

# A call to action to address the steatotic liver disease public health threat in Barcelona



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## Summary

Despite their high prevalence worldwide, steatotic liver diseases (SLDs) are largely excluded from most non-communicable disease (NCD) guidelines and strategies. We propose policies and strategies to achieve the United Nations Sustainable Development Goal of reducing NCD premature mortality by one-third by 2030. To assess this gap—the exclusion of SLDs from NCD policies—in urban areas, we reviewed Barcelona's strategies for NCD risks (e.g., alcohol, tobacco, healthy food access). We then explored applications of geo-spatial visualisation and whole-of-society approaches (e.g., citizen science engagement) aligned with the World Health Organization (WHO) Best Buys to provide recommendations to address NCDs, generally, and SLDs specifically.

The Lancet Regional Health - Europe  
2025;52: 101272

Published Online xxx  
<https://doi.org/10.1016/j.lanepe.2025.101272>

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**Keywords:** Liver disease; Health policy; City health; Citizen science; Sustainable development goals

## Introduction

Premature mortality due to non-communicable diseases (NCDs) has declined since 2015, but the slowing annual rate of reduction remains alarming. In 2019, a person aged 30 had a 17.8% (13.3%–23.1%) chance of dying due to cardiovascular disease, cancer, chronic respiratory disease, or diabetes.<sup>1</sup> In support of United Nations (UN) Sustainable Development Goal (SDG) 3.4, to reduce premature mortality due to NCDs by one-third by 2030, in 2017 the World Health Organization (WHO) proposed a set of revised prioritised interventions, known as 'Best Buys', to enhance the probability of achieving this important target; these were updated in 2024.<sup>2</sup>

Despite these efforts, steatotic liver diseases (SLDs) remain widely overlooked around the world.<sup>3</sup> SLDs are characterized by abnormal retention of fat in the liver, where the primary risks are obesity, insulin resistance, and alcohol. This is the basis of the sub-categories:

metabolic dysfunction-associated steatotic liver disease (MASLD, formerly called non-alcoholic fatty liver disease), alcohol associated/related liver disease (ALD), and metabolic and alcohol associated/related liver disease (MetALD), whose distinction depends on the presence of primarily metabolic factors, alcohol, or a combination of the two.<sup>3</sup> These are highly prevalent and important contributors to deadly liver and extrahepatic diseases, with an estimated MASLD prevalence of 38.2% (33.7–42.9) in the global adult population and an estimated prevalence of 7–14% among children, and an association with elevated age-adjusted mortality, especially in the presence of type 2 diabetes (T2D).<sup>4</sup> Yet, in a review of policies and strategies for MASLD in 102 countries, as of 2022, none were found to be well positioned to address the growing MASLD public health threat; around one-third scored zero on the MASLD policy preparedness index.<sup>5</sup> Furthermore, no WHO technical guidance or action plans address the full spectrum of SLDs, with MASLD notably completely absent. Due to this lack of emphasis at the global level, an expert panel set action priorities for the liver health community of practice in 2023, including calling for the

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explicit integration of MASLD in NCD guidelines at all levels.<sup>6</sup>

As the costs of advanced liver disease are high and can manifest as economic burdens on healthcare, productivity and carers,<sup>7</sup> this stretches the resources of health systems and individuals alike, especially disadvantaging populations facing socio-economic inequities. The WHO Best Buys concentrate on reducing modifiable risk factors, emphasising structural, social and commercial determinant-based drivers.<sup>2</sup> These also include commonly occurring consumption patterns observable in urban environments. For this reason, policy-makers should take special note of associated risk zones and contexts as, directly or indirectly, all NCDs are sensitive to alcohol, tobacco and unhealthy foods. In cohorts in Spain and the USA, it was shown that even moderate alcohol intake (i.e., 10–13 or 10–20 drinks/week for females and males, respectively) increases the risk of MASLD-related liver outcomes,<sup>8</sup> which often end in higher stages of fibrosis, the more complex condition known as metabolic dysfunction-associated steatohepatitis (MASH, formerly non-alcoholic steatohepatitis), cirrhosis or even hepatocellular carcinoma (HCC). Managing these conditions is further complicated by the subtle clinical diagnostic difference for alcohol intake between MASLD ( $\leq 20$  g daily for females;  $\leq 30$  g daily for males) and MetALD (20–50 g daily for females; 30–60 g daily for males).<sup>9</sup>

Taken together, SLDs represent an escalating risk of progression to liver cirrhosis and HCC. The high prevalence of MASLD progressing to MASH, MetALD and ALD, when left unaddressed, will lead to a growing incidence of SLD-related HCC, exacerbating premature mortality due to NCDs.<sup>10</sup> At the patient level, reductions in alcohol consumption, improved diet quality, and other lifestyle interventions (e.g., increased aerobic activity) have demonstrated a positive impact on liver injury, and are therefore recommended.<sup>9</sup> At the social-public health level, changes in alcohol policies can reduce overall, and alcohol liver disease-related, mortality,<sup>11,12</sup> and nutritional initiatives such as fruit and vegetable subsidies or unhealthy food taxes were found to be effective for reducing the T2D burden.<sup>13</sup> Features of the built environment, such as pedestrian safety features (e.g., sidewalks), bike lanes or building maintenance, have been shown to influence conditions such as obesity,<sup>14</sup> and alcohol access to influence alcohol consumption.<sup>12</sup> The positive impacts of such interventions should invite urban decisionmakers to consider policy changes that lead to reductions in alcohol consumption and improved nutrition.

## Strategies, guidelines, and policies

To increase the probability of achieving the SDG milestones on NCDs, and to reduce the burden of SLDs, urgency and coordination on the part of local, regional and national governments is critical and must be in line

with global efforts.<sup>6,15</sup> In 2024, WHO published the Global Alcohol Action Plan 2022–2030<sup>16</sup> to boost the implementation of a global strategy to reduce the harmful use of alcohol. This remains the only global policy framework for reducing deaths and disabilities from alcohol consumption in all aspects—from mental health conditions and NCDs to injuries and alcohol-attributable infectious diseases. The Global Alcohol Action Plan presents several goals to achieve by 2030, including at least 20% relative reduction worldwide (in comparison with 2010) in the harmful use of alcohol (global target 1.1). To date, 70% of countries worldwide have introduced, enacted, or maintained the implementation of high-impact policy options and interventions (global target 1.2). The WHO Best Buys to reduce alcohol consumption encompass several actions that should be implemented among the general population,<sup>2</sup> are easy to execute, and are highly cost-effective in low and high-income countries alike.<sup>17</sup> Other studies have proposed interventions like modification of the minimum legal drinking age<sup>18</sup> and adjustments of minimum unit pricing alone or in combination with sugar-sweetened beverage and alcohol volumetric taxes.<sup>19</sup> Targeted interventions may also be beneficial for high-risk and vulnerable populations.

Reducing unhealthy diets is another objective of the WHO Best Buys.<sup>2</sup> In 2011, the United Nations General Assembly recommended policy actions to improve nutrition quality and reduce the NCD burden.<sup>20</sup> To tackle MASLD, the European Association for the Study of the Liver (EASL)<sup>21</sup> called for European countries to take policy actions emphasising prevention, including commercial determinant-oriented reforms on taxation, marketing, and the availability of harmful dietary items. Municipal governments can take inspiration from these types of guidance and consider implementation at the city level, as cities may be able to move more swiftly to address the structural, social, and commercial determinants of health and, thereby, impact their citizens. For example, in 2024 New York City began requiring warning labels on certain high-sugar products to enable consumers to make healthier choices.<sup>22</sup> While labels offer a modest step in the right direction, they nonetheless place the onus for change on individuals. Labels, disclosures and warnings have been demonstrated to have low overall effects with respect to reducing public health risks, particularly when compared to industry-based interventions such as in-product harm reduction. On the other hand, MASLD screening efforts linked to the more robust management pathways of co-morbidities such as T2D,<sup>23</sup> for example, can help build awareness and increase case finding in these at-risk populations.

## Barcelona, Spain: a case study

Studies have shown that adult populations in Barcelona, in the capital of the autonomous community of

Catalonia (Spain), have a high prevalence of liver fibrosis,<sup>24</sup> which is the strongest predictor of mortality in individuals living with MASLD. However, tracking this issue to better understand, prevent, and mitigate the risks associated with MASLD-related mortality is challenging due in part to a lack of specific surveillance systems and healthcare pathway evaluations. These surveillance systems should include district/neighbourhood-level indices, combined with social determinants of health (SDoH) derived from individual-level data. For example, the Information System for Research in Primary Care (SIDAP) is a database representative of the population of Catalonia in terms of age, sex, and geographic distribution. Increasingly, database coordination efforts in Catalonia aim to improve the deficient information coverage in the health system, thereby helping researchers and health decisionmakers.<sup>25</sup>

The Barcelona Public Health Agency runs programmes that explore inequities within individual, disadvantaged communities.<sup>26</sup> The agency further provides support and additional programmes that promote healthy food, physical activity, and reduction of addictions such as tobacco use; targeted education and awareness campaigns around healthy food, physical activity and cessation of smoking and drinking in youth; citywide efforts to reduce tobacco use; and programmes at the autonomous community<sup>27</sup> and city<sup>26</sup> level to educate and reduce the harms of alcohol. However, these approaches do not yet encompass a comprehensive systemic, beyond-the-health-sector, ‘Health in All Policies’ approach that is structurally oriented to also address SLDs. While these efforts contribute to addressing the complex risk factors that can lead to liver disease or its progression (as well as those of other NCDs), we encourage the city to think boldly and embrace an approach that aligns several agencies and resources into a united front against these public health threats and urban NCD risk zones. Such efforts should be envisioned with explicit aim for equitable health outcomes. The Spanish National Liver Health Plan, adopted in 2024, is an important source of evidence and actions, on which city health agencies can draw.<sup>28</sup>

### Seeking effective and innovative solutions

Recent reports reveal that little progress has been made toward achieving SDG 3.4.<sup>2</sup> To achieve the targets, it will require a ‘whole-of-society’ approach, which the UN defines as, ‘embrac[ing] both formal and informal institutions in seeking a generalised agreement across society about policy goals and the means to achieve them’.<sup>29</sup> There have been calls both inside and outside<sup>30</sup> the UN to accelerate ‘whole-of-society’ strategies and tactics. To re-imagine ways that top-down policy solutions can interface with bottom-up movements, we explored tools with the potential to obtain neighbourhood-focused or ‘ground-level’ views.

#### Box 1.

##### Call to Action for the city of Barcelona, Spain.

We recommend Barcelona’s city leaders to initiate a multi-stakeholder, multi-disciplinary, whole-of-society consensus process to discern, prioritise and then act on agreed upon areas for addressing the public health threat presented by NCDs generally, with expansion to include otherwise neglected high prevalence steatotic liver diseases: MASLD and MetALD. This includes examining a range of both principles-based and determinants-oriented policy changes, with examples provided below.

##### For governments and policy-makers

- Whole-of-society (e.g., support adjacent agencies’ expansion of NCD programs and expand no-cost anonymised public health data in support of citizen science)
- Structural (e.g., revise nutrition programmes in schools)
- Economic (e.g., remove governmental incentives and require minimum unit pricing on tobacco, alcohol and ultra-processed foods)
- Regulatory (e.g., enforce minimum drinking age laws; reduce particulate matter exposure risks; require industry to undertake redesigning products to remove harm and reduce risks, rather than relying upon warnings, labels, or disclosures)
- Environmental (e.g., enhance walkability and bikeability)
- Social (e.g., support community-based, culturally relevant initiatives and programmes)

We also recommend that Barcelona’s city leaders purposefully seek-out and include participation from the following specific stakeholder groups:

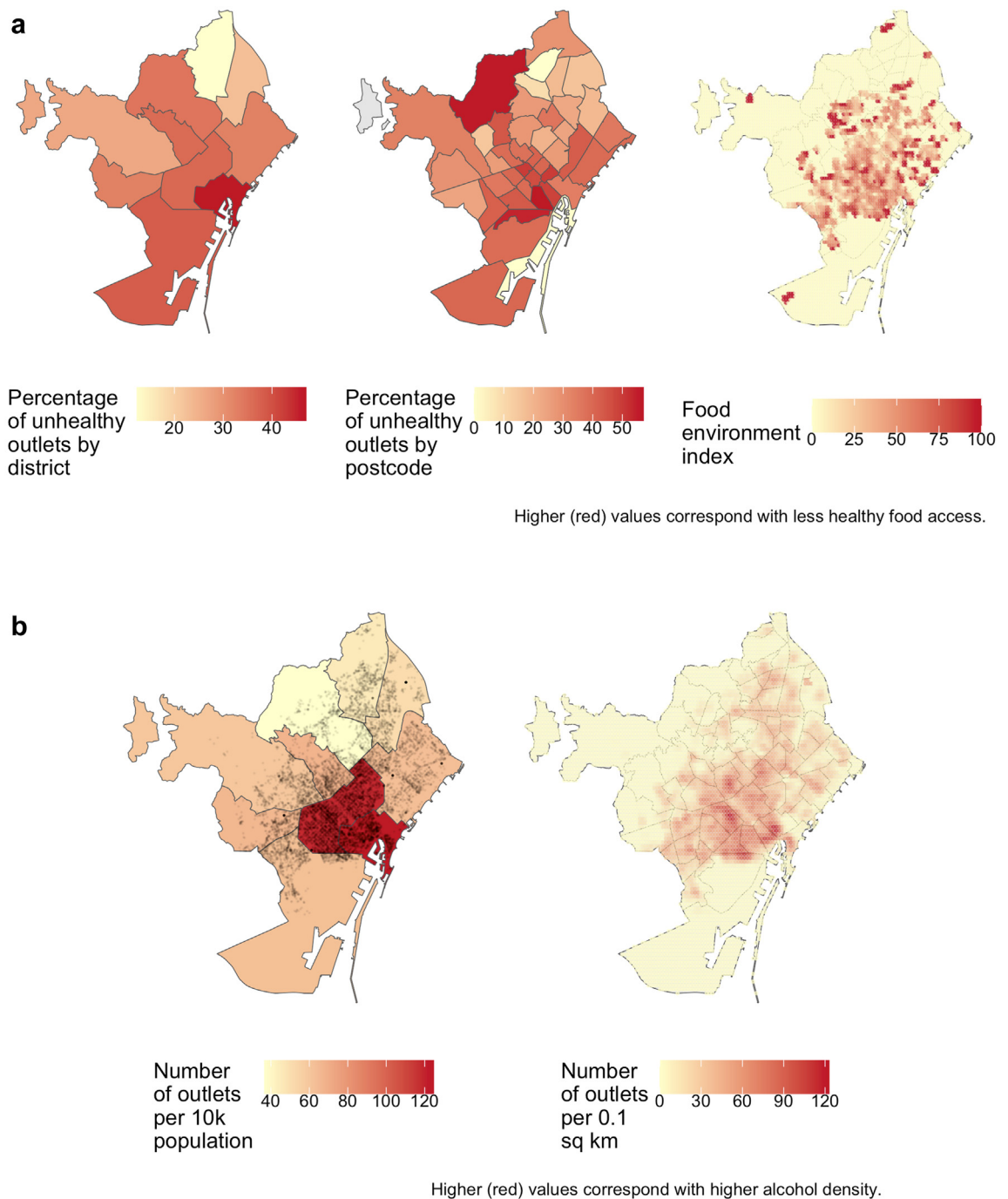
- People living with SLDs and, on behalf of children, their parents, guardians and caregivers
- Advocacy groups on behalf of people living with SLDs
- Members of the health systems, medical, scientific, and research communities with prior experience addressing SLDs, as well as general practitioners and family doctors (who are often the first point of contact within health systems)
- Community members and leaders within urban NCD high-risk zones
- Citizen scientists engaged in other local and regional efforts

**Notes:** These recommendations have been compiled from various sources and curated based on our experience as potentially suitable for application at the city level.

Spatial epidemiology leveraging geographic information systems (GIS) or other mapping utilities often provides direct or indirect insights on social and commercial determinants of health, such as charting the presence or absence of commercial locations offering healthy food choices (e.g., food deserts)<sup>31</sup> and the degree of geographic access of to alcohol outlets (e.g., as a driver for individual and culturally-influenced consumption).<sup>32</sup> We also note important work being carried out on environmental determinants in urban built environments (e.g., mapping greenspaces and walkability to increase the probability of exercise).

The evidence based on SDoH within the context of NCDs often provides limited discussion of behavioural and consumption patterns in specific interpersonal (set) and situational contexts like bars and fast-food establishments (setting). Yet it less frequently includes geo-spatial mapping of these temporal and social phenomena.<sup>33</sup> Mapping these urban environments, however, can provide important insights into risk zones that are less often discussed or otherwise overlooked.

Alcohol, tobacco, and food consumption are often narrowly framed as ‘modifiable lifestyle behaviours’. While this is partially accurate, we believe that mapping



**Fig. 1:** Barcelona urban non-communicable disease risk zones. (a) Food quality index generated by district, postcode, and by outlets in 200 m radius of grid locations with data extracted from OpenStreetMap.<sup>34</sup> Healthy categories were selected as “supermarket, greengrocer, seafood, nuts, farm” and unhealthy categories were selected as “convenience, butcher, pastry, ice cream”. (b) Alcohol outlet density generated by district and by outlets in 200 m radius of grid locations with data from the census of ground floor premises in Barcelona.<sup>35</sup> Overlaid are outlet locations. Alcohol outlet categories were “Restaurants, Autoservei/Supermercat, Bars/CIBERCAFÈ, Bars especials amb actuació/Bars musicals/Discotheques/PUB, Begudes”, (restaurants, self-service/supermarkets, bars/cybercafes, special bars with performances/music bars/discotheques/pubs, drinks).

urban NCD risk zones could broaden this perspective, enabling policy-makers to consider a wider range of priorities and actions at the local level. Where neighbourhood level insight, data availability, or community mobilization can be improved with citizen participation, incorporating evidence-based citizen science input with respect to SDoH, laws, regulations and policy interventions could help decrease the public health threat of NCDs exacerbated by commercial determinants, while also addressing inequities.

We provide observations for data and policy initiatives (Box 1), geospatial indications of urban risk zones (Fig. 1), a sketch on citizen science as a tool against NCDs (Box 2), and an illustration of iterative citizen science co-creation (Fig. 2), that can improve the ability for decisionmakers to address public health, focused not only on SLDs, but potentially more widely to all NCDs. We also recommend in Box 1 that Barcelona should hold a consensus process within which city leaders, health systems professionals, advocacy groups, community leaders, and other social stakeholders prioritise short-, medium-, and long-term interventions that are effective, affordable, and actionable, to discern areas of high alignment.

### Mapping NCD risk zones

Applying no-cost tools and data sources to geospatial insights in Barcelona, it is possible to observe several potential neighbourhood-based urban ‘risk zones’ that directly bear upon the types of interventions envisioned in the WHO Best Buys. The resulting maps, illustrated in Fig. 1, explore the food environment and alcohol availability at various levels of administrative division, both by the ratio of relatively healthy-to-unhealthy food outlets and by the density of alcohol outlets. At the district level, we see the food environment with the lowest access to healthy outlets in the downtown core of Barcelona’s “Ciutat Vella”, where the proportion of convenience stores outweighs more balanced supermarkets, fruit stands, and other healthier alternatives. Similarly, our population-normalised density map shows alcohol availability concentrated in the central Ciutat Vella and LEixample districts.

While these images are concerning for the health of local residents, it is important to acknowledge the challenges inherent in this type of analysis, such as the various assumptions and parameters. Classifying food outlet quality by broad categories is a crucial first step and, at a citywide scale, is presently the most actionable approach given the freely available data. However, it overlooks some of the nuances of individual retail locations. Similarly, alcohol outlet density requires selection or weighting of alcohol outlet types,<sup>32</sup> based on their perceived impact on drinking risk. A deeper exploration of this weighting, however, requires further study.

#### Box 2.

##### Citizen Science to reduce NCD risks.

The engagement of citizen scientists on the intersection of social and commercial determinants in urban settings that bear upon WHO Best Buys can generate volunteer insights for future community engagement with urban decisionmakers about higher NCD risk zones.

Citizen science is recognised as a broad field, subject to a range of definitions, with organisations like the European Citizen Science Association (ECSA) seeking to provide explanatory context and principles. Engagement of citizen scientists to advance an evidence base by gathering observational data is quite common, but in the context of NCDs citizen science is less frequent, though increasing. In practice, no citizen science initiatives have been observed that directly focus specifically on UN SDG 3.4, the NCD targets and WHO’s related Best Buys, whether for observational data gathering or more complex forms of participation.<sup>37</sup>

Engaging non-specialist citizen scientists for the epidemiology of NCDs presents a range of beneficial opportunities and risks. Citizen science is, by its nature, voluntary, though sometimes with modest gifts or incentives for participation. The absence of an economic incentive among citizen scientists, coupled by reported core motivations to advance science, expand knowledge and support scientific processes, are presumably compelling from a policymaking point of view.

Urban policy-makers may seek the clear advantage of empowering citizen scientists in the context of NCDs to cultivate an informed citizenry who have no direct economic incentives or professional obligations for advancing commercial determinants associated with alcohol, tobacco or low-nutrition food sales in their communities, and, thereby, can assume important roles in local and regional urban decision making processes, alongside other profit-neutral actors, such as public health research institutes and public health systems. Moreover, the data, software and technological infrastructure for identifying geospatial and temporal risks already exists and is transferable to these public health use cases.

Notwithstanding these limitations, relying solely upon no-cost data sources, we found it possible to identify potential NCD risk zones. However, correlating the relationships between urban social and commercial determinants and specific health outcomes was not possible due to the data access limitations. This is, in part, because anonymised health data in the autonomous community of Catalonia are typically available only on a per-use, cost basis, even though most of the data are held within the public health system. For diabetes and obesity there are neighbourhood level data from the Barcelona Health Survey 2021.<sup>36</sup> If the survey were to be expanded to other NCDs, it could provide a powerful tool for researchers; but, presently, geo-coded data on SLDs remain scarce. While some risk zone identification in Barcelona was possible, it remains uncertain whether such insights are sufficiently compelling for policy-makers to take action.

### A call to action to address steatotic liver disease

Working together, local policy-makers, public health researchers, community-based organisations and citizen scientists hold the potential to make significant strides in Barcelona, potentially demonstrating viable actions for other urban centres around the world with respect to NCDs generally and SLDs specifically. The most immediate challenges are economic, social, technological, and, ultimately, political. Socially, Barcelona should



further engage with local communities to better understand and address their specific risks and needs. Technologically, starting with Barcelona, then emanating outward, urban areas should assess and make further available the types of surveillance and data sources that can inform research into the social and commercial determinants of health. Politically, Barcelona's decisionmakers must be willing to directly engage with whole-of-society perspectives, with an awareness of WHO's Best Buys across all neighbourhoods (addressing inequities). Consequently, at-risk communities could be empowered to modify the social and commercial determinants that drive NCDs and worse health outcomes, such as the ease of access to alcohol and the challenge to obtaining nutritious foods that impact SLDs.

We recognize the challenge of external validation of and transferability for public policy lifestyle interventions from one population or geographic region to another. Given that the mapping of urban risk zones includes consideration of both structural and commercial determinants, we believe research could include both pre-market convenience samples among users of public health services prior to initiation of the intervention, as well as post-market samples following the intervention, emulating a similar approach observed with external validity of health label warnings. This may provide additional predictive and external validity to assist policy-makers and decisionmakers outside Barcelona in considering similar interventions.

As 2030 approaches, the targets set by UN SDG 3.4 may increasingly seem unachievable. We believe top-down policy mechanisms, such as WHO's proposed

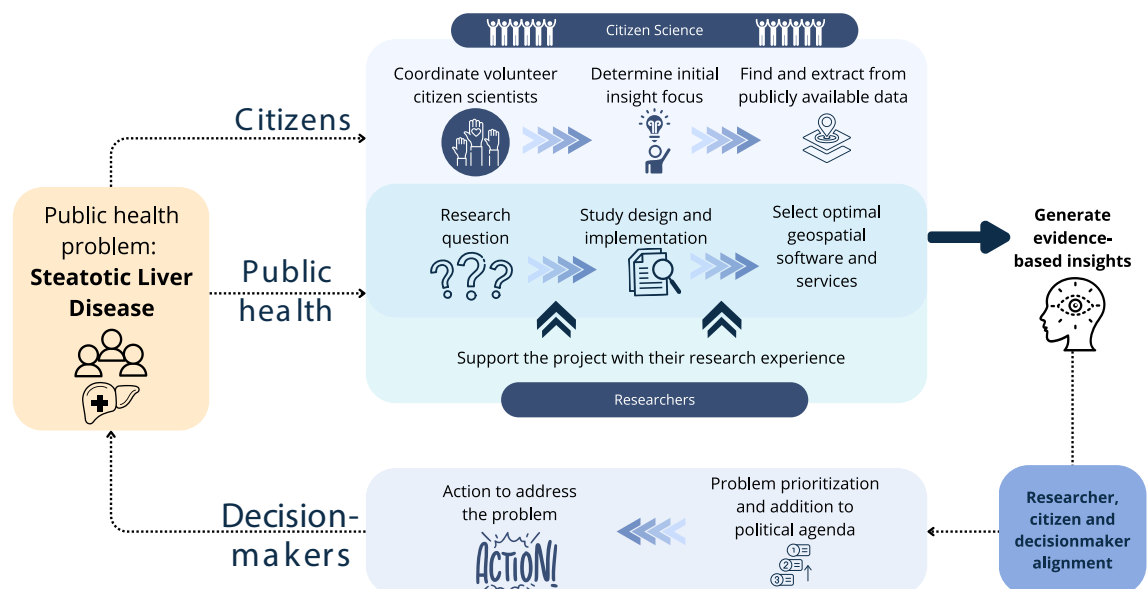
## Search strategy and selection criteria

References for this article were identified through PubMed, Google Scholar, and Internet searches, with no time restriction. The articles, strategies, guidelines, reports, and policies found in Catalan, English or Spanish were reviewed for inclusion of liver health, insulin resistance, tobacco and alcohol use, and food security, with special attention to solutions focused on social and commercial determinants of health, such as local policy, the built-environment, diet, nutrition, and lifestyle. The final reference list was generated on the basis of originality and relevance to the broad scope of this article.

Best Buy interventions, are more likely to succeed when complemented by bottom-up, whole-of-society engagement. This can be possible through initiatives like citizen science and community involvement, which we have proposed for UN SDG 3.4 to illustrate local, urban-specific insights into NCD risk zones.

## Conclusions

Steatotic liver diseases are a spectrum of complex and life-threatening conditions, with MASLD now the most prevalent liver disease in history. The full spectrum of SLDs currently receive scant attention in Barcelona, presenting an opportunity for the city to address SLDs in parallel with many other positive public health commitments. To better address this issue, and leverage these learnings across NCDs more generally, cities must implement existing national and global guidelines to



**Fig. 2:** Expanding the SLD community of practice by engaging citizen scientists to identify urban risk zones. This illustration is intended to be consistent with ECSA Principle 4 for Citizen Science.

better face the public health threat of NCDs generally and SLDs specifically.

Additionally, there is an opportunity for public health policy-making in urban environments to have objective, citizen-developed, profit-neutral data and insights. This would enable informed decision-making at the intersection of structural, social, and commercial determinants, and ultimately increase the probability of preventing premature mortality from exposure to urban risk zones that impact chronic NCD health outcomes, such as MASLD transitioning to MASH or cirrhosis. Embracing modern policies and strategies with whole-of-society innovation at all levels offers an additional, viable pathway to achieve the crucial goals of alleviating the burden of NCDs, including SLDs.

#### Contributors

JVL, Supervision, conceptualisation, writing, review, and editing; CJK: Conceptualisation, writing, review, and editing; JEMS: Writing, review, editing, data curation, visualisation, and figures; LAG: Writing, review, editing, and figures; NB, AN, AA, DB, LRD, JMP, JB, DIW: Writing, review, editing.

#### Data sharing statement

No unique datasets were created in the context of this work. The data to create the maps was acquired by the sources referenced in Fig. 1.

#### Editor note

The Lancet Group takes a neutral position with respect to territorial claims in published maps and institutional affiliations.

#### Declaration of interests

JVL reports grants from Boehringer Ingelheim and Madrigal, and grants and speaker fees from Gilead Sciences MSD, Novo Nordisk and Pfizer, consulting fees from Echosens, GSK and Novo Nordisk and speaker fees from AbbVie and Echosens, outside of the submitted work. JMP reports having received consulting fees from Boehringer-Ingelheim, MSD and Novo Nordisk. He has received speaking fees from Madrigal, Gilead, Intercept, and Novo Nordisk, and travel expenses from Gilead, Rubió, Pfizer, Astellas, MSD, CUBICIN, and Novo Nordisk. He has received educational and research support from Madrigal, Boehringer-Ingelheim, Gilead, Pfizer, Astellas, Accelerate, Novartis, AbbVie, ViiV, and MSD. Funds from European Commission/EFPIA IMI2 853966-2, IMI2 777377, H2020 847989, HLTH-2023-TOOL-05-03, ISCIII PI19/01898 and PI22/01770, MICIN IBEC\_ProjectCompl22, DTS24/00035, and “La Caixa” Foundation and Barcelona City Council (COVID-SHINE and StopALD). JB reports having received grants or contracts for “Study of the drivers of late diagnosis of alcohol related disease, alone or in combination with metabolic-dysfunction associated fatty liver disease (MAFLD), and implementation and evaluation of interventions to reduce its burden (StopALD)”, ID: 22S07286-001. Barcelona City Council. 2022–2024. EM, LAG NB, AN, AA, DB, LR, CJK, DIW declare that they have no conflicts of interest.

#### Acknowledgements

JVL, JEMS, LAG, NB, AN, AA, DB, LRD, and DIW acknowledge support to ISGlobal from the grant CEX2023-0001290-S funded by MCIN/AEI/10.13039/501100011033, and support from the Generalitat de Catalunya through the CERCA Program.

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