworks could be used in the formulation phase, to help us identify the pathways in these complex systems on which we should intervene. However, such conceptual models have been challenged for producing an impression of control over the wicked problem of health and planning, reducing the emerging complexity of reality to simple causal relationships (Verbeek and Boelens 2016). Instead of the expert knowledge based interdisciplinary approach of these models, we need transdisciplinary systemic approaches, and other types of knowledge, to bridge the implementation gap (Lawrence 2022). Therefore, these abstract conceptual frameworks might be most useful to diagnose issues at a systemic level.

Narrative – a story well told

A fifth dimension concerns interactive websites, explainer videos or drawings that are used for storytelling and awareness-raising. These visualisations are often based on quantitative data, but the data are interpreted and selected to support a certain story. If done well, this produces catchy images with strong messages that can quickly bring across a point to a large group of people. One example is the *Lives on the Line*[10] project that attractively visualises life expectancy and child poverty along the London Tube lines, assuming a relationship between the two indicators. Another example is the *Fairness on the 83*[11] project in Sheffield, which includes video interviews and a website with an interactive map. It is built around the fact that average life expectancy falls by 7.5 years for men and almost 10 years for women across the length of a specific bus route in the

city. On video sharing platforms attractive short videos can be found such as *A Tale of Two Zip Codes*,[12] bringing the message that where we live matters a lot to our health, by not only looking at the distribution of environmental conditions that can have an impact on health, but also the distribution of opportunities to live a healthy life (such as healthy food options and parks that promote physical activity and social interaction). A last fascinating example is the interactive website on *Ailing Brussels* (Box 4).

What these examples share is that they were not created in a top-down way but are the result of voluntary initiatives by activists, civil society organizations, independent journalists, artists and citizens. The aim is to educate people, raise awareness and (indirectly) put more pressure on governments to take action. While these initiatives help with putting health equity on the urban (planning) agenda, there is a risk that the message is seen as a biased view of a group of activists that only reaches those people that don't need to be convinced anymore. It is often also hard to verify the evidence claims that are made and the quality of the analysis depends a lot on who is involved in the project. A notable exception is the Glasgow train line map (McCartney 2011), created by a public health

Box 4. Ailing Brussels

The Belgian independent investigative journalists of Médor, supported by a data designer, an illustrator and a production company, developed an interactive website on *Ailing Brussels*[13] (Figure 6) The website presents a portrait of a capital city where inequalities operate in a vicious circle. Through an interactive, user-friendly and personalized story, using open data to understand inequalities, the website focuses on the triple jeopardy of precarity, health & environmental pollution. By answering questions and moving from one 'page' to the next the viewer gradually gets more information. While at first the viewer only sees text and drawings, they quickly get to see interactive maps and charts. When progressing in the sequence of information and visuals, the deeply engrained urban inequalities become apparent and are explained by gradually more accompanying text, alternated with short explainer videos. The website is visually very attractive but at the same time firmly based on reliable, mostly quantitative data, with consistent citation of sources. The project is clearly aimed at citizens and wants to inform them about inequalities in a fun and accessible way. While the website does not directly make any political statements, the interactive story ends with a call for putting health at the heart of political choices and land (re)development. This example focuses on the diagnosis of the problem, but by explaining spatial health inequalities to citizens it could also contribute to citizen empowerment and acceptability of policy intervention, aspects of the implementation phase.

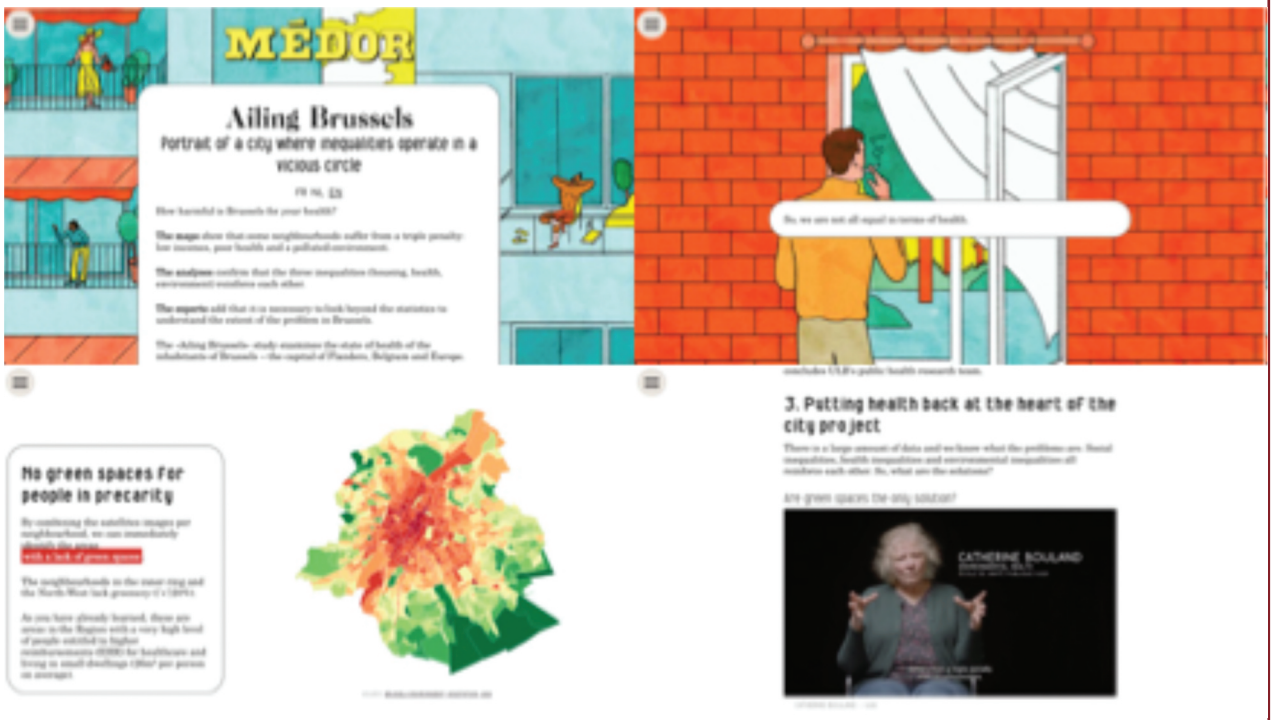

Figure 6. Screenshots from the interactive story on ailing Brussels (based on screenshot[13]).

professional working in a national public health agency, again visualising the relationship between place-based determinants of health and the resulting impact on health inequalities.

With regard to the planning cycle, this category has a strong link with diagnosis and implementation (supporting inclusion and engagement).

Illustrative – an image that speaks for itself

This final dimension aims to reveal health inequalities through the visual display of (large amounts of) quantitative data in the form of abstract, non-representational, static images. Featured tools include tables, charts, scatterplots, drawings, collages and simplified maps. Inspired by the work of Edward R. Tufte (1983), this dimension spurs the discussion how 'at their best, graphics are instruments for reasoning about quantitative information'. We argue that in an interdisciplinary field like urban planning for health equity, where stakeholders and practitioners with different sets of statistical training collaborate, there is an untapped potential in Tufte's work. He emphasized how looking at graphics based on numbers can be an effective way to describe, explore and summarize large sets of quantitative data, since those graphics ask for a well-designed simplicity, in order to maximize the power to analyse and communicate.

There are five main types of graphical illustrations that represent health inequalities and health determinants impacted by policies: (1) tables with coloured cells, e.g. the *EURO-HEALTHY matrix* by Freitas *et al.* (2020); (2) bar charts revealing absolute and relative inequalities between territories, e.g. the Portuguese *Atlas of Healthy Municipalities*,[14] or between population groups within a region, e.g. the *WHO CC fact sheet series on environmental health inequalities*[15]; (3) dot charts where each dot represents one territory, allowing to see inequalities in each indicator, e.g. the *regional health care profiles* by Mathis-Edenhofer *et al.* (2022); (4) line charts where the y-axis represents differences between territories, e.g. in the work of Schwandt *et al.* (2021); and (5) dimensional radar charts where each axis represents one dimension, more adapted to qualitative evaluation, e.g. the Scottish *Place Standard Tool*[16] that includes more subjective, behavioural and lifestyle dimensions (such as moving around, social interaction and play and recreation).

All the above examples can be best linked to the planning phases of diagnosis and monitoring and evaluation. In addition, graphical illustrations could be effective in the formulation (providing evidence of what works) and implementation (activating stakeholders and engaging communities) of urban planning for health equity.

General observations and outlook

Our exploratory review of examples of visualisation that can support the implementation of health equity concerns in urban planning shows that there is a wide variety of tools and methods used for different purposes. While we found some evidence that visualisation examples are used in, or have an impact on, planning processes, we think that there is still a lot of potential for using visual communication to promote health equity with the means of urban planning. In addition, we made a few general observations:

- The different examples focus on different concepts in the space and health interrelationship. Many examples focus only on environmental characteristics and socio-economic variables. The link with health outcomes is often not clear, as many examples do not use spatial health data. At best, good combinations are made that show environmental health inequalities. More indirect and complex pathways from environmental characteristics to health, healthy behaviour and healthy lifestyles are often not visualised (notable exceptions are the Photovoice method in Box 2 and the animated video *A Tale of Two Zip Codes*[12]).
- The scope and depth of the visualisation examples are clearly limited by the availability of data. In some countries, detailed health, environmental and socio-economic data are available but in other countries those data are hard to get by.
- While qualitative visualisation tools are used in research contexts, they do not seem to be very widespread and have limited or no impact on planning processes.
- Most of the examples we have collected – including the three examples we discuss in detail – make use of two-dimensional maps, or more abstract visualisations (e.g. charts, diagrams). These visualisations might not always be understood by laypeople. If we want to support a transdisciplinary way of thinking and decision-making in planning processes, we need visualisations that are simple to understand. Of the collected examples, Photovoice and the explainer video 'A Tale of Two Zip Codes' stand out as particularly suited for a wide audience. We could not find any good examples of physical or virtual

three-dimensional models that are used for spatial exploration of urban planning for health equity.
- Most examples of visual images depicting health inequalities in our sample seem to focus on the regional and/or city level (macro scale). On the other hand, some (qualitative) examples focus on public space and/or buildings (micro scale). There seem to be few examples addressing urban textures of homogeneous building typologies and open space typologies (meso scale).

Critical questions and a call for contributions

Based on our review we want to initiate further discussion on how to improve the visualisation of health inequalities and health equity to have stronger impacts on planning processes and contribute to healthier cities for all. Further empirical and conceptual work is required to further advance this field. To do so, we have formulated eight critical questions to frame a Special Issue of *Cities & Health*.

1. What are suitable methods to visualise health equity for urban planning?

There is a range of variables, determinants and dimensions used for visualisation. The combination of socio-economic and spatial data is important, but also reveals methodological challenges. The interaction of different social dimensions deserves more attention considering an intersectionality perspective. Further, it remains challenging to visualise indirect pathways from built environment characteristics to health behaviour and lifestyle.

2. How do we communicate on different types of structural discrimination and their association to health inequities?

Structural discrimination against people of different age, religion, gender, sexual orientation, nationality, ethnicity, mental and physical ability and language has a place-based component.

3. What qualitative data visualisation tools are needed to give subjective experiences more importance?

Visualisation tools are often heavily reliant on quantitative data. Qualitative data is essential to understand and act on health inequity, in particular for vulnerable populations.

4. How effective is the visualisation of health equity?

A variety of methodological approaches and visualisation strategies co-exist, with little research available on the impact on planning processes and policy making.

5. Who is responsible for visualising health equity?

Maps and other visual images and tools are always expressions of power. We need to be aware of who is making these visual images, who is equipped to use such tools, and who is left out.

6. How can we increase the use of visualisation tools within the planning process?

Most of the visualisation tools come from the public health sector and planners are not using them due to a lack of awareness and training. Current visualisation tools are often two-dimensional and abstract, which limits the understanding for some stakeholders in the planning process, in particular ordinary citizens.

7. How can we steer technological innovation for visualisation?

Innovations such as generative artificial intelligence and virtual reality can support better visualisation and decision-making tools that are accessible to a wide audience (including laypeople), but they also present a risk of over reliance on 'black box' calculations, replicating the existing bias in data and missing more qualitative perspectives.

8. What kind of contexts and processes are required to support change? What role can visualisation play?

However valid a visualisation technique is, the degree to which it can effect change will depend on the context and processes where it is used. More research is needed both to identify the key factors that promote success, and those that may hinder required outcomes.

To support development of this aspect of health equity in planning, we are launching a Call for Contributions for a special issue in *Cities & Health* called 'Visualising health inequalities and health equity for urban planning'. While the call is open further details can be found on the website. We are interested in attracting a wide range of contributions, especially papers that focus on graphic information. Please note that *Cities & Health* encourages graphics and visual material, it also has some bespoke image-based article types which we want contributors to take note of. We encourage not only researchers, but a full range of those working in this field, or with an interest, to contribute.

ARL international working group: urban planning for health equity

The mission of the Academy for Territorial Development in the Leibniz Association (ARL) is to bring together knowledge and ideas from the international planning community through its interactive knowledge and communication platform, to shape the future of spatial development and to ensure the sustainable development of spatial structures within Europe and beyond.

Recognizing the significance and potential of urban planning for health equity, ARL has set up an International Working Group. The working group consists of 15 members from academia and practice, representing eight countries and various disciplines – urban and landscape planning, urban design/architecture, public health, social work, economics, nutrition. The working group integrates knowledge from these different disciplines to bring new insights for urban planning promoting health equity.

This working group adopts an integrated view of health equity, environmental justice and quality of life for different communities living in European cities today. Spatial development, urban planning and urban design are considered key determinants of health equity, which have rarely been researched in a transdisciplinary and international perspective. This includes the living conditions that are developed, designed and planned to allow communities regardless of their level of marginalisation and deprivation to live more healthy lives. Aspects of environmental health, physical activity, mobility, and digitalisation, inclusion and participation in decision-making are on the agenda of the working group.

The working group aims at providing online content for the platform arl-international.com, developing and documenting approaches to visualise health inequities, collecting and sharing best practice approaches by learning from international experiences, and establishing a close partnership with a leading journal to disseminate its progress and results to an international audience. Its joint products may include a special edition, white paper, opinion pieces and more. The working group started its activities in March 2022 and will last until May 2025.

Written by Thomas Verbeek.

For more information: https://www.arl-international.com/activities/urban-planning-health-equity.

Notes

1. https://www.arl-international.com/activities/urban-planning-health-equity.
2. https://discomap.eea.europa.eu/atlas/.
3. https://www.atlasleefomgeving.nl/.
4. https://www.leefkwaliteitvlaanderen.be/.
5. https://map.geo.bs.ch/.
6. https://ejscreen.epa.gov/mapper/.
7. https://www.berlin.de/sen/uvk/umwelt/nachhaltigkeit/umweltgerechtigkeit/.
8. https://www.xhain-beruhigt.berlin/.
9. https://healthyregionseurope.uc.pt/.
10. http://life.mappinglondon.co.uk/life/.
11. https://fairnessonthe83.nowthenmagazine.com/.
12. https://www.youtube.com/watch?v=Eu7d0BMRt0o.
13. https://bxl-malade.medor.coop/.
14. https://atlasmunicipiossaudaveis.pt/.
15. https://www.uni-bremen.de/en/who-collaborating-centre-for-environmental-health-inequalities/fact-sheets.
16. https://www.ourplace.scot/tool.

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