Athens Journal of Health and Medical Sciences

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September 2025

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Front Pages

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The *Athens Journal of Health and Medical Sciences* (AJHMS) is an Open Access quarterly double-blind peer reviewed journal and considers papers from all areas of medicine (including health studies and nursing research). Many of the papers published in this journal have been presented at the various conferences sponsored by the Health & Medical Sciences Division of the Athens Institute for Education and Research (ATINER). All papers are subject to ATINER's Publication Ethical Policy and Statement.

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Athens Journal of Health and Medical Sciences

Editorial and Reviewers' Board

President's Message

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The current issue is the third of the twelfth volume of the *Athens Journal of Health and Medical Sciences (AJHMS)*, published by the Health & Medical Sciences Division of ATINER.

Gregory T. Papanikos
President
Athens Institute

25th Annual International Conference on Health Economics, Management & Policy, 22-26 June 2026, Athens, Greece

The Health Economics & Management Unit of Athens Institute will hold its **25th Annual International Conference on Health Economics, Management & Policy, 22-26 June 2026, Athens, Greece s**ponsored by the Athens Journal of Health and Medical Sciences. The aim of the conference is to bring together academics, researchers and professionals in health economics, management and policy. You may participate as stream leader, presenter of one paper, chair of a session or observer. Please submit a proposal using the form available (https://www.atiner.gr/2026/FORM-HEA.doc).

Academic Members Responsible for the Conference

- **Dr. Paul Contoyannis**, Head, Health Economics & Management Unit, Athens Institute & Associate Professor, McMaster University, Canada.
- **Dr. Vickie Hughes**, Director, Health & Medical Sciences Division, Athens Institute & Assistant Professor, School of Nursing, Johns Hopkins University, USA.

Important Dates

- Abstract Submission: **18 November 2025**
- Acceptance of Abstract: 4 Weeks after Submission
- Submission of Paper: **25 May 2026**

Social and Educational Program

The Social Program Emphasizes the Educational Aspect of the Academic Meetings of Athens Institute.

- Greek Night Entertainment (This is the official dinner of the conference)
- Athens Sightseeing: Old and New-An Educational Urban Walk
- Social Dinner
- Mycenae Visit
- Exploration of the Aegean Islands
- Delphi Visit

Conference Fees

Conference fees vary from 400€ to 2000€
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13th Annual International Conference on Health & Medical Sciences
5-8 May 2025, Athens, Greece

The Medicine Unit of Athens Institute is organizing its **13th Annual International Conference on Health & Medical Sciences, 5-8 May 2025, Athens, Greece** sponsored by the Athens Journal of Health and Medical Sciences. The aim of the conference is to bring together academics and researchers from all areas of health sciences, medical sciences and related disciplines. You may participate as stream leader, presenter of one paper, chair a session or observer. Please submit a proposal using the form available (https://www.atiner.gr/2025/FORM-HSC.doc).

Important Dates

- Abstract Submission: **30 September 2025**
- Acceptance of Abstract: 4 Weeks after Submission
- Submission of Paper: **6 April 2026**

Academic Member Responsible for the Conference

- **Dr. Vickie Hughes**, Director, Health & Medical Sciences Research Division, Athens Institute & Assistant Professor, School of Nursing, Johns Hopkins University, USA.
- **Dr. Carol Anne Chamley**, Head, Nursing Research Unit & Associate Professor, School of Health and Social Care, London South Bank University UK.
- **Dr. Andriana Margariti**, Head, Medicine Research Unit, Athens Institute & Lecturer, Centre for Experimental Medicine, Queen's University Belfast, U.K.

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September 2025 – Pages 159-176

Elderly and Disabled People in the Urban Environment: Does the 15-minute City Paradigm Protect Them?

By Letizia Cremonini[*], Teodoro Georgiadis[±], Marianna Nardino[○], Federico Carotenuto[•], Edoardo Fiorillo[○], Daniela Famulari[♦], Sheliza Thobani[•] & Duccio Caccioni[♠]

The 15-minute city is now considered paradigmatic in representations or models of cities. This city should allow all citizens access to all services, with each service located within a distance that takes no more than fifteen minutes to reach from any point in the city. However, would such a city be truly equitable encompassing the diversity of a population, or would it only represent the center of the Gaussian bell curve, with a reasonable deviation from the maximum of the Gaussian? Let us consider a person who is elderly, chronically ill or has limited mobility. This paradigm does not make him/her safe concerning the exposure to a climate risk within the current urban structure. The risk is directly related to climate exposure and thus to the time it takes to perform an "everyday life" task (e.g. going shopping). Studies show that an older adult with limited mobility also has limited ability to remain in a state of physiological well-being when exposed to a heat wave, so the 15 minute-city does not produce as much benefit for those living towards the tail end of the Gaussian. This example of an elderly person with limited mobility can, moreover, be aggravated by the presence of any disabilities. The first results of Horizon Europe Project CARMINE and of the interaction with a group of stakeholders who were asked how they would work to introduce Nature Based Solutions (NBS) in the Metropolitan area of Bologna are presented in the findings. The objective of the CARMINE Project is to create a decision support system, scalable to European cities, for implementing urban climate policies in the Climate Adapt Platform.

Keywords: *elderly, disables, equity, exposure, policies.*

Introduction

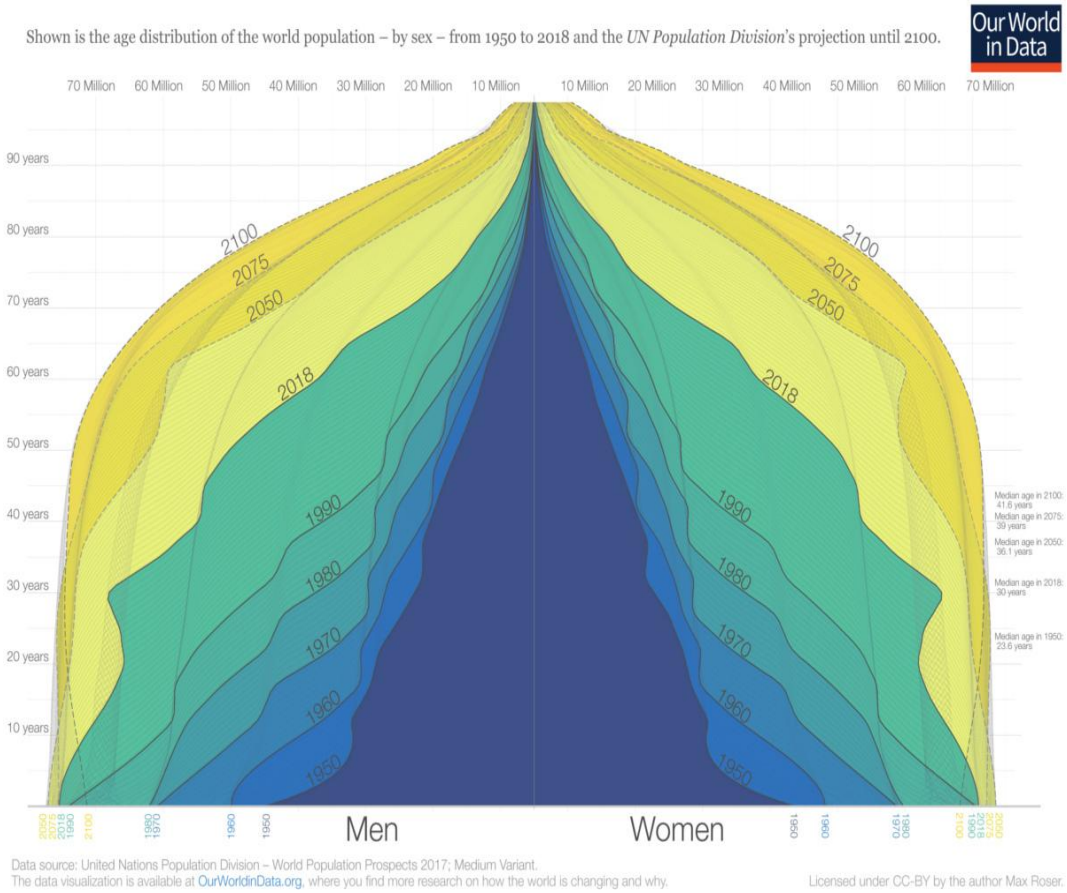
Today, urban planning in European cities is an ongoing collaboration process between various sectors, including planning, climate, environment, cultural heritage,

[*]Researcher, Institute for the BioEconomy, CNR, Italy.
[±]Sr. Research Assistant, Institute for the BioEconomy, CNR, Italy; Deputy Head, Environment Unit, Athens Institute, Greece.
[○]Researcher, Institute for the BioEconomy, CNR, Italy.
[•]Researcher, Institute for the BioEconomy, CNR, Italy.
[○]Researcher, Institute for the BioEconomy, CNR, Italy.
[♦]Researcher, Institute for the BioEconomy, CNR, Italy.
[•]European Projects Manager, Sustainability & Innovation · Caab Spa - Centro Agroalimentare di Bologna, Italy.
[♠]Marketing & Quality Director at Caab Spa - Centro Agroalimentare di Bologna, Italy.

economy, and social policies. Talking about urban planning today is very different from the urban planning that marked the explosive phases of urban development that characterized previous decades. Today, we face new challenges that are immeasurably greater than those of the past. Among the phenomena linked to climate change, the Urban Heat Island (UHI) combined with heat waves has the most significant impact in urban areas; therefore, it is essential to determine strategies to enable the population to counteract its effects.

If we imagine the cities of the near future, it seems likely that, over the next few decades, human beings will increasingly be drawn to urbanized centers. Furthermore, statistics show that these cities will be predominantly composed of the elderly, which are considered the least productive category and, at the same time, the one that falls ill the most (see Figure 1). Therefore, this category may have the most significant impact on our social system. As life expectancy continues to increase, it is important to consider the potential impact on social costs, which may rise exponentially.

Figure 1. *Distribution of the Population by Sex from 1950 to 2018, and the UN Population Division's Projection until 2100*



Source: licensed under CC-BY, by the author Max Roser. (The World Population Pyramid)

Suppose our scientific and technological advances remain at their current level. In that case, there is a risk that the social costs associated with the increase in the number of elderly people could increase significantly. It would be interesting to assess whether

urban and European governance are prepared to tackle this societal challenge. Moreover, with what tools might this challenge be achieved?

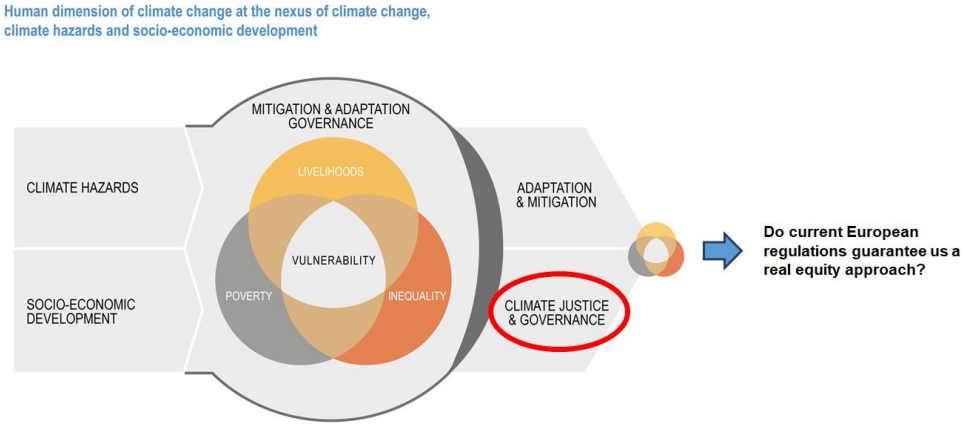
In the international debate on climate change, specific terminologies such as "resilience," "equity," and "renewability" are often used, but these phrases risk becoming ‘empty’ if not properly defined. For example, a relatively recent urban planning model is known as the "15-minute city". At first glance, it seems like a very advanced concept, being able to access all urban services within fifteen minutes, but on closer inspection, the question arises: "Who is it aimed at"? Perhaps a "standard" citizen of average age and average physical condition.

Moreover, here, the concept of "equitable" already begins to falter. How equitable can a city be if it is built around the average person, as opposed to the elderly person with health or mobility problems? From a quick Internet search, it would be easy to determine that a citizen with mobility problems may only have range of autonomy of a few hundred meters.

Starting from the United Nations 2030 Agenda for Sustainable Development, which sets out 17 interconnected challenges, we can focus precisely on the two primary targets for the urban environment, which will serve as our guide, referring to other European support policies where appropriate. The two sustainable development goals most relevant to the urban system are number 11, "sustainable cities and communities," and number 13, "climate action." Of course, the others are also important, but the urban agenda sees these two targets as essential for solving cities' challenges.

However, let us return briefly to the concept of equity. Consider, for example, an elderly person with a disability, low income, and no family support — a figure that, though statistically rare in our demographic-economic pyramid, represents one of the most vulnerable segments of society. While such individuals may lack in visibility or representation, this does not diminish their inherent value as individuals, and the wealth of experiences and knowledge they possess. Those living in our cities may be more exposed to climate phenomena than other categories, and our cities may not always respond equitably to their needs. What is an equitable approach that could be adopted at the European level? The European level is concerned about these issues, but does it also consider whether these citizens can be treated like others? It is important to recognize that these citizens require a different, and more inclusive approach. It is precisely their fragility that requires us to treat them differently, precisely in order to fully apply the concept of climate justice (see Figure 2). It is, therefore, necessary to analyze their needs in greater depth.

Figure 2. *The Human Dimension of Climate Change is at the Nexus of Climate Change, Climate Hazards, and Socio-economic Development*



Source: Birkmann, J., et al. (Birkmann, J. et al., 2022)

This study proposes a methodology within the Horizon Europe CARMINE Project (Carmine Project website, 2024), which is currently being tested for validity and operability. This Methodology seeks to establish an integrated strategy that aligns existing regulations (European, national, regional, and local) with scientific tools to understand the needs of vulnerable people and identify potential solutions, both operational and regulatory, for incorporation into urban planning instruments. In the short term, the intention is to integrate these solutions into the regulatory and operational/implementation framework, from local to regional and national levels.

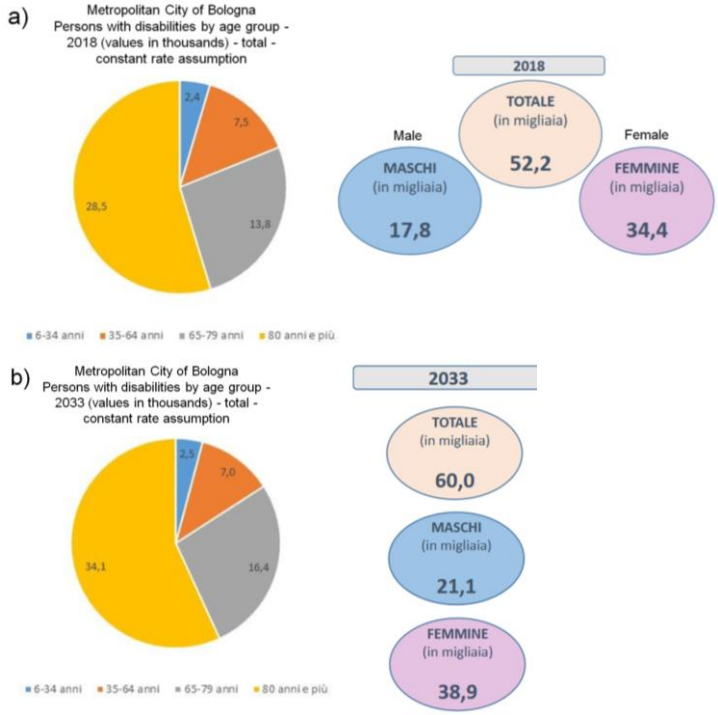
Methodology

Bologna is the capital of the Emilia-Romagna region. The municipality has approximately 400,000 inhabitants, and its metropolitan area has over one million inhabitants.

The CARMINE Project is working with partners to develop a knowledge-based framework to address adaptation and mitigation in eight European metropolitan regions. The project is designed to bridge the gap between science and practice, to create actionable tools, products, and services that will improve the climate resilience of local communities and support decision-making at the European level. It is understood that the eight case studies defined include one from the Metropolitan City of Bologna. This study aims to explore the complexity of vulnerable populations in achieving equity during climate-related risks and access to essential services, such as quality, fresh food. In other words, the study will seek to establish the extent to which the city can respond equitably to the needs of complex, vulnerable groups of the population during the summer months. This is a critical consideration given the city's experience of heat waves coupled with UHI. However, in such a city, pollution also appears to be strongly correlated with the effect of the local microclimate due to recirculation processes (secondary circulation). To adapt to climate change means also to deliver under proper atmospheric conditions and move toward electric delivery. In Figure 3 demographic data for 2018 show that the Metropolitan area of Bologna has a

total of 52,000 people with disabilities, two-thirds of whom are female. The same figure projected for 2033 appears to confirm an increase in the number of people with disabilities. It will inherently raise questions about the potential economic impact on the region's social and healthcare systems in due course.

Figure 3. *a) Metropolitan City of Bologna, Total of Persons with Disabilities by Age Group, (value in thousands), Constant Rate Assumption, Year 2018; b) Metropolitan City of Bologna, Total of Persons with Disabilities by Age Group, (value in thousands), Constant Rate Assumption, Year 2033*



Source: Statistical Area, Municipality of Bologna

How might urban policy be organized so that those facing disadvantages have their own "life plan" (Progetto di vita policy, 2024; The United Nations Convention on the Rights of Persons with Disabilities, 2017), a degree of autonomy, and "true" dignity in their daily lives? Legislative Decree 62 of 3 May 2024 seeks to define and detail the importance of placing the individual's wishes at the center of all reasoning, respecting personal expectations and desires. This decree could be seen as a step forward in our understanding of disabilities and the support needed to enable disabled people to live their lives fully. It is possible to identify this threshold of autonomy through a multidimensional assessment carried out specifically for the individual. This individual assessment considers several factors, including the disability, other medical conditions, and the wishes and expectations of the individual concerned. It also looks at the possible margins of autonomous management that the person can achieve daily. Based on this assessment, the social/health service reasonably adapts to the environment surrounding the disabled person to guarantee their right to life as independent and integrated as possible in the Community around them.

It is, therefore, not just a matter of welfare policies but also urban planning policies: it is a matter of "sustainable delivery," i.e. the possibility of finding quality food at affordable prices within a distance that can be reached within a time that does not expose the vulnerable individual to the physical risks posed by heat waves. In an inclusive and equitable city, the very concept of a "food desert" should be eliminated. The concept of food desert describes the poor access to nutritious food experienced by residents in urban or rural areas, and if high quality foods are available, they often are unaffordable for vulnerable groups. In the Food Desert EU Policy, it would be ideal for there to be no neighborhoods where people living in poverty will have limited access to fresh and healthy products. It is important to acknowledge that these food deserts, and lower-income neighbourhoods, may be particularly vulnerable to specific health challenges, such as obesity, diabetes, and cardiovascular disease (Smets et al., 2022; Food desert, 2022; Rogers, 2024; Mylona et al., 2016).

A polycentric city based on a well-connected infrastructure network (railway station, integrated public transport, safe cycle, and pedestrian paths) that allow citizens to move around independently and at their own pace, without having to rely exclusively on private vehicles to access the entire metropolitan system, could be a winning formula.

The concept of the polycentric city emerged in the 1970s, when, in response to the urban sprawl that had characterized European cities in the previous decade, urban planners and researchers began to recognize new urban challenges, such as traffic congestion caused by people commuting to work in city centers. The gradual and increasingly coherent organization of public transport and the infrastructure system, in general, has encouraged the creation of autonomous secondary centers, which were intended to counteract the phenomenon of sprawl (Lemoy, 2024). This city model continues to respond coherently to the needs of new citizens as it adapts to any strategic evolution. A polycentric city model is probably possible because of its fractal-like characteristic, which responds adequately to the ever-increasing need to manage a multitude of citizens and city users of European metropolitan systems. The model appears to be adaptable in responding to new urban challenges, such as the risks posed by the impacts of extreme weather events.

What, then, can be meant by the term 'risk'? It is the product of danger multiplied by vulnerability multiplied by exposure. Therefore, there is no such thing as a standard citizen; there are differences that entail different risks, even if they are present at the same point x, y, z at time t. Is the concept of the food desert included within inclusive food policies? Yes, it is, but there may be other factors to consider. These factors are included in health policies about food quality for vulnerable groups, with the local application of the "Farm to Fork" policy, which aims to promote local products and their supply chains while guaranteeing their quality at affordable prices (European Commission, 2020).

The Food Desert Policy is also closely linked to economic policies for vulnerable populations with low ISEE ("PNRR" - National Recovery and Resilience Plan) income, part of which, not surprisingly, often includes a significant percentage of elderly people living alone. It falls within the scope of equitable accessibility in an urban fabric that is shaped by the needs of vulnerable people (disability policies, "Life Project"). The food desert policy is linked to the Small Business Act commercial

policy, which focuses on local SMEs operating in a well-defined area (European Union, 2008) and promotes the creation of "natural shopping centers" and "natural markets" (Regional Council of Piedmont, 1999; Confcommercio, 2013) as a model of cooperation at a neighborhood level.

A natural shopping center is an organized group of shops, restaurants, accommodation facilities, market areas, and craft activities. Public-private partnerships are considered one of the most suitable legal forms for representing the interests of all stakeholders, particularly in implementing actions and programs aimed at the redevelopment and promotion of local areas. These public-private partnerships hold significant potential as a tool for supporting many social and local activities to increase the inclusion of vulnerable groups.

The Food Desert policy also aims to foster enhanced "walkability," i.e. the possibility of reaching places safely, favoring travel on foot, by bicycle, or by public transport (Salat et al., 2017).

Finally, this approach also includes the creation of small pocket parks, which provide places of rest and recreation for vulnerable people, as well as places for relaxation and socializing. These parks serve the dual purpose of providing cooling areas and creating new places of social interaction to combat isolation. It is possible that, if they are designed well, pocket parks might be able to eliminate some car parking areas at little cost, enabling urban areas to be more inclusive.

It is important to consider that vegetation in Nature-Based Solutions (NBS) is used as an adaptation element, and in its physical content, it contributes to mitigation by reducing the heat island effect. Firstly, through the shading of the tree canopy on a given building; simultaneously the plants act as an adiabatic cooler for nearby buildings, acting as a cold screen, thanks to the second law of thermodynamics. This characteristic allows surrounding buildings to lose heat to the plants selected, distributed, and numerically appropriate for the project. It reduces the cooling requirements of the buildings facing them and, therefore, the CO_2 emissions necessary for operating the thermal machines for air conditioning. When selecting the species to be planted in each project, it may be beneficial to consider the WWH rule:

- Which plants should be selected for planting?
- Where should they be positioned?
- How many should be planted?

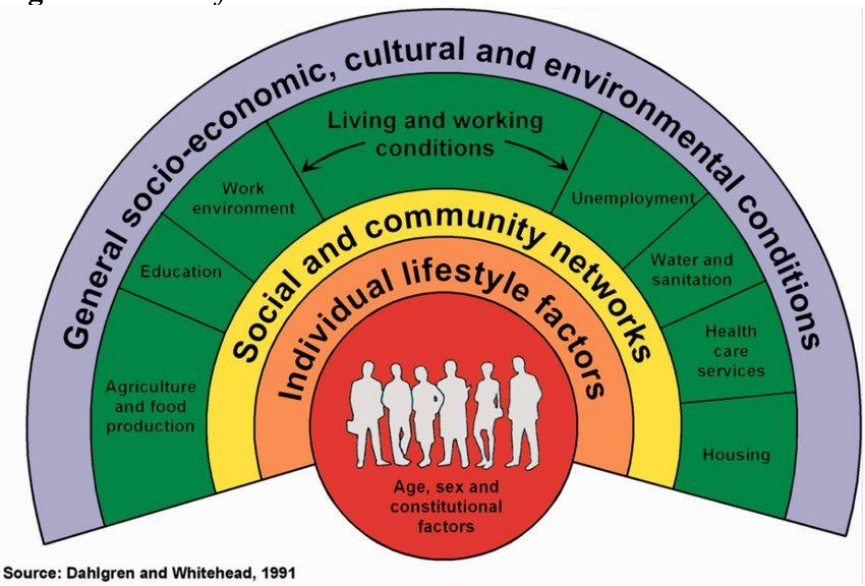
In the context of building and urban development projects in dense urban areas, it would be beneficial to consider this rule as a guiding principle, with its validity verified on a case-by-case basis using microclimate modeling. In terms of inclusion and safety, it would be beneficial to consider a further assessment of the social protection of the area, which could be achieved through a policy of opening shops and ensuring socially beneficial services are available 24 hours a day (through public-private agreements and partnerships).

It could be important to include another aspect in the complex reasoning. In a polycentric city, introducing means of transport (cars, buses, trains, etc.) is a critical factor, as it has led to planning taking on new forms. The possibility of moving easily and quickly, even within the same city, has made it possible to create purely

commercial areas rather than mixed-use areas, such as historical centers or inner suburbs, where homes and shops are easily accessible by foot. This is one of the key points in the debate on redeveloping urban areas suitable for low-income people. The important aspect is not the 15 minute-city, but rather the creation of a livable environment that is easily accessible to all. Consider revising this approach to social cities, particularly in densely populated urban centers, where low-impact transportation options could be prioritized for deliveries and general movement. Additionally, it would be valuable to explore ways to incorporate green spaces into our urban planning, recognizing their potential not only as a route for physiological revitalization but also as a place for social interaction and enhancing overall well-being.

It is suggested that European cities' responses should ensure a level of complexity at all governance levels and in all the disciplines that build the city (see Figure 4). It is vital to ensure that a social and service dimension is in place for vulnerable individuals to meet their basic needs and recognize the relational and social systems that contribute to personal identity, within a social context, and that values their contributions. In understanding vulnerable community members and fostering equity, it is of the utmost importance to preserve the dignity of the individual.

Figure 4. *Model of Health Determinants*



Dahlgren, G. and Whitehead, M. (1991). Policies and Strategies to Promote Social Equity in Health. Stockholm: Institute for Futures Studies.
Source: Dahlgren et al. (Dahlgren et al., 1991)

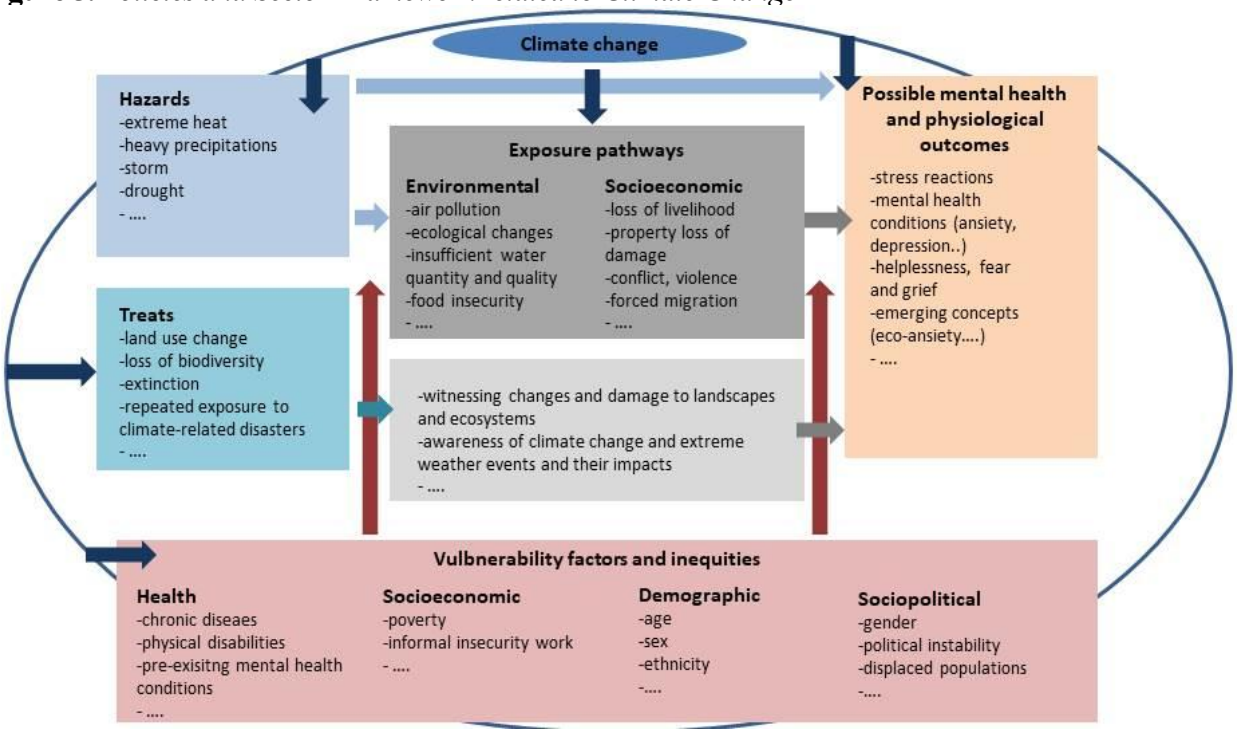
Fortunately, there are now a variety of tools at our disposal that can assist us in evaluating this across various scales and operational levels. The growth of European projects in recent years has been a valuable source of insight, helping us to identify approaches and methodologies that provide a framework for the various disciplines involved and their interactions. For instance, we have been able to draw on the Blue Green Solutions project (Blue Green Solution project, 2015) and the Eklipse project (Eklipse Project, 2017) to develop software and tools that facilitate climate

assessments at the micro and mesoscale. This knowledge enables us to represent the city's current and future responses.

We have outlined how to address this future challenge from a technological and scientific point of view. We have also understood what policies need to be taken into consideration in order to elicit the responses needed from the cities of the future. However, it is also worth considering a systemic approach that could help us to synthesize the complexity we face and must manage. Figure 5 shows a framework representing all the components at play. This framework includes the identification of a problem, which is climate change, and all the phenomena that impact the territory, and its direct and indirect impacts (hazards and threats). Ensuring that living beings are represented in the system is vital, and this study focuses on human beings.

Furthermore, individuals are exposed to environmental and social risks, with possible outcomes that climate change generates for them from both a physical and mental point of view. The lowest level represents the mechanisms and sectors that trigger the various impacts on humans, as shown in the exposure box. This framework was used to systematize the policies and sectors involved in the CARMINE Project Bologna case study to achieve the following results.

Figure 5. *Policies and Sector Framework related to Climate Change*



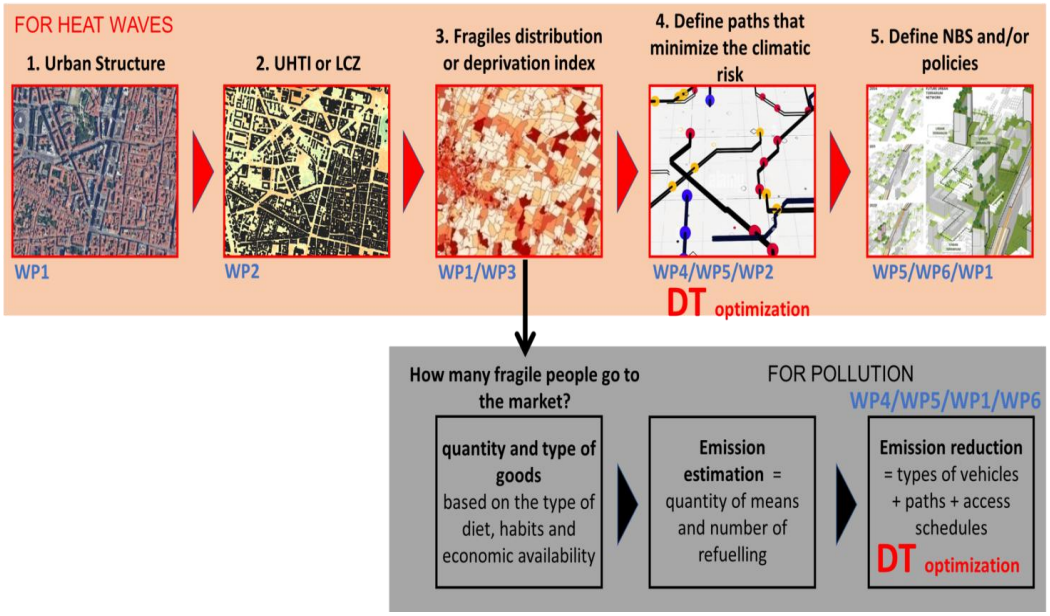
Source: The Authors

Results

Applying the system framework described in the introduction to CARMINE's Bologna case study and taking into account the policies involved (Life Project, Smart Business Act, Farm to Fork, Transit Oriented Development, Food Desert), the focus is on the vulnerable individual. Likely, an elderly person who is chronically ill (i.e., diabetic or suffering from heart disease), lives alone on average, has a low-income and has difficulty moving around independently. This person likely does not have access to a private vehicle, or is unable to drive, but needs to go shopping, as part of their daily activities. They are likely more exposed to the risk of heat waves than those of average age and good health, simply because it may take them longer to travel to their destination (e.g. fresh food markets). This exposure can lead to psychological and physical challenges in the short to medium term, which may hurt their quality of life (Gamble et al., 2016). The CARMINE project has sought to involve local stakeholders in a Living Lab (https://schub.carmine-project.eu/llm/#/ llm/living-lab/10?tabNo=0#tabs), which is collecting and analyzing the real needs of the project's target audience and their respective supply chains.

During the first workshop held in November 2024, stakeholders most directly involved with vulnerable and disabled people expressed the need for autonomy among the various categories of disabled people.

Figure 6. *Bologna's Methodology for Urban Frails, Risk and Exposure to Heatwaves and Pollution*



Source: The authors

If we consider the methodological framework (see Figure 6), two approaches for analysis have been identified that may be worth pursuing. The first of these is the analysis of the urban fabric during heat waves. Given the structure of the city and its behavior in terms of microclimate, the distribution of vulnerable people is analyzed, taking into account all their characteristics, and the most likely routes they take to

pursue their daily activities are hypothesized, including with the aid of digital twins. Based on these results, possible adaptation and mitigation actions can be defined. The second approach is linked to the well-being of vulnerable people. It considers aspects such as food quality, distribution, cost, and air quality, i.e. pollution linked to food-delivery transport.

In developing this Methodology, based on the number and type of vehicles that deliver products to the various markets, the presence of vulnerable population groups, and the deprivation index, four markets will be selected as the most representative of the communities within the Metropolitan City of Bologna. In order to describe all the urban and social situations that represent the structure of the municipalities in the metropolitan city, it would be advisable to select at least one market in the largest urban center (Municipality of Bologna), one in a medium-sized urban center, and another in a smaller urban center. This cross-section will allow all the critical issues and potentials to emerge based on each degree of urban density. Once the markets have been identified, we will move on to the next stage, which will involve analyzing the long-term trend concerning the UHI risk coupled with heat waves. In the next phase, consider the demographic distribution to analyze the "most likely" routes from a given point X to the market for each of the four markets. This would allow us to obtain the most likely potential routes to reach that market (GIS analysis). In the final phase, it is envisaged that the routes to be verified through microclimate simulations (using ENVImet software) will be identified from the route map to highlight vulnerabilities along these routes. Then other simulations could be carried out – this time during the design stage – which would allow the possibility to pre-determine new solutions.

The digital twin could potentially assist in classifying routes based on variables or elements that may contribute to discomfort, particularly in relation to microclimate comfort and pollution levels. It will also be possible to suggest regenerative urban solutions (NBS), advice for the population of Bologna, and guidance for local and regional policymakers.

It is important to note that data relating to vulnerable and disabled people is sensitive, so it will be necessary to consult the relevant authorities (the Local Health Authority of Bologna and associations representing these categories), which are included in the list of stakeholders already actively involved in the project.

Discussions

Why are adaptation issues prioritized over mitigation issues when analyzing the contents of the 2030 Sustainability Agenda? It is important to note that this criticism is not entirely without foundation, even when considering the findings of the 6th IPCC Report, which indicates that even if we achieve net-zero CO_2 emissions for several decades, the Earth's system will likely remain largely unaltered. It is not entirely fair to say that it is unjustified because applying urban planning techniques such as NBS are indeed adaptation measures, but they are also mitigation measures. Transit-Oriented Development and sustainable delivery are adaptation techniques. However, they have

a high mitigation content by reducing CO_2 and pollutant emissions, and we can consider them to be urban planning techniques.

The example of vegetation as an element of NBS is paradigmatic for many "rigid" cities, i.e., those containing monumental heritage sites that rightly represent a common identity for the resident population and are protected by the European Landscape Convention itself. Understanding that this vegetation performs the fundamental task of reducing sensible heat is vital. For this reason, its characteristics and purposes must be defined within the urban regeneration process. In order to do this, the ex-ante and ex-post aspects of the intervention must be studied in depth. It is important to avoid an ideological approach and to adopt an exclusively scientific approach. This vegetation also has characteristics that can negatively impact health, if not correctly identified in new plantings or replacement works. We see in complexities and urgencies of lung and allergen diseases in young children that revoke these NBS interventions, especially with the presence of extended pollen periods due to climate change. These extended pollen periods can cause negative impact on this vulnerable section of the population.

Due to these complexities in urban planning, an interdisciplinary approach to design is essential to achieve a response consistent with the objectives to be achieved. The WWH method, when combined with tools for microclimatic validation of the proposed solutions, could offer valuable support to policymakers in carefully selecting tree and shrub species to be planted in urban contexts. This could prevent any intervention from becoming unjustified, revoked or evident in greenwashing.

This is the current state of affairs about regeneration. From the analysis carried out thus far, another aspect has come to light, one closely linked to the number of elderly people: their integration into today's society. Elderly members are often far from their family environments, when they have one, and then there's the issue of property retrofitting. This can present unique challenges in a country like Italy, where the housing stock is often in the hands of families. It is interesting to note that in the past these properties were seen as safe havens, and today, it is heartening to see that nearly 80% of these families are direct owners of such properties. However, Istat (Italian National Institute of Statistics) has reported an increase in the percentage of homes with elderly residents out of the total number of owner-occupied homes, which now stands at 41% (Auser, 2015; Liberopensiero Immobiliare, 2016). The challenge here is twofold. On the one hand, there is the issue of finding the motivation that can drive an elderly person to undertake renovation work. If an elderly person lives alone, what desire might they have to engage in renovation? Furthermore, the properties are generously proportioned, with floor space that may exceed the requirements of a single elderly person. The main challenge that arises is therefore to find financial solutions that enable elderly people to solve the problem of loneliness, while ensuring adequate maintenance and renovation of their properties, allowing social housing solutions.

Redevelopment is a topic that has sparked a great deal of discussion within the Community. Unfortunately, this has also led to establishing a specific "standard" in building design, perhaps without fully grasping the richness of our country's diversity and cultural heritage. Culture and diversity are part of our widespread built heritage, which is of monumental value, and it is undoubtedly true that this does not meet the

new generation of energy criteria. Current planning does not allow for adaptation to respect the existing fabric's historical and artistic fabric (a real intellectual and operational limitation). Moreover, we are frequently faced with a conflict between preserving monumental value and avoiding fuel poverty, i.e. the inability to meet the costs of heating and cooling buildings due to low household income. The tendency to focus on mandatory regulatory compliance, dictated by a consumer market for the sale of heating and electrical systems, may be causing us to overlook the cooling and heating systems of existing buildings.

The study of historical air conditioning systems in houses within the context of monumental value, such as country houses, is important, as they are built with a specific orientation and calibrated, functional openings. Once the existing situation has been analyzed, it may be possible to design the surrounding green space in a way that improves both the functional system and the microclimate.

In the spirit of cooperation and to enhance the usability and operational effectiveness of the adaptation and mitigation measures and policies on vulnerability outlined in the Methodology, it might be beneficial to consider their inclusion, where feasible, in national legislation and regulations concerning construction and urban greenery (Ministry of the Environment and Protection of Land and Sea, 2018), It is worth noting that this is particularly relevant in passages that may, directly and indirectly, affect both public and private open spaces (as well as buildings near them).

The current regulations incorporate concepts such as acoustic, energy, thermal performance, and soil permeability (index). The same cannot be said for the microclimate and urban components that can affect it. For instance, at the national level, there is a degree of influence over free building activities, such as repair, renovation, and replacement of building finishes that do not require a building permit from the municipality. For example, the permeability index is now indicated in the replacement of paving and the finishing of outdoor spaces and parking areas, with reference to the municipal urban planning instrument. Consider introducing guidelines on a minimum albedo threshold for materials. At the municipal level in the Emilia Romagna region, some municipalities have introduced mandatory guidelines that aim to respond with adaptation measures. However, these involve obligations are often conflicting with the desire to combat climate change, such as planting distances, increased CO_2 from construction zones and elevated noise pollution levels, and becoming an inherent nuisance to surrounding neighbors.

For example, this has led to a situation where owners who fail to plant the number of trees, specified by law for the square meters of land they occupy, must pay for this failure. Another option would be to increase the diameter of sewer pipes during maintenance and upgrade work on the network, for example, by working on sections of neighborhoods at a time.

In public administration construction projects, the integrated action agreement between these parties could provide a microclimatic assessment (ex-ante/ex-post) of new works. In this case, we are referring to works in urban areas or works that may impact UHIs in the existing context. Public administrations could receive financial incentives from the region to undertake this work; otherwise, there is a risk of remaining stuck in an empty rhetoric about climate change.

Generally, urban regeneration projects involving increased floor space would ensure a permeability index and an albedo threshold in line with the municipal urban planning instrument. Where this is not specified, guidelines should be provided. To further facilitate urban regeneration, consideration could be given to increasing the percentage reduction in the building contribution by including microclimate safety measures, such as niches and microclimate paths, among the works. These measures could be incorporated into the areas to be regenerated/redeveloped. When paying the building contribution for urbanization works in facilities intended for tourism, commercial activities, and services, it may be possible to introduce incentives for activities that apply adaptation and mitigation measures (construction cost calculation). For new construction or urban redevelopment projects, consideration could be given to incorporating microclimate assessment into the provisions of the implementation plans and negotiated agreements.

Regarding policies for vulnerable people, Italian urban planning and building legislation made significant progress in 2009 by replacing the term 'handicapped' with 'disabled' in all existing regulations, thus encompassing a broader range of categories. A further step is now important to facilitate the necessary paradigm shift and clarify that disability does not lie in the diversity or categories of individuals, but in urban policy, which fails to respond to their needs.

Furthermore, properly organizing loading and unloading areas for goods deliveries is crucial to encourage small, neighborhood shops and 'natural shopping centers', such as farmers' or community markets, in the city. This action has been overlooked, causing the historic center to become more of an administrative hub than a commercial center. While aesthetically attractive roads and pavements are being built, they are being constructed close to shops that are on the verge of closure and places that are becoming increasingly unwelcoming, which is causing safety problems.

Another regulatory provision that could be addressed by implementing adaptation solutions, such as pocket parks, to promote socialization in dense urban areas, as it relates to outdoor spaces that serve food and beverages. When issuing the necessary authorizations and concessions, it would be interesting to explore the possibility of an agreement between the public administration (PA) and commercial businesses. For instance, if the PA plans to create a pocket park near a commercial establishment that serves food and beverages, such as a bar, the PA could solicit the help of the bar to manage the pocket park, in exchange for maintenance and management of the entire facility, resulting in a tax relief or other government funding. The establishment would be obliged to provide a certain number of shaded seats and access to public, potable water.

Conclusions

Such complexities cannot be resolved with simplistic, ideological answers, such as the 15-minute city. For example, a lawn may appear to mitigate climate change, but it can also pose a barrier for disabled people, forcing them to take greater risks due to the need to take a more complex route. This lawn might be a green space, but it is not

an NBS that targets the unique vulnerabilities of the individual citizens that we need to protect the most. The combination of targets 11 and 13 of the 2030 Sustainable Development Goals (SDGs) Agenda therefore, highlight the need for urban systems to engage with public administrations, as demonstrated by the PINQuA (Innovative Programme for Quality Living, 2019), as well as with intermediate bodies, trade associations, voluntary associations, and all stakeholders – particularly public health services and vulnerable community members.

An analysis of today's challenges, therefore, reveals the need for urban planning capable of grasping complexities, abandoning standardized concepts, and incorporating diversity into its models. This is not an easy task, but it is necessary given today's challenges. These challenges emerge most forcefully in metropolitan systems and regional connections. What does a metropolitan city mean without equal knowledge of the territory, demographics, and tools for making informed choices? Knowledge is not only awareness of the current state of affairs but also the ability to choose from a range of options. Modeling and digital twins are now an indispensable tool in urban planning because it enables the optimal choice to be made from a range of options. However, for harmonious territorial development, all stakeholders — public administrations, professional associations, and other groups — must have easy access to these tools. This is possible but requires organization according to specific themes, or an appropriate training plan.

Returning to today's challenges alongside urban regeneration, the increase in average life expectancy means that the Longevity City model is becoming increasingly prevalent among urban planning models. This model aims to create spaces that promote cognitive and physical well-being in all age groups.

However, urban regeneration alone may not be sufficient to sustain a system where the percentage of young people is much lower than that of the elderly population. Moreover, this demographic is shrinking year over year, at least in Italy, as it is attracted by the job and lifestyle guarantees offered by other countries. Baby boomers are currently seen as an indispensable resource in finance and the economy, as they have both capital and the financial knowledge to manage their wealth in line with the evolving economic landscape. The global financial sector has set out guidelines for policymakers and entrepreneurs to follow in the coming years, which could help to address the financial, economic, and health challenges we are already facing. The first paradigm shift is to stop considering aging as a cognitive and physical decline and to start considering it for its strengths: history, wisdom and culture. Older people are seen as mature consumers with knowledge and self-awareness. If they are in good health, they become careful selectors of products and thoughtful about their dependencies, such as the use of technology, as well as seekers of quality time and connection. If they are not in good health, we need to consider more equitable solutions to ensure their long-term well-being and access to quality, healthy food and other essential services. We need to ensure that the growing risks for heat waves (and other climate risks) do not diminish their good health by enabling their isolation or solitude, but instead, utilize climate mitigation and adaptation tools to promote outdoor spaces for cooling, rest and socialization when engaging in daily activities. This does not necessarily need to be encompassed within the 15-minute city, but it does need to have an individualized approach that targets specific disabilities.

Improving the health and well-being of the elderly population can save money on social and healthcare costs. Another area of action concerns the millennial and younger generations: increasing financial literacy to promote informed, financially sustainable economic choices. This would improve life expectancy for families in general (World Economic Forum, 2025).

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References

Birkmann J, Liwenga E, Pandey R, Boyd E, Djalante R, Gemenne F, Leal Filho W, Pinho PF, Stringer L, Wrathall D (2022) Poverty, Livelihoods and Sustainable Development. In: Pörtner HO, Roberts DC, Tignor M, Poloczanska ES, Mintenbeck K, Alegría A, Craig M, Langsdorf S, Löschke S, Möller V, Okem A, Rama B (eds.) *Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the IPCC*. Cambridge University Press, Cambridge, UK and New York, NY, USA, 1171–1274. https://doi.org/10.1017/9781009325844.010

Dahlgren G, Whitehead M (1991) *Policies and strategies to promote social equity in health*. Stockholm: Institute for Futures Studies.

Gamble JL, Balbus J, Berger M, Bouye K, Campbell V, Chief K et al. (2016) Chapter 9: Populations of Concern. In: Crimmins A, Balbus J, Gamble JL et al. (eds.) *The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment*. U.S. Global Change Research Program, Washington, 247–285. Available at: https://health2016.globalchange.gov/low/ClimateHealth2016_09_Populations_small.pdf (Accessed: 5 January 2025)

Mylona K, Maragkoudakis P, Bock AK, Wollgast J, Caldeira S, Ulberth F (2016) Delivering on EU food safety and nutrition in 2050 – Future challenges and policy preparedness. *EUR27957 EN*. Publications Office of the European Union, Luxembourg. https://doi.org/10.2787/625130

Salat S, Ollivier G (n.d.) *Transforming the urban space through transit-oriented development: The 3V approach*. World Bank, Washington, DC. Available at: https://openknowledge.worldbank.org/bitstreams/0818e8e4-5463-5102-90c1-6dd9b9df0f39/download (Accessed: 2 July 2024)

Smets V, Cant J, Vandevijvere S (2022) The changing landscape of food deserts and swamps over more than a decade in Flanders, Belgium. *International Journal of Environmental Research and Public Health*, 19(21):13854. https://doi.org/10.3390/ ijerph192113854

Web Sources

Anffas (n.d.) *Progetto di vita policy*. Available at: https://www.anffas.net/it/cosa-facciamo/supporto-alle-persone-con-disabilita/progetto-di-vita/ (Accessed: 20 May 2025)

Auser (2015) *Presentation of the Second Report on the housing conditions of elderly people living in their own homes in Italy* (in Italian). Available at: https://auser.it/comunicati-stampa/presentazione-del-secondo-rapporto-sulle-condizioni-abitative-degli-anziani-in-italia-che-vivono-in-case-di-proprieta-2015/ (Accessed: 5 June 2025)

Blue Green Solution Project (2015) Available at: https://bgd.org.uk/ (Accessed: 20 October 2024)

Confcommercio (2013) *Natural shopping centres: the Italian way sets an example* (in Italian). Available at: https://www.confcommercio.it/-/centri-commerciali-naturali-la-via-italiana-fa-scuola (Accessed: 22 July 2024)

Eklipse Project (2017) *An impact evaluation framework to support planning and evaluation of nature-based solutions projects*. Available at: https://climate-adapt.eea.europa.eu/en/metadata/publications/an-impact-evaluation-framework-to-support-planning-and-evaluation-of-nature-based-solutions-projects (Accessed: 10 June 2024)

European Commission (n.d.) *Farm to Fork Strategy*. Available at: https://food.ec.europa.eu/horizontal-topics/farm-fork-strategy_en?prefLang=it (Accessed: 20 May 2025)

European Union (n.d.) *A 'Small Business Act' for European SMEs*. Available at: https://eur-lex.europa.eu/EN/legal-content/summary/a-small-business-act-for-european-smes.html (Accessed: 12 May 2024)

Horizon Europe CARMINE Project. Available at: https://carmine-project.eu/ (Accessed: 4 June 2025)

Lemoy R (2024) Monocentric or polycentric city? An empirical perspective. Available at: https://doi.org/10.48550/arXiv.2403.07624 (Accessed: 14 June 2025)

Libero Pensiero Immobiliare (2016) *La questione abitativa in Italia e a Bologna* (in Italian). Available at: https://www.liberopensieroimmobiliare.com/la-questione-abitativa-in-italia-e-a-bologna (Accessed: 6 June 2025)

Ministry of the Environment and Protection of Land and Sea (2018) *Strategia nazionale del verde urbano* (in Italian). Available at: https://www.mase.gov.it/portale/documents/d/guest/strategia_verde_urbano-pdf (Accessed: 15 September 2024)

PInQUa Programme (2019) (in Italian). Available at: https://territorio.regione.emilia-romagna.it/politiche-abitative/erp/programmi-di-intervento/pinqua (Accessed: 10 June 2025)

Regione Piemonte (1999) *Resolution of the Regional Council of Piedmont n° 563-13414* (in Italian). Available at: https://legislazionetecnica.it/node/2652484 (Accessed: 22 July 2024)

Rogers K (2024) *Food desert. Encyclopedia Britannica*. Available at: https://www.britannica.com/topic/food-desert (Accessed: 20 June 2025)

StudySmarter (n.d.) *Food desert*. Available at: https://www.studysmarter.co.uk/explanations/human-geography/agricultural-geography/food-desert/ (Accessed: 10 April 2025)

The World Population Pyramid (1950–2100). Available at: https://www.populationpyramid.net (Accessed: 12 June 2025)

United Nations (n.d.) *Convention on the Rights of Persons with Disabilities* (in Italian). Available at: https://www.lavoro.gov.it/temi-e-priorita/disabilita-e-non-autosufficienza/focus-on/Convenzione-ONU/Documents/Convenzione%20ONU.pdf (Accessed: 10 April 2025)

World Economic Forum (2025) *Future-Proofing the Longevity Economy: Innovations and Key Trends*. White Paper. Available at: https://reports.weforum.org/docs/WEF_Future_Proofing_the_Longevity_Economy_2025.pdf (Accessed: 10 January 2025)

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The Birth Connection: An Examination of the Relationship between her Birth Event and Infant Feeding among African American Mothers

*By Nicole Banton**

There is an epidemic of maternal and infant death rising in plain sight in the United States. The maternal and infant mortality rate of Black/African-American mothers is three times that of White/European Americans in the US. Current research indicates that breastfeeding lowers both. While African-American mothers had the highest breastfeeding rates through the start of the twentieth century, by close of the century, their rates precipitously declined. Presently, they have the lowest rates of breastfeeding in the United States. In this paper, I examine how the ideas that Black/African American mothers had about breastfeeding before, during, and after pregnancy (postpartum) affected initiation and duration of breastfeeding. Also, I investigate how mothers' healthcare providers affect their decision making, as well as how the type of birth that a mother has, e.g., preterm, vaginal, c-section, full term, affects her actual versus idealized infant feeding practice. I present a discussion of how doctors, nurses, breast pumps, etc., affect breastfeeding practice and how the practice impacts mothers' beliefs about themselves as "good" mothers. In order to understand the interplay of the decision-making process and these constructs, I conducted a qualitative study in which I participated in face-to-face interviews with a diverse group of thirty African-American mothers. They ranged in age from 18 years-old to 50-years-old. At the time of her interview, each mother had at least one child who was three years old or younger. Through our discussions, we explored how pre-pregnancy perceptions, lived experiences as a mother, familial influences, and the discourses surrounding motherhood within an African-American context affected the perceptions and experiences that the mothers in the study had with their infant feeding practice(s). Findings suggest that pregnancy and birth experiences of the mothers in the study influenced whether or not they breastfed exclusively, combined breastfeeding and infant formula use or used infant formula exclusively. Specifically, the interplay of invocation of agency (the ability to control their bodies before, during, and after birth), birth outcomes and the interaction that the mothers in this study had with resources, human and material, had the highest on the initiation, duration, and attitude toward breastfeeding.

Keywords: *pregnancy, breastfeeding, Black/African American mothers, maternal & infant mortality*

*Assistant Professor, Stetson University, USA.

Introduction

The highly publicized cases of the mistreatment that celebrities Serena Williams and Beyoncé experienced during their respective births shone a light on the ongoing disparities that exist in the treatment that Black mothers receive in the healthcare system in the US. In the past half century, rates of breastfeeding among African-American women have shifted significantly. While initiation rates have been steadily and significantly increasing in tandem with all of the racial groups in the United States, current data from the Center for Disease Control and Prevention[1] (CDC) indicate that African-American mothers are the group least likely to breastfeed their babies regardless of their class, age, or educational status. According to the CDC, while today 83% (roughly 60% in 1995) of all newborns discharged from the hospital are breastfed, among African Americans the figure is 74% (roughly 35% in 1995) (Centers for Disease Control and Prevention n.d.). By the six-month mark (the duration for exclusive breastfeeding[2] recommended by the American Medical Association), only 56% of all infants in the US still receive some breastmillk. Forty-four percent of African-American infants receive breastmilk at the six months (Centers for Disease Control and Prevention n.d.). Non-Hispanic Black[3] women have the highest rate of maternal and infant mortality in the US. Breastfeeding can reduce both.

I explore how the birth event, beginning with pregnancy, affected the infant feeding choices that mothers made. Specifically, I examine how their birth experiences, including their interaction with birth attendants and other healthcare providers, impacted the feeding method that they chose to use, as well as how they viewed their options for feeding their babies. Further, I connect these factors to what the respondents in the study think about themselves as mothers in relation to their feeding experiences. According to my findings, the pregnancy and birth experiences of the participants in the study influenced whether or not they breastfed exclusively, combined breastfeeding and infant formula (human breastmilk substitute) use or used infant formula exclusively. Specifically, the interplay of invocation of agency (the ability to control their bodies), before, during, and after birth, birth outcomes and the interaction that the mothers in this study had with resources, human and material, shaped the initiation, duration, and attitude toward breastfeeding and infant formula use among the mothers in this study.

Background

While in the late 1800s most babies in the United States were breastfed, the act of feeding from the breast was viewed as most suitable for lower-class white

[1]The Centers for Disease Control and Prevention is the central public health organization in the United States of America.

[2]Exclusive breastfeeding means that the baby is only fed breastmilk.

[3]Throughout this article, the terms African American and Black are used interchangeably because that is the accepted, common practice among Black people in an American context.

women, African Americans, and other people classified as "colored." The high incidence of using wet nurses among upper- and middle-class white women stands as a testament to this orientation. Within this society, breastfeeding was viewed as primitive and animal-like. When the first commercially-available "formula" for infant food was introduced to European and American markets in 1867, it was embraced by the predominantly white, middle- and upper-class women who could afford its costly price tag. Babies who drank the product developed health problems like diarrhea, dehydration, constipation, and other gastrointestinal problems that the fledgling group of doctors who focused on children's health (pediatricians) could treat (Blum 1998, Levenstein 1988). Mothers were marked as "haves" or "have nots" based on whether or not they could afford to purchase this engineered human breastmilk substitute. Over the following decades, companies like Nestlé and Mead Johnson refined their products to add ingredients approximating some of the ingredients found in human breastmilk. As the cost of infant formula fell, making it more accessible to greater masses of people, "formula" makers (supported by the medical establishment) began aggressively attacking breastfeeding, depicting the female body as fallible and unsterile (Blum 1998, Levenstein 1988). Among mothers in the US, African Americans were the last group to widely use infant formula (Blum 1988). By the 1960s and 1970s that changed as companies like Nestlé and Mead Johnson embarked on campaigns that heavily targeted Black mothers to recruit them as consumers of their products (Freeman 2020). By the early 1970s, the majority of babies born in the US, across all racial lines, were formula-fed. During that time, maternalists and other feminists focusing on women's health began protesting the human breastmilk substitute commonly used in US hospitals. As a result, a revitalization of breastfeeding was promoted among predominantly middle- and upper-class women (Blum 1988). By the 1990s, breastfeeding rates had begun to rise, but remained low compared to breastfeeding rates in other equally industrialized nations (Blum 1988). While the latest data from the Centers for Disease Control and Prevention indicate that breastfeeding rates have continued to rise across racial lines among women in the US, African American women's breastfeeding rates remain significantly lower than the national average (CDC n.d.).

Methods

I chose to focus on African-American mothers because African Americans have the highest infant and maternal mortality rates in the US. Most of the existing research on breastfeeding practices and attitudes consists of between-group studies with large white populations and comparatively small African American (and sometimes Hispanic) populations (Centers for Disease Control and Prevention n.d.). These between-group comparisons often skew and/or obscure the within-group characteristics that are unique to that multifaceted group. For example, while research indicates that male partners exert the most influence on white women's decision-making regarding breastfeeding, female family members and

friends have the greatest influence on African-American women's decision-making process (Jefferson et al. 2021, Blum 1999).

Because Black mothers and motherhood have long been sites for derision, policing and social control, I sought to use a recruitment method that would allow mothers to refer potential future participants. I expected that they would communicate with each other about the interviewing process, thereby vouching for me before I interviewed them. To that end, I used snowball sampling to recruit thirty African-American women from the metro Orlando area. Each woman had at least one child who was, at the time of the interview, three years old or younger. Recruiting women who were temporally close to or in the process of addressing the infant feeding event served to limit the distortion in memory that can come with the passage of time. The participants were recruited from the practice of a local African-American, certified nurse midwife who practices in a local hospital, has a free-standing birthing center, and attends home births. In order to populate the sample, I accepted a maximum of three referrals from each of the participants in the study. I conducted an in-depth, face-to-face interview with each participant at a location of her choosing. The interviews were loosely structured. The length of the interviews ranged from one to four hours. Each interview session was tape recorded, videotaped and later transcribed and manually coded thematically for analysis using modified Grounded Theory Method (Charmaz 2014).

This study was approved by the Institutional Review Board at Georgia State University to ensure the ethical treatment and privacy participants and their data.

Birth (Interrupted)

"It's time." This phrase has been uttered in movies and television alike to mark the moment when a pregnant woman recognizes (or medical professionals identify) that it is time for her baby to be born. While the woman is pregnant, there is space for speculation about everything from what she will call the baby to what she will feed the baby. Once the baby is born, fantasy becomes tangible reality. The preliminary "maybes" morph into actualities which have to be addressed. Feeding is one such actuality. The decisions that the respondents made about infant feeding were shaped by how and where they gave birth to their babies. Also, their experience(s) of birth informed how they felt (physically and emotionally) about what they chose to feed them, as well.

All of the participants in this study had health insurance coverage (private and government sponsored) when they gave birth. Tables 1 & 2 list where and with whom the participants in the study gave birth, as well whether or not they had access to Lactation Consultants. Six of the participants used Medicaid to pay for the cost of their prenatal care, the birth of their babies, and the extended stay of the mother and/or child (when necessary). Twenty-four of the mothers in the study relied on private health insurance to cover those medical expenses. As a result of having health insurance to pay for their birth related medical expenses, mothers who had c-sections were able to benefit from extra recovery days in the hospital.

The extra time in the hospital became a double-edged sword for the participants in the study. On one hand, extra recovery days meant that the mother could rest, and have others take care of her while she was in the hospital. Also, she had easier access to her and her baby's healthcare provider(s). Another benefit of being in the hospital, specifically if her child had to stay in the hospital for an extended time because of prematurity or a birth-related complication to the child's health, was that the mother was in the same facility as her child. When mothers were in close proximity to their new babies, they were able to have more frequent with the child. Also, when mothers were mobility-challenged after birth, the babies could easily be brought to them. As a result, mothers could have skin-to-skin contact with their babies, even if they were not able to physically feed them at the breast[4]. Also, mothers in the study who birthed at hospitals which had lactation centers were more likely than other respondents to have facilities where they could pump and store their breastmilk. Hospitals which invested in on-site lactation centers, had a greater likelihood of having full-time lactation consultants on staff than did hospitals which did not invest in those facilities[5]. Similar to the mothers in Conner's (2021) study, multiple mothers articulated that a downside of being in the hospital was they felt due to the rules and practices within the hospital, they had lost control of their bodies and their babies because their movements were monitored, and nurses controlled when (and how) they had access to their children.

The feelings that the participants had about "losing control" of their children were exacerbated when they were discharged from the hospital, but their children had to remain there. Nzingha, a 34-year- old billing clerk, reflected on her experiences with breastfeeding after her first child was born,

> they kept him, he was there, I want to say for probably five days, it could be from 3-5 days they kept him, and I said I was going to breast-feed, but they sent me home and they kept him, so I had to keep coming back and forth, and I did it for probably about one or two days, going back and forth to the hospital to feed him, and I just said no I can't do this, so I waited for them to release him. Then when I brought him home, he had already been having all these bottles, so it was hard for me. I think that's what caused the problem.

Nzingha's plan to breastfeed her child was disrupted by the hospital's policy of keeping newborns in the hospital beyond birth, even when there were no complications (to mother or child) during birth. According to Nzingha, her child was full term and her attending doctor told her that her child did not have any medical problems. Nzingha attempted to work within the system so that she would be able to follow through with her feeding plan and remain compliant to the rules and

[4]Kangaroo skin-to-skin refers to the practice of having mother and baby have direct physical contact. Preference is placed on having the baby on her/his mother's chest. This practice has been shown to help the child regulate her/his breathing and body temperature. Also, it has been suggested that this type of contact positively affects the mother's milk supply, as well as, her mood.

[5]Lactation consultants are healthcare providers who are recognized as experts in the fields of human lactation and breastfeeding. They do everything from watching a mother latch her baby onto her breast to providing hands-on assistance with breastfeeding and providing pro-breastfeeding external resources to mothers.

regulations established by the medical authorities who were responsible for her child. Once her son was released to her, she had to reconcile the postnatal infant feeding plans that she had oriented herself toward during her pregnancy with the reality that her child had grown accustomed to being bottle-fed infant formula while he was in the hospital. As a result of her compromise, Nzingha's feeding trajectory was greatly compromised. She struggled with maintaining her breastmilk supply and getting her son to latch on to her breast for feedings. Nzingha wasn't opposed to her child being fed infant formula as an alternative to breastmilk, but she wanted to choose when (and how much) it was used. Once Nzingha's milk supply started to decrease, her son weaned himself. Ultimately, her "one to two years" breastfeeding plan with the possibility of occasional infant formula use was replaced with the reality of three months of breastfeeding and a primary reliance on infant formula. At the time of the interview, Nzingha remained angry about what had transpired after the birth of her first child. The experience reinforced her distrust of the medical establishment. She blamed the problems that she had with breastfeeding on the doctors keeping her son and feeding him bottles. Once she was able to reflect upon her first infant feeding experience, Nzingha resolved that when it came to her future child(ren) she would not just go along with what she was told by doctors. The unexpected interruption in her feeding plans intensified her desire to breastfeed her child(ren) past six months. At the time of the interview, she had breastfed her third (and youngest child) until she was eleven months old.

When mothers in the study experienced complications with their birth or the baby developed health challenges, they were more likely to feel gratitude towards and surrender their decision-making power to medical authorities. In Amy's case, she had a c-section with her first (and only) child. She said:

> So yeah, I couldn't feed her because I had too much medicine in my system after I had it. So they started giving her Good Start from the day she was born, but then I switched over to breast milk.

Amy, who was an 18-year-old data entry clerk at the time of the interview, talked about the events in a matter-of-fact way. Even though she had planned to breastfeed her daughter from birth, she accepted the decision that her doctors made to initially feed the child infant formula. Although it wasn't what she had planned, she trusted that the doctors would do what was best for her baby. Amy adapted to her new circumstances by adjusting her feeding plan. She chose to (and was comfortable with) temporarily relinquishing her control over her daughter's daily care because she believed that she would be able to regain it and that choosing to let medical authorities take over the care of her daughter was in the child's best interests. Once she was cleared to breastfeed her daughter, mother and child did not experience any challenges with latching and Amy had an ample milk supply. She judged herself to be a "good" mother and her child to be a "good" girl because even though they took a detour from her initial plan, they were able to get back on course without any problems.

Mothers in the study, who opted for pharmaceutical intervention(s) in their birth experiences, faced the effects of the drugs on their new babies with aplomb.

Yvette, a 35 year-old mother of two, knew that she wanted to breastfeed. She did not experience any complications during (or after) her vaginal birth, but:

> Yvette: She was kind of sleepy, so we had to give her a little bit of formula there just to make sure that she wouldn't dehydrate.
> Interviewer: Why was she sleepy?
> Yvette: I think it was from the epidural, but I'm not sure, I didn't think to ask, but they think it might have been, they think that it might have been.

Yvette planned to breastfeed her child exclusively for her first six months. Because of her daughter's sluggishness--a common response that babies exhibit when their birth mothers receive epidurals during the birth process--she did not immediately respond to being breastfed. After this was explained to Yvette, she adapted to the new situation, which nurses caring for her daughter told her necessitated her daughter being fed infant formula. She kept her general plan, and took her daughter to the hospital's lactation consultant before she was discharged from the hospital. While she did not experience any challenges with breastfeeding, once her daughter's grogginess subsided, she "wanted to make sure that the latch was okay." Yvette was determined to have a positive breastfeeding experience, both for herself and her child, so she made use of all of the resources that were available to her.

When participants in the study experienced complications with their birth and/ or complications to their child's health, and breastfeeding, they blamed themselves (faulty bodies) and absolved medical professionals of any culpability if they experienced problems with breastfeeding. According to Kendra, a 29 year-old homemaker, with two children,

> My thoughts on formula, frankly, I thought it was an easy way out. I didn't think that it was the best option for babies. Honestly, when I had to use formula with him, I was disappointed. When I wasn't able to breast feed, I took that as a failure on my part that I wasn't able to take care of my son on a bare and basic level.... Since my son has had to take it, he's fine. If people want to use formula, fine. If they want to use breast feeding, I'm open to anything. I'm not quite as judgmental.

Like other mothers in the study, who were opposed to using infant formula, Kendra's unexpected birth outcome and her child's health shaped the way that she thought about her feeding experience. She developed an apologetic narrative which supported her decision to use infant formula as the primary food for her baby. The apologia provided her with a comfortable counterbalance to the guilt and disappointment she felt about not breastfeeding. Once she became a regular infant formula feeder, Kendra changed the way that she judged people who fed their babies infant formula. This concession was common among the participants who did not initially plan to privilege infant formula use over breastfeeding in theory or practice, but wound up having to primarily feed their children infant formula and maintain breastfeeding as supplementary or discontinue it altogether.

When mothers in the study had a vaginal birth with little or no complications and proceeded to breastfeed without any challenges, they focused on the process

of birth and breastfeeding as "natural." They believed that their experiences reinforced the actuality that women's bodies were made to do both (grow people and breastfeed). In regards to the mothers in this study, belief in the "naturalness" of breastfeeding, after experiencing an "uneventful" vaginal birth was not a reliable indicator for initiation and/or duration of exclusive breastfeeding. These mothers were equally likely to exclusively breastfeed for six months or more as they were to initiate breastfeeding and begin supplementing with infant formula shortly after their babies were born.

The participants in the study who had c-sections discussed feeling a greater obligation than the women who had vaginal births to breastfeed their babies. According to Amy,

> I wanted to get up and do things on my own, because I didn't just want to be sitting there. If my baby started crying, I would go pick her up. I knew I wasn't supposed to be doing that stuff, but I had to get up and start moving and start interacting with my baby, because I felt like if all those people are around my baby, she is not really going to get to know me. . . . if she needed to be fed I would be like, don't, leave her alone, I'll come get her, I'd pick her up, put her on, do what she needs to do.

Despite the fact that she was in the process of recovering from major surgery and had been advised to avoid lifting, going to the bathroom without assistance, and to reduce her movements, Amy believed that she had to go to her baby and breastfeed her so that her daughter would "know her." She believed that simply being around her child was not enough because she had to create a physical bond. Although her child had already been fed formula, she insisted on breastfeeding her. Like other mothers in the study, Amy held firm to her beliefs about what was "natural" for herself and her baby. While her birth and initial feeding was interrupted by an unnatural act, she would make sure that her child would experience natural feeding that she intended from her body. While she could (and would) adapt to less than ideal circumstances, like the need for surgical intervention in her birth experience, she would do her best to expose her daughter to the natural things that she perceived she "needs to do." Her belief that her job was to provide the food that she believed was ideally suited for her child motivated Amy to pursue whatever lengths would make that possible. Amy's ability to marry her intent with action provided the impetus for the paths that she took in her infant feeding journey and how it impacted her perception of her mother practice (McClain 2019).

Table 1. *Birth Outcomes Data List*

Alias	Birth Type	Birth Attendant	Lactation Consultant	Birth Location
Shaniqua	V	Midwife	Y	Birth Center
Chelsea	V	Midwife & OB	N	Hospital
Hadiatu	V & c-sect	OB	N	Hospital
Elaine	V	OB	Y	Hospital

Amy	c-sect	OB	N	Hospital
Kim	V	OB	Y	Hospital
Diedre	c-sect & VBAC	OB Midwife	Y	Hospital Birth Center
Leila	c-sect	OB	Y	Hospital
Lydia	V	OB	N	Hospital
Yvonne	V	OB	Y	Hospital
Carla	V	OB Midwife	Y	Hospital Birth Center
Dejonae	V& c-sect	OB	Y	Hospital
Yvette	V	OB	Y	Hospital
Evelyn	V	Midwife	Y	Birth Center
Diana	V	OB	Y	Hospital
Nzingha	V	OB	Y	Hospital
Cassandra	V	OB, Doula	Y	Hospital
Esther	c-sect	OB	N	Hospital
Rachel	V	OB, Midwife (Last Child)	Y	Hospital
Kendra	V (Preemie)	OB	Y	Hospital
Yolonda	V	OB	Y	Hospital
Monica	c-sect	OB	Y	Hospital
Faluke	V	OB	Y	Hospital
Destanni	V	OB	N	Hospital
Denitra	V	Midwife	Y	Birth Center
Brihanna	V 1st c-sect 2nd	OB	Y	Hospital
Melissa	V	Midwife	N	Hospital
Sholanda	c-sect	OB	Y	Hospital
Juanita	V	Midwife	Y	Home
Danielle	c-sect	OB	Y	Hospital

KEY= V-Vaginal Delivery; c-sect- Cesarean Section; VBAC-Vaginal Birth After Cesarean; OB-Obstetrician

Table 2. *A Crosstabulation of Birth Outcomes*

Count	Type of Birth			
Birth Attendant*	**Vaginal (20)**	**C-section (9)**	**VBAC (1)**	**Total(30)**
Midwife	**8**	**0**	**1**	**9**
Obstetrician	**14**	**9**	**0**	**23**
Birth Location				
Hospital	**15**	**9**	**0**	**24**
Birth Center	**4**	**0**	**1**	**5**
Home	**1**	**0**	**0**	**1**
Lactation Consultant				
YES	**16**	**6**	**1**	**23**
NO	**4**	**3**	**0**	**7**

N=30

*Two of the mothers in the study reported having both an obstetrician and a midwife.

Tech Support

Released in theaters in the US in May 2024, the movie Babes (Adlon 2024) showcases the birth and infant feeding experiences of an African American mother and her European American, Jewish best friend. Through their interactions, detailed birth experiences, and foibles with infant feeding the audience is shown two typical examples of birthing in America and the subsequent journey to feed infants. From the onset, the audience is shown that the process of birth is predominantly managed by obstetricians, gynecologists (OB/GYN) professionals and technological intervention. Throughout the film, the audience is shown that mothers have access to different technologies and that they shape the way that mothers experience birth and by extension infant feeding. In order to understand these phenomena, I explore the relationship between those who provide technical support (obstetricians, midwives, lactation consultants, and nurses) to birthing/postpartum girls, women, and nonbinary people who were assigned female at birth, technology (breast pumps and infant formula), and their intersectional impact on the infant feeding experiences of the mothers in this study.

The Machine

> I swear there should be a book in the Bible called "breast pumps" [Laughter] because it was one thing after the other. (Shaniqua)

Shaniqua, a first time mother, wanted to do everything "naturally." She wanted to have her birth with a midwife at a birth center. She didn't want any drugs during her labor. She wanted to breastfeed her baby as soon as he was born. She stuck to her plan and had a drug-free birth at a birth center with her midwife. According to Shaniqua,

> He knew what to do. I didn't. That's why I was like, okay, everything is going to go easy. He came out, and he was like [Slurp] [Laughter]. He latched right on. . . I was like, okay, no problem, no conflict; he knows what to do. I just let him do it.

Everything seemed all right. One week passed without incident then:

> I started to feel pain in my right breast. I would nurse him. I tried nursing him on my side, and he wouldn't nurse. I'm thinking he's full, but he would still be upset. It didn't take long for me to realize something was wrong. I'm like go ahead and eat, and he would try, and then he would stop and be upset. Something is wrong. There was pain. I thought it was because I was engorged, but it was clogged. He wouldn't nurse on this side. We were like, okay, it's time to get a pump.

Shaniqua found out that she had a clogged milk duct and thrush[6]. She found relief (and a means of continuing to breastfeed) by pumping her breastmilk and feeding it to her son in a bottle. Initially, she bought the least expensive breast pump that she could find at a local store. She quickly discovered that, "all pumps are not created equal." Shaniqua talked to her midwife. Her midwife referred her to a lactation consultant who recommended a specific brand of breast pump. The cost of the pump was prohibitive, but Shaniqua got the one the one that she wanted as a belated shower gift. After she began using it, she saw an immediate difference in the amount of milk that she was able to extract from her breast. She summed up her feelings about breast pumps when she said, "You get what you pay for." Shaniqua was able to build a supply of breastmilk that could be stored and fed to her son while she was healing from her infection. Without the proper pump, she would have been forced to use infant formula which she did not want to do.

Elaine, a 32-year-old mental health technician, was happy when her first child began breastfeeding without any challenges. Her mother was not able to breastfeed her and she was afraid that she would experience problems with breastfeeding, as well. Her child latched on to her breast and suckled happily. For good measure, she agreed to try using a breast pump at the hospital. She wanted to make sure that she was prepared with expressed milk, "just in case." Speaking about her first experience with a breast pump, she said,

> I didn't like being milked. I had no problem with the birth thing, but I didn't get nauseated until they milked me. They put the little milk suction thing on me, and literally I got nauseous. I'm like I'm being milked, and I didn't like it [Laughter]. I was like get this off of me, so they brought the baby, and then we worked more with him getting the milk from me as opposed to the entire suction machine thing. I felt better.

The breast pump did not suit Elaine, but her child nursing from her breast did. Elaine decided that she did not want to use a breast pump. Also, she was not comfortable with expressing milk from her breasts with her hands. She turned to

[6]Thrush is a fungal infection which is characterized by White spots inside the baby's cheek or on the gums. It can be caused by taking antibiotics or oral contraceptives (La Leche League International 1995).

infant formula as her "just in case" food. Elaine adopted the belief that "meeting needs" was the most important factor in her infant-feeding journey embodying the ideology that, "fed is best." (Chamberlain 2012).

Edibles

Fledgling doctors, who would cement themselves as specialists in children's medicine, promoted the scientific food (infant *formula)* which could replace the need for a woman to use her breast to feed a baby (Freeman 2020, Blum 1998). According to the CDC, touted as the "formula" for babies, formula have replaced human breastmilk as the primary food that is fed to infants in the US. At the time of their interviews, eleven of the mothers in the study had not fed their infants infant formula. The rest had either consciously chosen to feed their babies infant formula, or had the choice made for them by their doctors and/or nurses. Among the participants in the study who chose to exclusively breastfeed, one mother began to supplement her child with rice milk when he was nine months old. At the time of the interview, three of those mothers had babies who were younger than six months old. Three others weaned their babies between the ages of nine and ten months old. Subsequently, each mother transitioned her child either to cow's milk or soy milk.

Eighteen out the thirty mothers in this study used formula to feed their babies. Two of the participants in the study chose to introduce infant formula as their baby's first food. Eight of the respondents, all of whom had a c-section, found out that their babies received formula after they were delivered. Each of these mothers had a variety of drugs in their system as a result of the sedation and added medication to stabilize their vital signs. As a result, they were instructed to wait to breastfeed their babies. After the complication of their interrupted birth, each mother was happy that she and her child was alive and healthy. She expressed disappointment that her birth deviated from her plan, but she did not display distress that her baby had been fed infant formula. According to the respondents, the nurses explained that their babies would be fed formula to keep them healthy. After the mothers indicated that they wished to breastfeed, they were told that once they bodies were clear of the medicines, they could breastfeed. The mothers in this group accepted this information and waited until they were cleared to breastfeed. In their collective opinion, technology was keeping their babies alive and healthy, so that they could get better and take over the job of caring for their babies.

The mothers in the study had mixed feelings about the policy that their hospitals had of feeding newborns infant formula shortly after birth in the absence of breastmilk or colostrum. At the time of her interview, Brihanna was a 32-year-old mother of two. She had formula fed her first child, who was born 1997. Brihanna said that formula was all that she knew about at that time. Her son had ear infections and other health problems when he was younger. Over the years, she learned more about breastfeeding. When she found out that she was pregnant again, she decided that she wanted to breastfeed this child. Reflecting on her experience in the hospital with her second child she said,

> Well, when I had her I nursed and I told them definitely do not give her a bottle, not matter what the circumstances was, don't give her a bottle; if she needs to be fed bring her to me. And I kept her in the room for that simple fact. I kept her in the room with me the whole time was in the hospital.

Brihanna knew that using infant formula was fast and easy for the hospital staff. In order to prevent her daughter from being fed formula, she adamantly sought to keep her child near her. As a result of her objection to using infant formula, Brihanna positioned herself as able to breastfeed her daughter on demand.

Outside of the hospital, eighteen of the respondents in the study actively combined breastfeeding and infant formula use. Participants in the study, like Evelyn, a 21-year-old first time mother, began supplementing with infant formula when she returned to her job as a medical assistant. For Evelyn, infant formula was a stand-in for her breastmilk. She experienced less stress about having food for her daughter on the days that she could not express the quantity of milk that she desired. Also, she could take formula along on trips and anyone could easily mix it without in her absence and feed the baby.

Leila, a 38 year-old mother of two, happily breastfed her daughter, but when her daughter wasn't producing dirty diapers, she thought that something was wrong. According to Leila, her pediatrician told her to stop breastfeeding and feed her daughter infant formula. Leila, a nurse, complied. She pumped her milk in the meantime. Her daughter began urinating and defecating so Leila continued feeding infant formula and expressed her breastmilk. Evelyn never put her daughter to the breast again.

Elaine completely transitioned each of her three children to infant formula. She said that initially she felt guilty about not breastfeeding them and then she "got over herself." Elaine evaluated what was important to her. After she observed that her children were not getting sick, as she feared that they might without her breastmilk, she relaxed into the ease that came with using infant formula. Despite whether or not each of the mothers in the study liked (or used) infant formula, they all agreed that its lure was that it was technology that made their (and other people's) lives easier. They believed that using infant formula meant that they didn't have to worry about their milk supply, the quantity or quality. Also, the cultural norm for the women in the study is that others (other mothers, their partners, childcare workers, etc.) would be actively engaged in the care of their babies. So, they knew that having bottles that could be handed to anyone would facilitate this practice.

Human Resources

According to the mothers in the study, obstetricians and midwives had opportunities to play significant roles in their infant feeding decision-making. The role of the healthcare provider was expanded when the respondents had challenges with their births and/or breastfeeding. When Lydia found out that her daughter had

GERD[7], she relied heavily on the advice of her doctor when she determined how she would proceed with feeding her child. While she was committed to using infant formula, her daughter's pediatrician encouraged her to breastfeed the baby. Following his advice, Lydia breastfed her daughter for a few days and her child's health improved. Despite this positive turn of events, Lydia decided that breastfeeding was not something that she wanted to continue. She said,

> I tried pumps, I tried everything. I had like three or four pumps trying to get something out to give her. I wasn't comfortable with her latch[8]. I didn't like breastfeeding at all, it was just ugh. It hurt.

Lydia's negative experience with breastfeeding trumped the advice that she received from her daughter's pediatrician, as well as, the evidence that her daughter's health improved once she stopped receiving infant formula and started getting breastmilk. Lydia embraced infant formula. Although she did not choose to follow his initial recommendation to breastfeed, she sought him out to find a technologically enhanced formula that would easier for her daughter to digest. At the time of the interview, Lydia's daughter was three years old. She still suffered from the symptoms of GERD. Lydia believed that despite the episodic vomiting that her daughter experienced, the prescription infant formula that she used was the right choice because her child would be fed food that would not make her sick all of the time and provide Lydia with the option not to breastfeed her.

Esther, a 37-year-old, a full-time mother of two, found out that she had Hepatitis B before she got pregnant. She believed that she contracted it from her mother while she was breastfeeding. Esther's mother did not find out that she had contracted the disease until after she received a blood transfusion many years later. After Esther found out about her infection, she spoke with her obstetrician about the utility of discussing breastfeeding with a lactation consultant. According to Esther her obstetrician said that,

He didn't think it [breastfeeding] was a good idea, but . . . . he wasn't a pediatrician and he didn't want to influence my decision, but this was his opinion as my doctor. He didn't think that it would be a good idea. And he told me this earlier on.

Esther's obstetrician's response was that she would not need one because he believed that she should not take the chance of passing the disease on to her child through breastmilk. He acknowledged that his expertise didn't lie in children's health, but he asserted his authority and his vested interest in her, as "her" doctor. The implicit message was that a pediatrician, her child's doctor would not be focused on "her" best interests, but on that of the child. So, what he said should hold more sway. Also, based on Esther's recollection, he clearly asserted his stance on her proposed feeding practices "early on," thereby reiterating his status as "expert" during the time that she was beginning to gather information about her options. Esther went on to interview pediatricians, so that she could choose one

[7]Gastroesophageal Reflux Disease (GERD) is a condition in which the esophagus becomes irritated or inflamed because of acid backing up from the stomach.

[8]The term "latch" refers to when a baby takes her/his mother's nipple into her/his mother while breastfeeding.

before her baby was born, and asked them what they thought about her breastfeeding even though she had Hepatitis B. According to Esther, all of the doctors believed that she should breastfeed. Each doctor based his decision about breastfeeding on the recommendation that was issued by the Centers for Disease Control and Prevention (CDC n.d.) for Hepatitis B infected mothers and breastfeeding[9]. Despite their advice, Esther chose to use infant formula, although she had previously committed herself to breastfeeding. She "didn't want to take a chance." The fear of her child contracting the disease, which was reinforced by the OB she trusted, superseded everything else. Throughout the interview, she lamented the flaws of infant formula. She said,

> It was awful and I felt terrible because I'm like if I was breastfeeding this wasn't happen... I was so upset about it. I took him to specialists because it continued. He would have really, really hard bowel movements. And I switched his formula a couple of times and the same thing. He didn't have a problem with his intestines or his colon or anything they checked. His stomach was fine...it was just the formula.

Although she firmly believed that the food that she was feeding her son was keeping him sick, she did not attempt to breastfeed him. Esther exhausted every other possibility, even switching formula brands, but never modified her fear.

After giving birth to their babies, 28 out 30 mothers in the study-initiated breastfeeding. Of those, 22 mothers delivered their babies in hospitals and six of the mothers delivered at birthing centers. Many of them, particularly first time breastfeeders, stated that they were plagued with the fear that they would not be able to get their babies to latch correctly. All of the mothers in the study who delivered at birthing centers received help from their midwives with latching their babies to their breasts after the baby was born. The form of help that was offered was either "supportive talk" or direct hands-on instruction. Supportive talk consisted of verbal encouragement and/or loose verbal instructions which guided the mother through taking the baby to her breast and positioning her/his head. Direct hands-on instruction involved the midwife touching the mother and baby. She physically showed the mother how to get her child to latch on to her breast. Also, she showed the mother how the child's head should be positioned against her breast. According to the mothers in the study, this help was invaluable when it was desired and offered in a culturally appropriate manner (Conner 2021).

Participants in the study who birthed with obstetricians said that they did not receive advice about the mechanics of breastfeeding or any hands-on instruction from them. According to the mothers in the study who birthed at hospitals, *when* they received help with the mechanics of breastfeeding, nurses were the healthcare providers who helped them after they indicated that they wanted to breastfeed. According to Amy, 18 years old, 1 child,

> Yea, a lady came in and sat with me the day after I had my daughter…she asked me what my decision was to breast-feed or formula feed, so I let her know I was going to

[9]According to the Centers for Disease Control and Prevention, Hepatitis B is not spread through breastfeeding.

> be breastfeeding and she brought a pamphlet in there and let me, they had pictures of how to hold the breast and how to hold the baby and she showed me, she had this doll in there and she showed me how to hold the doll so that the doll would be like the baby, the baby would get a good amount of milk and it wouldn't hurt and everything. So I think that's why I had a good experience breastfeeding. Oh, it was really easy for me in the beginning. Because she showed me the steps and everything so I wouldn't hurt and (so)that my baby would get enough milk and be full.

Like other mothers in the study who said that they received help with breastfeeding while in the hospital, she credited her success with breastfeeding to the help that she received from a nurse. Amy had not experienced breastfeeding, nor did she know anyone who was doing it. The nurse provided her with a live person, not a book, a video or a disembodied voice on the phone, who could answer her questions about breastfeeding while physically guiding her when she had any problems. Also, the prop that the nurse brought eased some of Amy's tension and made it possible for the nurse to guide Amy through the physical aspects of breastfeeding without having to handle Amy's breasts. Having a medical professional there, who was eager to talk with her while she was breastfeeding, provided Amy with external validation about her mothering.

All of the mothers who birthed at hospitals did not have positive experiences with their healthcare providers. Chelsea wanted to breastfeed her daughter. She initiated breastfeeding, but began having problems. As we sat in her living talking about her early experiences with breastfeeding she recalled:

> I breast fed, and she was very hungry. . . . I don't know if I was doing it wrong . . .it was making my nipples really sore . . . They were teaching me how to do it. They were trying to show me the finger removal like when to stop and how to alternate breasts. The nurse showed me that, but it wasn't nothing really in details. To be honest with you, I don't really think that they were very helpful. I think if they may have been a little more helpful and a little bit more understanding as opposed to just saying it will be okay eventually, you'll get used to it, maybe I would have breast fed longer.

Chelsea, 22 years old, 1 child, received some assistance, but not the type of detailed, handson help that she felt that she needed to continue breastfeeding. When she spoke with her obstetrician about the scabs that she was developing on her nipples because she believed that may have been breastfeeding her daughter incorrectly, he told her to "just keep trying" and that her feeding experiences would improve. He said that if they didn't she could just go to formula. According to Chelsea that advice did not reinforce her desire to breastfeed. Nor did it validate her breastfeeding experience. Instead, it provided her with a justification for quitting. She believed that her doctor's attitude supported the interchangeability of infant formula and breastmilk. Chelsea's breastfeeding experience did not improve so shortly after her visit to the doctor, she weaned her daughter and switched to infant formula. In sum, Chelsea breastfed her daughter for approximately five weeks. At the time of the interview, she said that if she had any other children, she would not initiate breastfeeding.

Mothers in the study, who were breastfeeding for the first time, were most likely to desire the presence of a healthcare provider when they initiated breastfeeding.

Participants in the study, who birthed in hospitals, which had lactation consultants, were most likely to have one visit them before they went home with their babies. According to the respondents, their presence and accessibility was both a blessing and an annoyance. According to Monica, a thirty-three year-old, housewife, the White lactation consultant at the hospital where she delivered her baby was too enthusiastic with her "help":

> It probably is similar to what happened to me at [the hospital] when everyone was forcing me to do something and they're whipping my breast out and giving it to the baby and they were always just pushing, pushing, pushing. Then I got kind of well, you know, no. I'm not going to do that. So now I'm going to formula-feed and there you go. . . . You can't make me do this with my body. I can do whatever I want to do with it.

Monica felt as though she was being pushed beyond her level of comfort because of the uninvited way in which the lactation consultant touched her body. Rather than feeling empowered to breastfeed her child, the lactation consultant's unsolicited manipulation of her breasts left Monica feeling violated, and her response was to reject breastfeeding. By rebuffing the act, she believed that she would be taking charge of how she would feed her baby and by extension, regain control of her body.

Discussion

While the specific birth experiences of the participants in the study influenced whether or not they breastfed exclusively or combined breastfeeding and infant formula use, the ability to invoke agency continued to be a recurrent theme throughout our conversations. Interaction with resources, human and material, played a significant role in the initiation, duration, and attitude toward nursing and infant formula use. I explore the interplay of these factors.

The mothers in the study who had been breastfed (or whose partners had been breastfed) talked about receiving a lot of positive support for them to breastfeed. Within their familial circles, breastfeeding was constructed as something that was not simply "best" but also normal. In the end, participants weighed the advice that they received and balanced it with the preexisting knowledge that they had about breastfeeding and infant formula to make a wide variety of decisions.

While the chatter surrounding infant feeding did not disappear once their babies were born, the mothers in the study shifted their focus from the noise of others to the embodied experience (and consequences) of their birth. Mothers who had normal births[10] were more likely to focus on feeding on their own terms. They sought out human (like lactation consultants and childcare workers) and technological (breast pumps, nipples, etc.) resources which would improve their breastfeeding outcomes.

[10]Following the medicalization of pregnancy and childbirth in this society, medical intervention during the birth process, e.g., epidurals, episiotomies, drug therapy to accelerate birth, etc., has been routinized and normalized. As a result, a normal birth is any vaginal birth that occurs without any medical complications.

While having a healthy birth was the first step in having success with breastfeeding, it did not ensure it. Despite having healthy vaginal births, some mothers found themselves dealing with challenges like access to resources, and healthcare providers who did not respect the wishes and/or parameters of care established by the respondents. These elements negatively impacted the participants' duration of breastfeeding, especially when the mothers did not have access to family and friends who supported their breastfeeding efforts.

Mothers in the study who had premature babies and/or c-sections found themselves caring for healing bodies and dependent on the medical system. These participants were most likely to blame their bodies when their infant feeding plans were disrupted. Also, these mothers were most likely to view medical intervention positively. They adapted to the changing landscape of their personal care, as well as that of their babies. While their breastfeeding outcomes differed, these respondents were most likely to use innovative ways, such as expressing breastmilk for three months without feeding from the breast or mixing breastmilk with infant formula because they were determined to feed breastmilk to their babies despite being instructed by their baby's doctors to formula feed. The participants in the study gained the most knowledge, experience, and comfort with breastfeeding when their healthcare and social service providers understood the boundaries of their roles and provided them with information and access to resources while remaining within those boundaries. Regardless of her birth experience, each mother did what she believed a "good mother should do."

Conclusion

Providing mothers with more relevant (beyond the superficial), and detailed information about the plethora of benefits of breastfeeding for them has the potential to enhance the appeal of breastfeeding. For example, all of the mothers in the study knew that breastfeeding speeds postpartum weight loss. Some of the mothers knew that breastfeeding increases the speed of the uterus returning to its pre-pregnancy size, but they did not know the significance of the above stated actions. They were not told that breastfeeding immediately after birth significantly reduces their chances of hemorrhaging or that weight loss reduces the comorbidities of hypertension and diabetes. While women in the study understood the message that breastfeeding is best, the practice is not normalized in the larger society. In the US, policies did not support breast is *normal*. As a nation, we have not universally addressed the structural issues that impede the breastfeeding choice by enacting policies like flexible schedules for working, extended **paid** leave for ***all*** mothers, on-site daycare facilities, on-site lactation centers, abolishing ALL laws that criminalize breastfeeding in public, etc. Further, my findings suggest that women are significantly receptive to information about infant feeding during pregnancy. During that time, healthcare providers are empowered to present soon-to-be mothers with materials (goodie bags, etc.) and information (pamphlets, support group contacts, etc.) that normalize breastfeeding instead of formula. Also, mothers who have had challenges with their births and/or new mothers are particularly vulnerable to hospital practices

regarding infant feeding. For the mothers in this study, nurses and lactation consultants were both helpful and harmful to the participants' feeding plan. My findings suggest that the respondents, particularly those who had little or no experience with breastfeeding, were pleased to be able to talk and work with a healthcare professional who could assist them with the mechanics of breastfeeding. But, the respondents were displeased when the nurse(s) and/or lactation consultant did not respect their physical and emotional boundaries. I argue that both nurses and lactation consultants, particularly those who are not Black women, should receive cultural sensitivity training which would provide them with information about guidelines for touching Black women's lactating breasts, as well as parameters for "encouraging" Black women to breastfeed. This training would affect Black women's birth experiences and therefore impact their infant feeding choices.

Finally, studying sites where a plethora of tangible options are made available to African-American mothers that encourage them to breastfeed and support their efforts would aid in understanding how structural policies impact breastfeeding rates among African American women and lead to creating and enacting policies, procedures, and practices that increase health equity, especially since these directly impact Black women's infant feeding choices.

References

Adlon P (2024) *Babes.* FilmNation Entertainment; Range; Media Partners; and Starrpix.

Blum L (1998) *At the Breast*. Boston, MA: Beacon Press.

Centers for Disease Control and Prevention – CDC (n.d.) *Breastfeeding National Immunization Data*. Centers for Disease Control and Prevention. Available at http://www.cdc.gov/breastfeeding/NISdata/socio-demographic.htm.

Chamberlain B (2012) *"How My Heart Feels as Far as My children, Is What I Do": Examining African American Women's Negotiations of Infant Feeding Practices*. Doctoral Dissertation. The University of North Carolina at Chapel Hill.

Charmaz K (2014) *Constructing Grounded Theory*. 2nd Edition. Thousand Oaks, CA: Sage.

Conner N (2021) *Black Mothers' Birthing Center Experiences and Exclusive Breastfeeding Practices*. Doctoral Dissertation. Walden University.

Freeman A (2020) *Skimmed: Breastfeeding, Race and Injustice*. Stanford, CA: Stanford University Press.

Jefferson U, Bloom T, Lewis K (2021) Infant Feeding Exposure and Personal Experiences of African American Mothers. *Breastfeed Medicine* 16(2): 124–130.

Levenstein H (1988) *Revolution at the Table: The Transformation of the American Diet*. New York: Oxford University Press.

McClain JS (2019) *Pregnant African American Women Breastfeeding Intentions, Beliefs Attitudes and Perspectives*. Doctoral Dissertation. Walden University.

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Elevated Right-Lateral Head Position using a Bolster Pillow as a Non-Pharmacological Strategy to Prevent Gastric Acid Effects in Patients with Gastritis or Dyspepsia: A Physiological Approach Involving Parietal Cell Activity

*By Agussalim Agussalim**

Background and aim: Gastritis and dyspepsia often worsen during recumbency due to increased intragastric pressure and reflux, exacerbating gastric acid contact. We evaluated whether sleeping in an elevated right-lateral head position with a bolster pillow reduces acid production and symptom severity in patients with gastritis or dyspepsia. Methods: An experimental study was conducted from January 2023 to February 2025 across multiple hospitals in Ajatappareng. A total of 200 diagnosed gastritis/dyspepsia patients were enrolled following ethical clearance (Poltekkes Kemenkes Makassar, EC/47832/01/2023). Patients were assigned to sleep in a 30° elevated right-lateral head position using a bolster pillow every night. Gastric acid output was measured via basal and stimulated acid tests; symptom questionnaires were collected at baseline, 3 months, and end-point. Results: Compared to baseline, mean basal acid output decreased by 35% ($p < 0.001$); peak acid output decreased by 40% ($p < 0.001$). Patient-reported symptom scores (pain, burning, early satiety) dropped by 50% ($p < 0.001$). No adverse events were observed. Conclusion: Non-pharmacological elevated right-lateral head positioning attenuates acid production and dyspepsia/gastritis symptoms, likely by enhancing gastric emptying, reducing gastric distension, and dampening parietal cell activation. This posture may serve as a simple, effective adjunct to standard management.

Keywords: *Gastric acid secretion, Parietal cell activity, H^+/K^+-ATPase, Right-lateral sleeping position, Bolster pillow, Non-pharmacological intervention*

Introduction

Gastric acid secretion is a complex and tightly regulated physiological process governed primarily by gastric parietal cells, which secrete hydrochloric acid (HCl) into the lumen of the stomach. The final step of acid secretion involves the activation of the H^+/K^+ ATPase proton pump, located in the apical membrane of parietal cells. This enzyme system uses adenosine triphosphate (ATP) to exchange intracellular H^+ ions for extracellular K^+ ions, thus acidifying the stomach contents and creating the harsh luminal environment necessary for digestion and protection against pathogens (Smith et a., 2019; Johnson, 2001; Patel, 2017).

The activation of parietal cells is primarily stimulated through three major signaling molecules: acetylcholine (ACh), histamine, and gastrin.

*Associate Professor, Makassar Health Polytechnic, Indonesia.

Acetylcholine, released from vagal postganglionic fibers, binds to muscarinic M_3 receptors on the parietal cell membrane. This interaction activates Gq protein-coupled pathways, leading to phospholipase C (PLC) activation, hydrolyzing phosphatidylinositol 4,5-bisphosphate (PIP_2) into inositol 1,4,5-trisphosphate (IP_3) and diacylglycerol (DAG). IP_3 mobilizes Ca^{2+} from intracellular stores, which triggers downstream activation of kinases that stimulate H^+/K^+ ATPase translocation and activity (Phillips, 2015; Lee et al., 2012; Walker & Hernandez, 2014)
Histamine, secreted by enterochromaffin-like (ECL) cells, binds to H2 receptors on parietal cells. These receptors are linked to Gs proteins, which activate adenylyl cyclase, increasing intracellular cyclic adenosine monophosphate (cAMP) levels. cAMP then activates protein kinase A (PKA), which facilitates phosphorylation of proteins involved in the fusion of tubulovesicles containing H^+/K^+ ATPase with the apical membrane, thereby augmenting acid secretion (Phillips, 2015; Lee et al., 2012; Walker & Hernandez, 2014).

Gastrin, a peptide hormone produced by G cells in the gastric antrum, binds to CCK2 receptors on ECL and parietal cells. This promotes histamine release from ECL cells and directly increases intracellular Ca^{2+} in parietal cells, further amplifying the stimulatory effects of acetylcholine and histamine (Phillips, 2015; Lee et al., 2012; Walker & Hernandez, 2014).

These signaling cascades converge on the fusion and activation of H^+/K^+ ATPase-containing vesicles, integrating both Ca^{2+}-dependent and cAMP-dependent pathways to facilitate maximal acid secretion during the gastric phase of digestion.

However, when individuals lie flat—particularly at night—gastric emptying is delayed, and intragastric pressure increases due to a horizontal stomach orientation. This postural effect leads to retrograde movement of gastric contents into the lower esophagus, promoting gastroesophageal reflux, and triggering symptoms such as epigastric pain, burning, nausea, and mucosal irritation of the esophagus (Gonzalez, 2016; Brown et al., 2022; White, 2022) .

Several studies have shown that elevating the head of the bed reduces acid exposure in the esophagus during sleep by approximately 50% (Carter et al., 2020; Zhang et al., 2012; Ramirez et al., 2020). Despite this, the molecular mechanisms underlying this benefit—specifically how posture may influence gastric acid production itself—remain inadequately characterized.

Right lateral positioning further facilitates gravitational drainage of gastric contents into the duodenum by aligning the pylorus in a downward orientation. Simultaneously, head elevation reduces intragastric hydrostatic pressure, thereby minimizing mechanoreceptor activation of vagal afferent pathways that would otherwise enhance acetylcholine and gastrin release (Ramos et al. 2017; Singh & Patel, 2018). These postural modifications are hypothesized to attenuate parietal cell stimulation, reducing proton pump recruitment and thereby suppressing HCl secretion in a non-pharmacologic manner.

This study investigates the clinical and biochemical effects of maintaining an elevated right lateral head position using a bolster pillow, specifically focusing on its impact on gastric acid output and symptom relief in patients with gastritis or functional dyspepsia, and aims to elucidate the underlying physiological and molecular mechanisms responsible for these improvements.

Methods

Study Design and Setting

This study employed an experimental, prospective, multi-center design, conducted across five major hospitals in the Ajatappareng region of South Sulawesi, Indonesia. The study duration extended from January 2023 to February 2025, encompassing a total of 14 months of intervention and periodic follow-up evaluations. Ethical approval for the study protocol was granted by the Institutional Review Board of Poltekkes Kemenkes Makassar under clearance number EC/47832/01/2023. Each participating institution provided site-specific operational oversight to ensure protocol adherence and participant safety.

Participant Selection

Participants were adult patients aged 18 to 65 years, recruited from outpatient gastroenterology units and inpatient wards based on a confirmed diagnosis of either gastritis (via endoscopy and histopathology) or functional dyspepsia (based on Rome IV clinical criteria). Eligible patients presented with persistent upper abdominal symptoms, including epigastric pain, burning sensation, early satiety, or postprandial fullness, for at least 8 weeks prior to enrollment.

Exclusion criteria included:

- Current or recent (within 2 weeks) use of proton pump inhibitors (PPIs), H_2-receptor antagonists, or antacids.
- Known structural gastrointestinal disease (e.g., gastric ulcers, esophageal varices, malignancy).
- Significant comorbidities (e.g., uncontrolled diabetes, renal failure, congestive heart failure).
- Pregnancy or lactation.
- Inability to tolerate right-lateral positioning or head-of-bed elevation due to orthopedic or neurological limitations.

Informed consent was obtained from all participants, with confidentiality and data protection measures strictly observed.

Intervention

Participants were instructed to adopt a specific sleeping posture every night for 14 consecutive months. The intervention involved:

- A 30° elevation of the head and thorax, achieved using an adjustable hospital bed or a medically approved wedge base.
- Right-lateral decubitus positioning throughout sleep.

- Support using a custom-fitted bolster pillow placed beneath the back, neck, and knees to maintain alignment and comfort during prolonged right-sided positioning.

This posture was designed to optimize gastric drainage into the duodenum via gravitational forces while minimizing reflux into the lower esophagus (Ramos et al. 2017; Singh & Patel, 2018). Participants received daily sleep logs and were periodically monitored for adherence through scheduled visits and home assessments.

Outcome Measurements

1. Gastric Acid Output:

Gastric acid secretion was assessed at baseline and post-intervention using basal acid output (BAO) and pentagastrin-stimulated acid output (PAO) tests.

- A nasogastric tube was inserted in the fasting state, and gastric aspirates were collected over a 1-hour period for BAO.
- Afterward, pentagastrin (6 μg/kg IV) was administered to stimulate maximal acid production, followed by a 1-hour acid collection for PAO.
- Each sample was titrated to neutrality (pH 7.0) using 0.1N sodium hydroxide (NaOH), and acid output was expressed in mmol H^+/hour.

2. Symptom Scores:

Subjective symptom evaluation was performed using a validated Dyspepsia Symptom Index (DSI), which included scales for:

- Epigastric pain (0–10)
- Burning sensation (0–10)
- Early satiety/fullness (0–10)

Scores were assessed at three time points: baseline, 3-month follow-up, and end of the 14-month intervention.

3. Safety Monitoring:

Patients were monitored for postural intolerance, including complaints of dizziness, discomfort, sleep disturbance, or musculoskeletal pain. Safety data were documented during monthly check-ins, and participants could withdraw from the intervention if intolerable effects occurred.

Statistical Analysis

All data were analyzed using SPSS version 27.0.

- Paired t-tests were applied to compare pre- and post-intervention values for BAO, PAO, and DSI scores.
- A p-value < 0.05 was considered statistically significant.
- Adherence rates and safety reports were tabulated descriptively.

This rigorous design aimed to investigate not only the clinical impact of a physiologically advantageous sleeping posture but also its potential role in modulating gastric acid secretion at the molecular level, without the use of pharmacological agents (Smith et a., 2019; Johnson, 2001; Patel, 2017; Phillips, 2015; Lee et al., 2012; Walker & Hernandez, 2014; Ramos et al. 2017; Singh & Patel, 2018).

Results

Our findings support the hypothesis that adopting an elevated right lateral head position significantly reduces both gastric acid secretion and symptom severity in patients diagnosed with gastritis or functional dyspepsia. This posture promotes gastric emptying, reduces intragastric pressure, and thereby diminishes mechanical stretch on the gastric wall. As a result, mechanosensitive vagal afferent pathways are less activated, leading to a downregulation of acetylcholine (ACh) release, one of the key stimulators of parietal cell activity (Smith et a., 2019; Phillips, 2015; Lee et al., 2012).

At the molecular level, parietal cells rely on intracellular calcium ions (Ca^{2+}) and cyclic adenosine monophosphate (cAMP) as second messengers to initiate the insertion of H^+/K^+ ATPase proton pumps into the apical membrane (Johnson, 2001; Phillips, 2015; Clark, 2021; McKenzie & Roberts, 2001). These messengers are triggered by stimulation of M_3 (muscarinic), H2 (histamine), and CCK2 (gastrin) receptors. By minimizing the upstream release of ACh (via vagal suppression), and indirectly reducing histamine release from enterochromaffin-like (ECL) cells as well as gastrin signaling, the elevated posture disrupts the converging pathways necessary for maximal HCl secretion (Johnson 2001, Phillips, 2015; Clark, 2021; McKenzie & Roberts, 2001).

Our study reveals that this mechanical intervention significantly reduces both basal acid output (BAO) and stimulated acid output (PAO), providing the first detailed physiological evidence linking posture with quantitative acid suppression in humans.

This therapeutic posture acts as a non-pharmacological adjunct to conventional proton pump inhibitors (PPIs) or H_2 receptor antagonists, helping avoid potential side effects such as hypochlorhydria, malabsorption, bacterial overgrowth, or rebound acid hypersecretion associated with long-term pharmacologic therapy.

Clinical Implications

Given the simplicity, safety, and affordability of this positional therapy, it may be readily recommended as adjunctive care in patients with gastritis or functional dyspepsia, particularly in resource-limited settings or in patients for whom long-term drug therapy is contraindicated.

Table 1. *Participant Characteristics (n=200)*

Variable	Mean ± SD or n (%)
Age (years)	43.1 ± 12.4
Gender (Female)	110 (55%)
Diagnosis: Gastritis	112 (56%)
Diagnosis: Functional dyspepsia	88 (44%)
BMI (kg/m²)	24.6 ± 3.7
Smoking status (active smokers)	41 (20.5%)
Prior PPI use (discontinued)	0 (excluded from study)

Table 1 presents the baseline demographic and clinical characteristics of the 200 patients enrolled in the study. The mean age of participants was 43.1 years with a standard deviation of 12.4 years, indicating a broad adult age distribution. The gender distribution was relatively balanced, with 55% (n=110) of participants being female.

In terms of diagnosis, the majority of participants were diagnosed with gastritis (56%), while 44% had functional dyspepsia, based on either endoscopic findings or clinical criteria. The average Body Mass Index (BMI) was 24.6 kg/m², which falls within the normal-to-overweight range, suggesting that most participants did not have severe undernutrition or obesity, both of which could influence gastric physiology.

Additionally, 20.5% of participants (n=41) were active smokers, a factor known to affect gastric mucosal integrity and acid secretion. Importantly, no participants were on proton pump inhibitors (PPIs) at the time of enrollment, as recent or ongoing use of acid-suppressive therapy was part of the exclusion criteria. This ensured that the study accurately assessed the physiological impact of the postural intervention without pharmacologic interference.

Overall, the table confirms that the study population was clinically diverse yet appropriately selected to isolate the effects of the positional therapy on gastric acid production and symptomatology.

Table 2. *Gastric Acid Output Before and After Intervention*

Outcome Measure	Baseline (Mean ± SD)	Post-Intervention (Mean ± SD)	% Reduction	p-value
Basal Acid Output (mmol H^+/h)	0.60 ± 0.18	0.39 ± 0.12	–35%	<0.001
Stimulated Acid Output (mmol H^+/h)	3.20 ± 0.90	1.92 ± 0.73	–40%	<0.001

Table 2 presents the comparison of gastric acid output before and after the 14-month intervention involving elevated right-lateral head positioning using a bolster pillow. Two primary measures were assessed: Basal Acid Output (BAO) and Stimulated Acid Output (SAO) following intravenous pentagastrin administration.

At baseline, the mean BAO was 0.60 ± 0.18 mmol H^+/hour, indicating the amount of gastric acid secreted under fasting conditions without stimulation. Following the intervention, this value decreased significantly to 0.39 ± 0.12 mmol H^+/hour, representing a 35% reduction in basal acid secretion ($p < 0.001$). This reduction suggests that the positional therapy effectively suppressed resting acid output, likely by reducing vagal stimulation and subsequent acetylcholine-mediated activation of parietal cells (Smith et al., 2019; Phillips, 2015; Lee et al., 2012).

Similarly, the mean SAO—which reflects maximum acid secretory capacity in response to exogenous stimulation—declined from 3.20 ± 0.90 mmol H^+/hour at baseline to 1.92 ± 0.73 mmol H^+/hour post-intervention. This represents a 40% reduction in stimulated acid production, also statistically significant ($p < 0.001$). The pronounced decline in SAO indicates that the elevated right-lateral position may also dampen parietal cell responsiveness to pharmacologic stimuli, potentially through long-term modulation of receptor sensitivity or reduced proton pump trafficking (Smith 2019; Phillips, 2015; Clark, 2021; McKenzie & Roberts, 2001).

Overall, these findings strongly support the conclusion that sleeping in an elevated right-lateral position significantly suppresses both basal and stimulated gastric acid secretion, underscoring the physiological efficacy of this non-pharmacological approach in managing hyperacidity-related symptoms in gastritis and dyspepsia.

Table 3. *Symptom Severity Scores Before and After Intervention*

Symptom	Baseline Score (0–10)	Post-Intervention Score (0–10)	% Improvement	p-value
Epigastric pain	6.1 ± 1.5	3.0 ± 1.2	50.8%	<0.001
Burning sensation	5.9 ± 1.4	2.8 ± 1.1	52.5%	<0.001
Early satiety/fullness	6.3 ± 1.6	3.2 ± 1.3	49.2%	<0.001

Table 3 presents the changes in symptom severity scores among participants before and after the 14-month intervention involving an elevated right-lateral head position during sleep. The results show a significant reduction across all key dyspeptic symptoms, including epigastric pain, burning sensation, and early satiety/ fullness.

At baseline, the mean score for epigastric pain was 6.1 ± 1.5 on a 10-point scale. After the intervention, this score decreased to 3.0 ± 1.2, representing a 50.8% reduction ($p < 0.001$), indicating substantial relief from upper abdominal discomfort.

The burning sensation, often associated with acid reflux or mucosal irritation, showed a similar trend. The average score dropped from 5.9 ± 1.4 to 2.8 ± 1.1, corresponding to a 52.5% improvement ($p < 0.001$), suggesting that the postural adjustment effectively reduced acid exposure to the esophageal and gastric mucosa.

In terms of early satiety and postprandial fullness, symptoms frequently linked to delayed gastric emptying and intragastric pressure, the average score declined from 6.3 ± 1.6 to 3.2 ± 1.3, equating to a 49.2% reduction ($p < 0.001$). This improvement supports the hypothesis that right-lateral positioning enhances gastric drainage and reduces pressure-related discomfort.

Collectively, these statistically significant outcomes demonstrate that the simple non-pharmacological intervention of sleeping with an elevated right-lateral posture can meaningfully alleviate the symptom burden in patients with gastritis or functional dyspepsia.

Discussion

This study demonstrates that maintaining an elevated right-lateral head position using a bolster pillow over a prolonged period significantly reduces both gastric acid secretion and dyspeptic symptom severity in patients with gastritis or functional dyspepsia. These findings reinforce the hypothesis that postural modification during sleep can effectively modulate physiological and biochemical pathways involved in acid production.

Biopsychophysiological Correlation

Quantitative measurements revealed a 35% reduction in basal acid output and a 40% reduction in pentagastrin-stimulated acid output. These findings indicate that the mechanical posture change influences gastric physiology at the molecular and cellular levels. Specifically, the posture reduces mechanoreceptor-stimulated vagal afferent signaling, disrupting downstream activation of parietal cells.

Parietal cells depend on signaling through M_3, H_2, and CCK_2 receptors to regulate the H^+/K^+-ATPase proton pump, a process mediated by Ca^{2+} and cAMP second messengers (Smith 2019; Johnson, 2001; Lee et al., 2012; Phillips, 2015; Clark, 2021; McKenzie & Roberts, 2001). By enhancing gastric emptying and reducing intragastric pressure, this posture likely downregulates vagal cholinergic tone—thus diminishing acetylcholine stimulation—as well as reducing ECL cell histamine release and possibly suppressing gastrin secretion. The net result is decreased recruitment of proton pumps to the parietal cell surface, leading to lower HCl output.

Symptomatic Improvement

Clinically, the intervention led to a significant reduction in epigastric pain, heartburn, and early satiety, with improvements greater than 49% across measured domains. This aligns closely with the biochemical and physiological mechanisms identified, underscoring the therapeutic potential of a non-pharmacological, posture-based approach for managing upper gastrointestinal symptoms.

Context in Literature

Prior head-of-bed elevation studies documented reduced supine acid exposure and reflux symptoms, but lacked objective measurements of acid output (Carter et al. 2020; Zhang, 2012; Ramirez, 2020). Our study extends this knowledge by directly measuring acid secretion, thus establishing a causal link between positional therapy and parietal cell inhibition.

In addition, research published in the *Athens Journal of Health and Medical Sciences* has shown that abdominal and diaphragmatic mobility is impaired in chronic gastritis patients, suggesting that mechanical factors play a significant role in gastric pathophysiology (Papadopoulos et al., 2023).

Another AJHMS study highlighted the interaction between diaphragmatic posture and visceral sensitivity, demonstrating that altered posture can modulate gastrointestinal discomfort (Georgiadis et al., 2021). Furthermore, studies of physiotherapy interventions from the same journal emphasize the importance of body positioning on autonomic regulation, including vagal tone (Papadopoulos et al. 2020; Papageorgiou et al., 2024). Notably, Georgiadis et al. (2021) in their study titled *"Postural Modulation of Gastric Symptoms in Functional Dyspepsia Patients"* explored how semi-erect and lateral postures influence the severity of dyspeptic symptoms, aligning with our focus on positional strategies in gastric symptom relief. Similarly, the work of Papadopoulos and Kotsanis (2020), *"Diaphragmatic Excursion and Autonomic Balance in Gastrointestinal Disorders,"* provided neurophysiological evidence that diaphragm-targeted interventions can positively influence vagal tone and digestive symptoms.

Integrating these insights, our study supports a model in which erect right lateral positioning with bolster support enhances gastric drainage and suppresses reflux, while simultaneously reducing vagal excitatory input to the parietal cell through mechanoreceptor and diaphragmatic mechanistic pathways. This not only extends the findings of the aforementioned AJHMS studies but also opens a dialogue with their physiotherapeutic and mechanobiological framework in treating functional gastric disorders.

Advantages and Limitations

This posture-based therapy is simple, safe, and low-cost, and can be readily implemented at home. Importantly, it avoids side effects linked to longstanding PPI or H_2-blocker use, such as malabsorption, microbiome disruption, or rebound acid hypersecretion. However, the lack of a control group, reliance on nasogastric aspiration rather than continuous pH monitoring, and the absence of long-term follow-up limit the generalizability and mechanistic resolution of the findings.

Despite these limitations, key strengths—such as a large sample size, multi-center design, and concurrent physiological and clinical outcome measures—underscore the robust nature of the data. The intervention presents a compelling, non-pharmacologic supportive strategy for the management of gastritis and

functional dyspepsia, especially in resource-limited or medication-sensitive patient populations.

Conclusion

Elevated right-lateral head positioning with the support of a bolster pillow has been shown to significantly reduce gastric acid secretion and alleviate dyspeptic symptoms by influencing both mechanical and neurohumoral pathways involved in acid production. This therapeutic posture works by minimizing gastric wall distension and enhancing gravitational drainage of gastric contents into the duodenum, thereby reducing intragastric pressure and preventing retrograde acid movement into the esophagus.

At the cellular and molecular level, this intervention exerts its effect by modulating parietal cell activity. The reduction in gastric wall stretch decreases the stimulation of gastric mechanoreceptors, leading to a downregulation of vagal efferent signaling, particularly the parasympathetic release of acetylcholine (ACh). ACh normally activates M_3 receptors on parietal cells, increasing intracellular Ca^{2+} and triggering the activation of H^+/K^+ ATPase proton pumps. With diminished ACh input, there is a consequent decline in calcium-mediated enzyme trafficking and acid secretion.

Moreover, vagal downregulation also reduces the activity of enterochromaffin-like (ECL) cells, which are responsible for releasing histamine, a potent stimulant of acid secretion through H_2 receptor-mediated cAMP pathways. In parallel, the reduction in gastric antral pressure may also suppress the release of gastrin from G cells, further dampening the stimulatory cascade on parietal cells.

Through this multi-level physiological modulation—targeting mechanoreceptor sensitivity, neurotransmitter release, and second messenger systems—the elevated right-lateral position provides meaningful suppression of HCl output, which translates to clinically measurable improvements in epigastric pain, burning sensation, postprandial fullness, and nocturnal discomfort commonly associated with gastritis and dyspepsia.

This strategy is particularly valuable because it offers a non-pharmacological, non-invasive, and cost-effective approach that can be easily implemented in both clinical and home settings. It poses no risk of drug interactions, avoids long-term side effects of acid-suppressive medications such as hypochlorhydria, micronutrient malabsorption, or rebound hyperacidity, and enhances patient autonomy and comfort.

Given these advantages, elevated right-lateral head positioning with a bolster pillow represents a simple, safe, and physiologically grounded adjunct to existing therapies for acid-related disorders, and may be especially beneficial in settings where access to medications is limited or long-term drug use is contraindicated.

Study Limitations

Several limitations merit discussion. First, this study did not include a control group, limiting causal inference. Second, gastric acid secretion was measured using nasogastric aspiration, which, while clinically validated, may be less precise than intragastric pH telemetry. Despite these limitations, the study offers robust evidence through a large sample (n=200), multi-center design, and detailed biochemical and symptomatic assessments.

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References

Brown K, Smith L, Nguyen T, et al. (2022) Sleep positional therapy for nocturnal reflux: a randomized clinical trial. *Clin Gastroenterol Hepatol*, 20(8), 1720–1728.

Brunner S, Kline J. (2020) Stress-induced gastritis and parietal cell activation: molecular pathways. *StatPearls*. Treasure Island (FL): StatPearls Publishing.

Carter JS, Williams P, Jones M, et al. (2020) Impact of head-of-bed elevation on GERD symptoms and quality of life. *Gastroenterol Hepatol*, 33(7), 1–8.

Clark AB. (2021) Histamine's effect on parietal cell function and acid secretion. *Colo State Univ Handbook*.

Georgiadis E, Antoniou M, Tzani A. (2021) Postural modulation of gastric symptoms in functional dyspepsia patients. *Athens Journal of Health and Medical Sciences,* 8(2):95–106. doi:10.30958/ajhms.8-2-3.

Gonzalez HH. (2016) To fight reflux, elevate head of bed. *Health Central*.Johnson LR. (2001) Gastric secretion regulation by acetylcholine, gastrin, histamine. *Curr Opin Gastroenterol*, 17(6), 587–593.

Hamada Y, Suzuki T, Ishikawa A. (2000) Gastrin release and acid secretion: effects of vagal stimuli. *Scand J Gastroenterol*, 35(6), 567–574.

Hayes J, Martin J. (2020) Acetylcholine and gastrin pathways in parietal cell stimulation. *StatPearls*. Treasure Island (FL): StatPearls Publishing.

Herzog T, Manning B. (2001) Gastric secretion mechanisms: current understanding. *Lippincott Williams & Wilkins*, 17(11), 123–130.

Lee A, Kim S, Gupta P. (2012) Role of Ca^{2+} and cAMP in parietal cell activation. *Gastroenterology*, 142(5), 1124–1133.

Liu S, Zhang Y. (2021) Physiology of gastric acid secretion – a SAGE review. *J Clin Med*, 10(4), 673–680.

McKenzie KW, Roberts S. (2001) H_2 receptor–Gαs–cAMP–PKA activation in gastric acid secretion. *Clin Gastroenterol Insights*, 17(2), 45–52.

Morales H, Ramos M, Patel S. (2023) Right lateral sleeping posture reduces nocturnal reflux: a randomized crossover trial. *Dove Press J Gastroenterol*, 15, 223–231.

Nguyen T. (2024) Sleep hygiene and GERD management: recommendations and guidelines. *Sleep Foundation*.

O'Neill P. (2021) Acid reflux: elevate head of bed wedge pillow improves symptomatic relief. *Verywell Health*.

Papadopoulos A, Kotsanis G. (2020) Diaphragmatic excursion and autonomic balance in gastrointestinal disorders: A clinical physiotherapy approach. *Athens Journal of Health and Medical Sciences* 7(4):241–250. doi:10.30958/ajhms.7-4-2.

Papadopoulos E, Dimitriou C, Marinos G, et al. (2023) Abdominal and diaphragmatic mobility in adults with chronic gastritis. *Athens Journal of Health and Medical Sciences* 10(2), 84–93.

Papageorgiou I, Kounios A, Karagiannis A. (2024) Body positioning and autonomic regulation: implications for gastrointestinal health. *Athens Journal of Health and Medical Sciences* 11(2): 75–84.

Patel S, Wang X, Liu Y. (2017) Molecular regulation of histamine synthesis in enterochromaffin-like cells. *Front Physiol*, 8, 737.

Phillips JE. (2015) H^+/K^+ ATPase trafficking in parietal cells: cytoskeletal and membrane dynamics. *Sci Ed*, 22(4), 305–312.

Ramirez E, Santos J, Ortiz M. (2020) Head-of-bed elevation improves reflux symptoms in patients with chronic GERD. *Gastroenterol Hepatol*, 33(7), 9–15.

Ramos RB, Garcia V, Perez F, et al. (2017) Right lateral decubitus position and gastric emptying: an ultrasound study. *Dig Dis Sci*, 62(2), 445–453.

Singh M, Patel D. (2018) Gravity-assisted drainage in gastroenterology: clinical implications. *World J Gastroenterol*, 24(20), 2170–2176.

Smith JE, Patel D, Thompson R, et al. (2019) Physiology of gastric parietal cell. *Dig Dis Sci*, 64(3), 558–567.

Torres F, Delgado P, Ramos J. (2014) Supraesophageal reflux and posture: clinical perspective. *Allergy Asthma Proc*, 35(2), 104–110.

Walker CA, Hernandez E. (2014) Enterochromaffin-like cells and parietal coordination: endocrine and neural interactions. *J Physiol Pharmacol*, 65(1), 15–23.

White R. (2022) Gastroesophageal reflux and body position: a current review. *J Watch Gastroenterol*.

Zhang M, Li Q, Zhou R. (2012) Effect of bed-head elevation on nocturnal GERD episodes. *J Gastroenterol Hepatol*, 27(6), 1078–1082.

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Impact of Preoperative Psycho-Educational Program on Anxiety and Cooperation of Pediatric Patients

By Mina Yosefy[*], Lilach Yeshayahu[±], Rima Weinshelbaum[○], Zohar Landau[○], Alon Farpel[•], Chezy Levy[♦], Galit Amozigh[♥], Ofer David Zadeh[♠] & Ilan Linder MD[♣]

This study investigated whether providing a mediation program by the education staff prior to elective surgery would reduce anxiety, improve cooperation, and increase knowledge compared to children who did not receive a mediation program. Participants included 60 children (ages 5–16) prior to undergoing elective surgery under general anesthesia at Barzilai University Medical Center, Ashkelon, assigned to two groups: The control group received treatments provided exclusively by the medical and nursing staff. The experimental group also received mediation by the educational staff through a psycho-educational mediation program. Results were measured using the SCARED questionnaire in Hebrew with a section adapted to the study addressing anxiety, cooperation, knowledge acquisition, and one reflective question. Findings indicate that the experimental group's levels of knowledge and cooperation significantly exceeded that of the control group. In the psycho-educational program, 90 percent of experimental group participants exhibited a significant reduction in anxiety compared to the control group, persisting for two weeks following the intervention. The psycho-educational discussion was instrumental in helping most participants, particularly improving their emotional well-being. The staff's expertise in adapting the program to the children's emotional, physical, and mental needs also played a key role in reducing anxiety, increasing knowledge, and fostering cooperation.

Keywords: *anxiety, psycho-educational, surgery, pediatric, mediation program*

Introduction

Based on various assessments, approximately five million children in the United States undergo surgery each year (Wahid et al., 2022), while 50–70% experiencing severe anxiety and distress prior to the procedure (Finchler et al., 2012). Surgery can trigger a range of emotions for both children and their families, which may persist from the preoperative period through the surgery itself and even for several days

[*]Director of Shaked Barzilai Education Center, Certified Child Life Specialist (CCLS), Israel.
[±]Coordinator of Measurement and Evaluation, CCLS, Israel.
[○]Director of General Educational Framework for Hospitalized Children, CCLS, Israel.
[○]Professor, Pediatric Endocrinologist, Israel.
[•]Head of the Pediatric Department, Israel
[♦]Professor, Director of Barzilai Hospital, Israel.
[♥]Head Nurse of the Pediatric Department, Barzilai Hospital, Israel.
[♠]Statistician, Israel.
[♣]Head of Pediatric Neurology and Epilepsy Services, Barzilai Hospital, Israel.

afterward. These emotions can disrupt eating and sleeping patterns. Parental anxiety may further exacerbate or even trigger their child's anxiety. Preoperative anxiety is a key predictor for postoperative complications among children and is associated with undesirable outcomes, such as distress during recovery and regressive behavioral issues, such as nightmares, separation anxiety, eating disorders, and enuresis (Wahid et al., 2022; Perry et al., 2012).

Furthermore, children must often undergo surgery that is unexpectedly imposed on them, leading to heightened anxiety and confusion. This is compounded by hospitalization, where they find themselves in an unfamiliar environment while experiencing pain, sickness, and fatigue. At the same time, parents may struggle to accept the situation often feeling powerless, frightened, and anxious about the outcomes of the illness and/or surgery. It is, therefore, understandable that children often experience uncertainty and a diminished sense of independence during illness and hospitalization. While medical and nursing staff do their best, within the available time, to alleviate anxiety and increase children's sense of control, children nevertheless may perceive these events as traumatic, potentially impacting their recovery and mental health in the short, medium, and long term (American Academy of Pediatrics, 2014; Pinchover, 2019). This underscores the crucial importance of preparing children for surgery.

The Shaked Barzilai Education Center is a facility that offers supplementary support to address the educational, emotional, and therapeutic needs of children hospitalized in the hospital's various departments. These services are provided for children from all sectors, regardless of religion, race, or sex (Barzilai University Medical Center Ashkelon, 2024),**Error! Reference source not found.** in accordance with the Free Education for Sick Children Law (2001). It operates under the supervision the Ministry of Education, in collaboration with the Ashkelon Municipality's Education Department, the hospital administration, and the medical and nursing staff.

The center's staff includes therapists and special education teachers who specialize in providing a "the healthy world for the sick child," and are considered Certified Child Life Specialists (CCLS) (American Academy of Pediatrics, 2014). These staff members initiate a psycho-educational dialog with the both the sick child and their family, helping them navigate the challenges of hospitalization, uncertainty, and pain, together with the experiences of illness and recovery. They also address aspects of the child's reintegration into the community.

The staff is well-versed in various therapeutic areas, including developmental theories, family inclusion in therapy, and support methods. They provide counselling and guidance to children, their families, and caretakers in the community, including in educational institutions. All these factors are handled with a deep understanding of the crises associated with illness, hospitalization, and the child's return to the community (Wahid et al., 2022).

The program for mediating medical procedures, developed by the Shaked Barzilai Education Center staff, welcomes patients upon hospitalization and accompanies them through their discharge. Utilizing content and various activities, the program mediates information and provides guidance, along with mental and emotional support. Its primary goal is to calm patients and their family attendants

while helping them make sense of the hospitalization process in a way that prevents a traumatic experience in the future (Thomas, 2009).

In Israel, various mediation programs have been developed that are tailored to children's conceptual understanding based on their age, sector, and language. These programs incorporate medical terminology and relevant medical equipment, following the guiding principle of transferring knowledge, experience, and practice (Ministry of Education, 2024). The staff members undergo training to become CCLS**Error! Reference source not found.** (Association of Child Life Professionals, 2024) through the Child Life Council (CLC), an organization of educators and therapists specializing in program development. The CLC encourages sick children and their family members, equipping them with various skills to cope with illness, hospitalization, and the return to everyday life.

The preoperative preparatory program was developed based on the Shaked Barzilai Educational Center's philosophy, rooted in a holistic approach, serving as a foundation for educational work that simultaneously addresses physiological, emotional, and mental needs under one roof. To achieve this, Shaked Barzilai Educational Center employs various additional mediation programs based on a psycho-educational approach, including:

1. *Chess for Life*: A program that helps hospitalized child explore their available resources through play, music, and art.
2. *The Art of a Healthy Place*: A program based on famous artistic works as a means of expression and coping during the hospitalization and recovery process.
3. *Healthier than Ever Before*: A program based on classic games (pick-up sticks, cards, etc.) that helps children process their hospitalization experience.
4. *Feelings Bin*: A program designed to encourage emotional expression, providing children with tools to cope with the hospitalization process by developing and expressing awareness of their emotions and feelings.
5. *Book Journey*: A program that invites children to process their hospitalization experience through books and words.
6. *Doll Hospital* (under development): A therapeutic program focused on crafting therapeutic dolls.

It appears that data is absent from the literature regarding the impact of mediating medical procedures as implemented at our center and the significance of these programs for other hospitalized children and those in chronic day hospitalization. Therefore, the present study was conducted to investigate whether delivering the mediation program by educational staff prior to elective surgical procedures reduces anxiety, enhances self-confidence, improves cooperation and increases knowledge compared to children who do not receive the mediation program.

The objectives of the present study are as follows:

1. Emotional aspect: To examine changes in levels of anxiety;
2. Functional aspect: To assess changes in the degree of cooperation among hospitalized children;

3. Educational aspect: To evaluate changes in the acquisition of adapted information relevant to the medical procedure.

Materials and Methods

Sixty children scheduled for elective surgery with general anesthesia were randomly assigned to two groups: (1) A control group (30 children), which received standard mediation solely from the medical and nursing staff, as is the common practice in the department; and (2) an experimental group (30 children), which received mediation psycho-educational mediation by the educational staff through the program described above. Group assignment was randomized by coin flip. Participation was voluntary, with written consent obtained by one parent (or the legal guardian).

Inclusion criteria were children aged 5–16. Both the children and their parents completed a questionnaire upon hospital admission, before the procedure, and again after it. For children under age seven, parents completed the questionnaire; children aged seven and older completed it themselves in their native language. The selected questionnaire was based on the validated Hebrew version of the SCARED**Error! Reference source not found.** (Birmaher et al., 1997) questionnaire, with additional elements adapted to the present study. It assessed anxiety, cooperation, knowledge acquisition, and included one reflective question.

The questionnaire was sent digitally (via WhatsApp, SMS, or e-mail, based on family preference) two days before the elective procedure. Completion was guided by an educational staff member (L.Y.), a CCLS trained in the mediation program. Children who received the intervention attended a single two-hour session two days before surgery in a private, quiet room in the Barzilai Hospital's pediatric department.

The questionnaire was administered at three points: immediately before the operation (baseline), immediately after, and two weeks post-operation. The final questionnaire, administered when the children were at home and pain-free, aimed to capture their reflections after processing their pre- and post-surgery experience. This timing, sufficiently removed yet close enough to the procedure, was expected to yield different impressions (Fortier et al. 2010, Kain et al. 1999).

All interventions were delivered by a mediation program specialist (L.Y.). Demographic and medical data were collected from the children's medical records, including age, sex, medical history, family history, prior hospitalizations, regular medications, surgery details, and duration of hospital stay. The study spanned from June 6, 2022 to May 7, 2023.

Mediation Program Description

The medical psycho-educational program is a designed to prepare children for medical procedures and surgery. This modular program "greets" patients upon admission and supports them through discharge, mediating information and providing guidance, along with emotional, mental, and physiological support. Its primary goal is to calm patients and their accompanying family members, helping them process hospitalization in a way that mitigates future trauma (Thomas, 2009).

Developed in alignment with the research and development principles of the Ministry of Education, the program was designed by the Hadassah Hospital Education

Center in Jerusalem. It is tailored to children's conceptual world, taking into account their age, cultural background, and language. The program incorporates relevant medical terminology and equipment, adhering to the principle of transferring knowledge, experience, and practice (Ministry of Education, 2024).

Information is provided based on the assumption that knowledge is a tool that helps calm and cope emotionally in situations of stress and uncertainty. According to established cognitive restructuring therapeutic theories, providing information reduces the intensity of children's catastrophic imaginings (when they are explained what will happen to them and why). In parallel, the hospitalized children are taught various distraction and self-soothing techniques (Katsnelson, 1993).

The mediation program is based on a psycho-pedagogical approach that applies awareness to emotions that arise and attitudes that develop within the reciprocal dynamics of teaching and learning processes. Typically, psycho-pedagogy identifies the mutual influence of the learning-teaching task and the emotional aspects experienced by both learner and teacher in these processes. Through the accompanying dialogue, it becomes possible—and essential—to address the student's emotional experiences and the emotional bond between the teacher and student, as well as foster feelings such as optimism, hope, and motivation (Zimmerman et al., 2014). In our mediation program, the psycho-pedagogic concept has been expanded to include dialogue that focuses on the sick student dealing with hospitalization; that is, psycho-pedagogic, psycho-educational dialogue.

The program includes several tools:

1. *Travel journal*. The journal is filled out by the children from the time of their arrival. It includes personal details, information about the procedure they will undergo, and which medical personnel they will meet. The journal entry is written following a detailed explanation by the CCLS about the roles of the various staff members and the nature of the upcoming procedure (a photo-album is provided for young children). This tool aims to provide children with a sense of control by helping them understand the steps of the hospitalization process while engaged in soothing activities. These activities help them draw on their inner strengths and resources, helping them cope more effectively with the medical procedure and physical pain. Employing this tool may prevent a negative experience. Dr. John Graham-Pole noted that the converse is true as well; when trauma, such as pain, is handled improperly, it can be etched in the child's memory as a negative experience that will shape their feelings towards their bodies, others, and medical treatment in general (Graham- Pole, 2000).

The travel journal includes three interactive rulers developed by the Shaked Barzilai educational staff: a pain ruler, emotions ruler, and relaxation ruler. These tools address help the hospitalized children assess and articulate their pain and emotions through images from their internal world (animals, colors, weather, characters from movies and fairy tales, etc.). The relaxation ruler encourages sick children devise strategies to overcome their difficulties and harness their strengths for coping. A

special version of the pain ruler was printed for use by nurses and doctors in the department for everyday use.

2. *Information Cards.* Age-appropriate information cards about the surgery that the child will undergo before entering the operation room and following the surgery. Tailored to three different age groups, the cards are designed with the understanding that knowledge can be a calming tool, helping patients manage situations of stress and uncertainty. By reducing the intensity of children's catastrophic imaginary thoughts, the cards facilitate coping while incorporating various techniques for self-soothing and distraction (Katsnelson, 1993).
3. *Visual Aids.* These include surgical scrubs, anesthesia masks, intravenous tubes, and other aids relevant to the procedure. The goal is to familiarize the patient and their family members with the medical devices and equipment, allowing them to see and feel them before the procedure begins. Following this hands-on introduction, the patients participate in a creative activity incorporating these aids to further reduce anxiety (Thomas, 2009).
4. *Photo Album.* As part of the presentation of theoretical information, visuals will be provided through a photo album that visually depicts what the child will undergo and see, including the children's ward and the route to the emergency room.
5. *Creative Activity.* After reading *Where the Worries Go at Night* (the Hebrew version of *Silly Billy* by Anthony Browne), a psycho-educational discussion is held to explore the children's concerns about the upcoming procedure. Afterward, the children create a "worry doll" (Brown, 2008; 2006)[0] to hold their fears. Alternatively, they can make a picture using medical equipment, such as a syringe and tongue depressor**,** to help familiarize the children with the medical equipment they will encounter during their hospitalization to reduce their anxiety. All of the children in the intervention group participated in the psycho-educational program and received the five tools described above.

Statistical Analysis

The study required evaluating the impact of the medical intervention (the mediation program) on children's anxiety levels. To evaluate the program's effectiveness, we assessed the children's anxiety levels prior the intervention and two weeks afterward. This assessment was conducted using a paired-samples T-test. Another test was performed on the control group who did not experience the intervention, and the comparison was made using an independent-samples T-test. We also examined whether there were differences in the children's knowledge about the procedure they were about to undergo and in their cooperation. For each of these areas, we referred to the children's feedback and compared it to the control group. The significance of the differences between the groups was analyzed using SAS statistical software.

Results

A total of 155 potential participants were identified between June 2022 and May 2023. Of these, only 67 participants met the inclusion criteria: ages 5–16, scheduled for elective surgery, and agreement to sign the informed consent form. Of the 67 eligible participants, seven withdrew for the following reasons: three declined surgery on the day of the procedure after receiving information from the anesthesiologist (two of whom were in the control group, which did not receive preoperative preparation). Another participant withdrew after her mother refused to complete the second questionnaire. One participant refused to undergo the preoperative blood tests at her local clinic, resulting in the cancellation of surgery. For the two remaining participants, surgery was postponed for more than six months.

Table 1 presents the demographic and medical characteristics of patients who participated in the study, including age, sex, and medical history.

Table 1. *Study Participant Characteristics*

	Experimental Group	Control Group
Average age (years)	3.11±9.66	3.56±10.33
Sex: Male (%)	15 (50%)	19 (63.33%)
Female (%)	15 (50%)	11 (36.66%)
Prior surgeries	3	1
General surgery	5	5
ENT surgery	13	15
Orthopedic surgery	5	7
Plastic surgery	7	1

As shown in Figure 1, following the procedure, 27 students (90%) in the experimental group experienced a reduction in anxiety, while three students (10%) showed no change in anxiety levels at that time. None of the students experienced an increase in post-procedure anxiety. Two weeks after the procedure, of the 27 students who initially showed a reduction in anxiety, four (14%) experienced a slight increase in anxiety, which was not significant and remained within a low-anxiety range. For 18 students (66%), anxiety levels remained stable, with most of them reporting very low anxiety. The remaining five students (18%) continued to experience a decrease in anxiety. Two weeks following the procedure, of the three students who did not experience a change in anxiety level before and after the procedure, two maintained low anxiety levels; the third showed a significant reduction in anxiety, dropping from 5 to 1.

As shown in Figure 2, the percentage distribution of the participants' reports on the primary tool that influenced their anxiety levels and cooperation. The figure indicates that 18 children (34%) found that the psycho-educational discussion about the feelings and relaxation rulers, which focused on their resources, to be the most beneficial. Fourteen children (26.4%) identified the psycho-educational discussion in the journal context as most helpful. Thirteen children (24.5%) reported that the informative discussion (photo album) was most effective, while the remaining eight

children (15.1%) reported that the psycho-educational discussion related to the creative activity helped them cope best with hospitalization and surgery.

Figure 1. *Anxiety Levels Among Experimental vs. Control Groups: Pre-Procedure and Two Weeks Post-Procedure.*

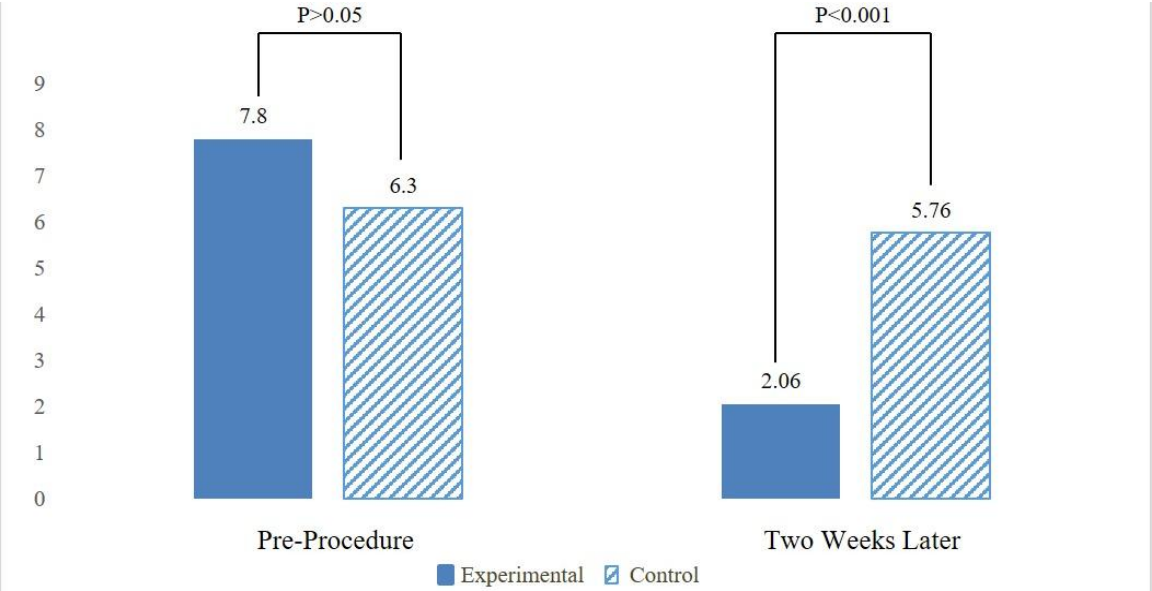
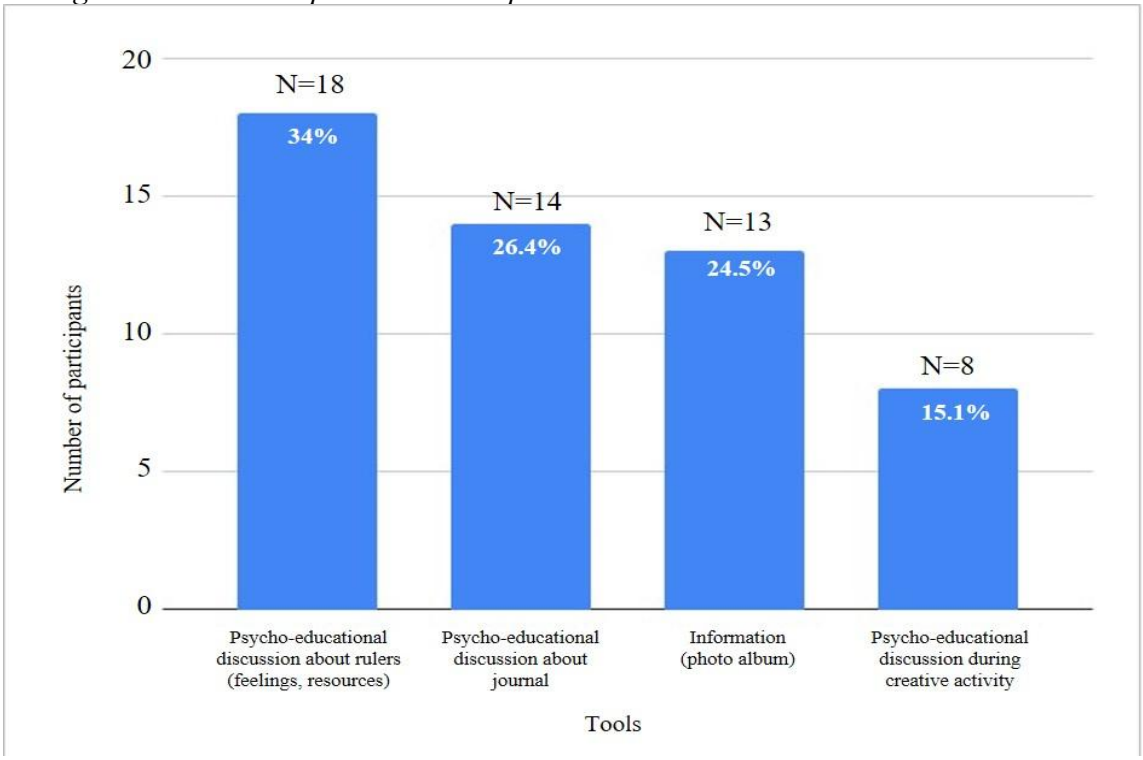
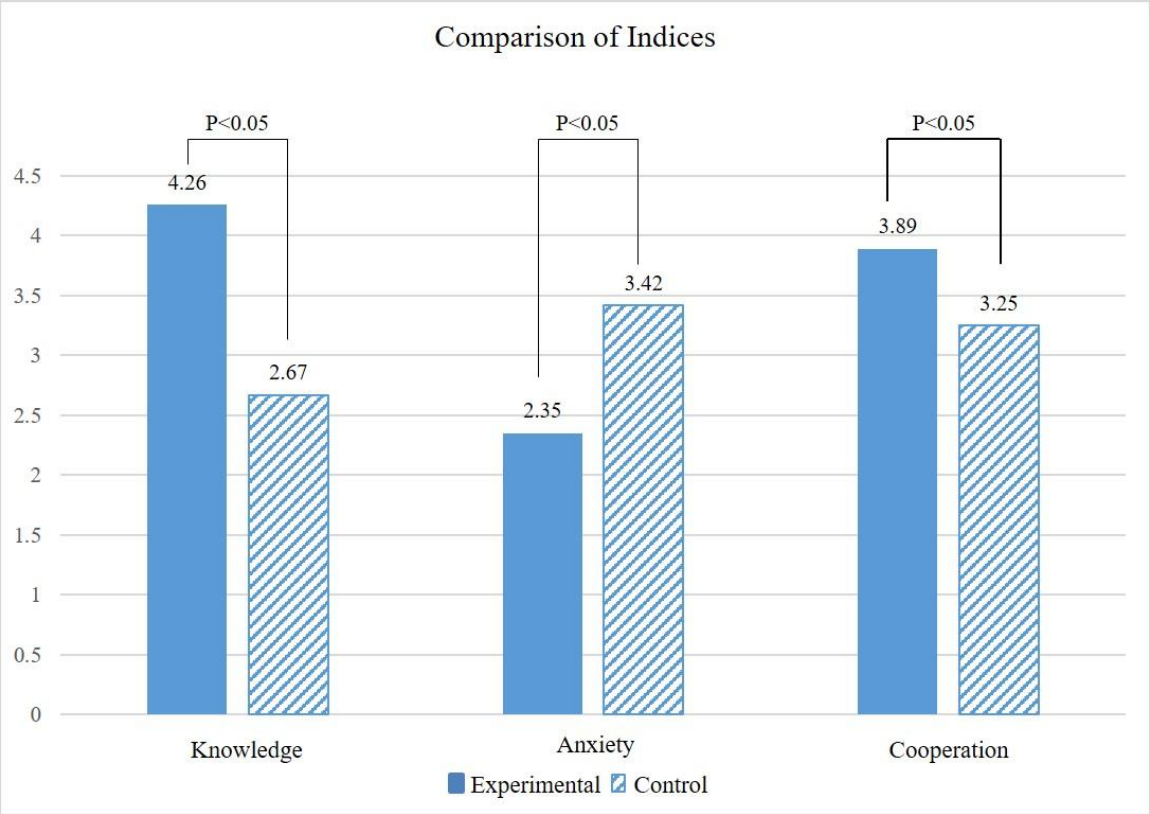


Figure 2. *Constructive Qualitative Analysis of Tools Impacting Anxiety Reduction Among Children in the Experimental Group*



As shown in Figure 3, the graphs describe the average levels of the knowledge, anxiety, and cooperation in the experimental group compared to the control group. The data shows that the experimental group demonstrated significantly higher knowledge levels than the control group (4.26 vs. 2.67, $p<0.05$). Anxiety levels were lower in the experimental group than in the control group (2.35 vs. 3.42, $p<0.05$). Additionally, the experimental group exhibited higher levels of cooperation than the control group (3.89 vs. 3.25, $p<0.05$).

Figure 3. *Consolidated Results: Knowledge, Anxiety, and Cooperation in the Experimental Group vs. Control Group*



Discussion

Prior to surgery, children report experiencing various types of fear, including social fear, fear of animals, fear of death, fear of the unknown, and medical fear. In the context of hospitals, the most intense fears that children report include fear of separation from parents, hospitalization, blood tests, injections, fear of prolonged hospitalization and from "bad news" about their medical situation. In this category of fears can be added anxiety and fear of surgery (Hart and Bossert, 1994).

In recent decades, hospitals in various countries have placed a significant emphasis on reducing anxiety in child undergoing surgery, particularly with regard to the fear of general anesthesia (Litke et al., 2012).0 There is broad consensus that an anxiety-inducing experiences for children facing surgery should be prevented to the

greatest extent possible. Preventative methods include listening to calming music, playing with an iPad, watching videos, teaching coping skills, and involving parents (Wahid et al., 2022; Finchler et al., 2012; Hossari, 2013; Kennedy and Howlin, 2022). One study assessing the impact of providing knowledge (both verbal and written) about the medical procedure to both children and their parents on the day of surgery found a significant reduction in the child's level of anxiety before the procedure (Hartani and Handayani, 2021; Cumino et al., 2017).**Error! Reference source not found.** Furthermore, a review of empirical studies examining the most effective techniques for alleviating preoperative anxiety in children assessed the influence of parental presence both independently and in combination with an additional anxiety-reducing technique (Wahid et al., 2022). In light of this research, doctors favor non-medical interventions, particularly parental presence during the administration of anesthesia, to reduce children's anxiety. Routine techniques to mitigate preoperative anxiety include the use of various anxiety-reducing medications; however, these methods are costly and require additional nursing staff and beds in the operation room.1

The review and studies (Wiles, 1988; 1987; 1979; Ratnapalan et al., 2009), along with the impressions of the medical staff at Barzilai Medical Center, found that children who participated in a two-hour preparatory program before the medical procedure exhibited less anxiety and were calmer before and during the procedure, as well as during their hospitalization afterward. In the present study we demonstrated that integrating psycho-educational dialogue with the five abovementioned tools significantly reduced anxiety levels in the experimental group, with 90% of the children (28 out of 30 children) showing some extent of reduction in anxiety. Moreover, this decreased level was maintained for two weeks following the intervention.

The present study assessed several components, including the impact of knowledge, cooperation, and anxiety levels. We found that, in addition to reducing anxiety, there was a significant increase in cooperation. Notably, when more information was delivered, this combination played a significant role in reducing anxiety.

This study is unique inasmuch as it highlights additional factors that can influence anxiety reduction, providing a basis for assessing the effectiveness of intervention programs. In response to the reflective question asked at the end of the process—"Which part of the program you participated in prior to surgery helped you cope best with the surgery?"—responses varied according to the children's ages. For example, five-year-olds had difficulty pinpointing what helped them most, aside for receiving attention and participating in the psycho-educational discussion. Six-year-olds noted that the psycho-educational discussion, facilitated by the mediator and focused particularly on information about the upcoming procedure, helped them most. In contrast, children aged 9–14 reported that psycho-educational discussion related to the relaxation ruler (resources) was most beneficial.

As previously mentioned, parental presence during the intervention was significant, but without their involvement. In our study, the ones completing the questionnaire were the children, in contrast to other studies, where parents or medical staff provided responses. This approach allowed for more precise answers directly from the children, reflecting their own perceptions, rather than through the mediation of parents or medical staff as they perceive the children.

Conclusions

This study highlights the critical importance of providing psycho-educational support to hospitalized children through medical mediation programs in general and pre-operative preparation in particular, while raising physicians' awareness of the significance of this support.

In the psycho-educational program described in our study, 90% of the children who participated in the intervention exhibited a significant reduction in anxiety compared to the control group, with this reduction persisting for up to two weeks following the procedure (see Figure 1). To date, no research in the literature has documented a comparable decline following psycho-educational discussions combined with the tools utilized in this study (a travel journal, interactive rulers, information cards, visual aids, creative activities, and a photo album; see Figure 2). Our findings indicate that not only is this method effective, but we can even isolate specific components of the program that are particularly effective in reducing anxiety in individual children.

We found that the experimental group exhibited significantly a higher level of knowledge compared to the control group (see Figure 3). From an educational perspective, imparting information also assisted in reducing anxiety (see Figure 2).

We extended the concept of psycho-pedagogical discussions by applying psycho-educational discussions during times of crises to help students cope with the hospitalization process. These discussions, especially when focused on emotions, significantly helped most participants reduce their overall anxiety, especially the emotional aspect. The skills and expertise of the staff in selecting and tailoring the content to the emotional, physical, and mental state of each child was found to be especially important.

All participants completed the questionnaires, in contrast to many studies were responses were filled out by the medical or nursing staff. This process ensured more accurate answers, reflecting the children's own perceptions rather than those of their parents or hospital personnel.

The present study is unique in its ability to maintain continuity in the children's levels of cooperation. The findings indicate that the cooperation levels of the experimental group were higher than those of the control group, even two weeks post-intervention. This was reflected in responses to the questionnaire, which asked participants if they would be willing to cooperate in future surgeries.

Children who participated in the intervention program not only experienced reduced anxiety and manifested higher levels of cooperation, but also acquired tools to help them cope with similar situations in the future. This was largely achieved through the awareness they developed using the resource and relaxation rulers, which may explain their high level of cooperation in future surgeries.

The type of surgery each child underwent did not affect their anxiety or cooperation levels during surgery. Differences by sex in terms of levels of knowledge, anxiety, and cooperation were minimal. However, the study found that the intervention program had the greatest impact on older boys.

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References

Association of Child Life Professionals (n.d.) *Child life specialist*. Association of Child Life Professionals. Available at: https://www.childlife.org/

Barzilai University Medical Center Ashkelon (n.d.) *Shaked Educational Center mission statement*. Barzilai Medical Center website (In Hebrew). Available at: http://www.bmc.gov.il/?CategoryID=437&ArticleID=836

Birmaher B, Khetarpal S, Brent D, Cully M, Balach L, Kaufman J, Neer SM (1997) The screen for child anxiety related emotional disorders (SCARED): Scale construction and psychometric characteristics. *Journal of the American Academy of Child & Adolescent Psychiatry* 36(4): 545–553. https://doi.org/10.1097/00004583-199704 000-00018

Browne A (2008) *Worry dolls – Where the worries go at night*. Kinneret Zmora-Bitan Dvir Publishers (In Hebrew).

Browne A (2006) *Silly Billy.* Candlewick Press.

Child Life Services (2014) Policy statement: Committee on hospital care and child life council. *American Academy of Pediatrics* 133(5): 1471–1478. https://doi.org/10.1542/peds.20 14-0556

Cumino DO, Vieira JE, Lima LC, Stievano LP, Silva RA, Mathias LA (2017) Smartphone-based behavioural intervention alleviates children's anxiety during anaesthesia induction: A randomised controlled trial. *European Journal of Anaesthesiology* 34(3): 169–175. https://doi.org/10.1097/EJA.0000000000000589

Finchler W, Shaw J, Ramelet A (2012) The effectiveness of a standardized perioperative preparation in reducing child and parent anxiety: A single blind randomized controlled trial. *Journal of Clinical Nursing* 21: 946–955. https://doi.org/10.1111/j.1365-2702.2011.03748.x

Fortier M, Del Rosario A, Martin S, Kain Z (2010) Perioperative anxiety in children *Paediatric Anaesthesia* 20: 318–322. https://doi.org/10.1111/j.1460-9592.2010.03263.x

Free Education for Sick Children Law, 5761-2001 (2001) (In Hebrew). Available at: http://meyda.education.gov.il/files/charedy/SickChildrenLaw2016.pdf

Graham-Pole J (2000) *Illness and the art of creative self-expression: stories and exercises from the arts for those with chronic illness*. New Harbinger Publications Inc.

Hart D, Bossert E (1994) Self-reported fears of hospitalized school-age children. *Journal of Pediatric Nursing* 9(2): 83–90.

Hartanti RW Handayani L (2021) Pre-operative education to reduce anxiety: Literature review. *Epidemiology and Society Health Review* 3(2): 23–28. https://doi.org/10.26555/eshr.v3i2. 4301

Hossari H (2013) *The effect of watching an animation video about surgery and anesthesia preparation on levels of anxiety and pain in children* [Master's thesis, Max Stern Yezreel Valley College] (In Hebrew).

Kain Z, Wang S, Mayes L, Caramico L, Hofstadter M (1999) Distress during the induction of anesthesia and postoperative behavioral outcomes. *Anesthesia & Analgesia* 88(5): 1042–1047. https://doi.org/10.1097/00000539-199905000-00013

Katsneslon E (1993) *That hurts! Emotional coping with physical pain among children*. Amichay Publishers (In Hebrew).

Kennedy M, Howlin F (2022) Preparation of children for elective surgery and hospitalisation: A parental perspective. *Journal of Child Health Care* 26(4): 568–580. https://doi.org/10.1177/13674935211032804

Litke J, Pikulska A, Wegner T (2012) Management of perioperative stress in children and parents. Part I—The preoperative period. *Anesthesiology Intensive Therapy* 44(3): 165–169.

Ministry of Education (n.d.) *Program principles and main work procedures.* Ministry of Education. Available at: https://sites.google.com/tikshuv4sn.org.il/medical-procedures/3 (In Hebrew).

Perry J, Hooper V, Mastiongade J (2012) Reduction of preoperative anxiety in pediatric surgery patients using age-appropriate teaching interventions. *Journal of PeriAnesthesia Nursing* 27: 69–81. https://doi.org/10.1016/j.jopan.2011.12.008

Pinchover A (n.d.) *A school for hospitalized children: The vision and implementation at Hadassah Medical Center*. Oranim College (In Hebrew). Available at: https://dvarim.oranim.ac.il/wp-content/uploads/2019/10/%D7%A4%D7%99%D7%A0%D7%A6%D7%95%D7%91%D7%A8.pdf

Ratnapalan S, Rayar MS, Crawley M (2009) Educational services for hospitalized children. *Paediatrics & Child Health* 14(7): 433–436. https://doi.org/10.1093/pch/14.7.433

Thomas B (2009) *Creative coping skills for children: Emotional support through arts and crafts activities.* Jessica Kingsley Publishers.

Wahid SA, Johncy S, Abbas S, Lee M (2022) The effects of distraction on preoperative anxiety in preschool and school-age children: A literature review. *Athens Journal of Health and Medical Sciences* 9(1): 49–70. https://doi.org/10.30958/ajhms.9-1-4

Wiles P (1979) Hospitalized children in the USA. *British Journal of Special Education* 6(4): 23. https://doi.org/10.15390/EB.2021.9503

Wiles P (1987) The schoolteacher on the hospital ward. *Journal of Advanced Nursing* 12(5): 631–640. https://doi.org/10.1111/j.1365-2648.1987.tb03056.x

Wiles P (1988) Teaching children in hospital. *British Journal of Special Education* 15(4): 158–162. https://doi.org/10.1111/j.1467-8578.1988.tb00749.x

Zimmerman S, Burg O, Slonim K, Talmor T, Gilad M (2014) *Mosaic: Psychopedagogy – Awareness and knowledge in the art of education and pedagogy*. Ministry of Education (In Hebrew).