SINTEZA 2025

INFORMATION TECHNOLOGY IN SPORTS SESSION

# THE GROWING ROLE OF NUTRITION APPLICATIONS IN HEALTH AND WELLNESS - THE DEVELOPMENT OF CISHRANA, SERBIA'S FIRST NUTRITION APPLICATION

Marija Anđelković\*, [0009-0009-7220-2617]

Nenad Dikić [0000-0001-5245-2891]

Singidunum University, Belgrade, Serbia

Correspondence:

Marija Andjelković

e-mail: mandjelkovic@singidunum.ac.rs

#### Abstract:

With increasing awareness of the connection between diet and health, nutrition applications have become essential to promoting balanced eating habits. These apps provide real-time dietary tracking, calorie counting, and nutrient analysis, helping users make informed food choices. The rising prevalence of obesity and diet-related diseases has driven the need for digital solutions that empower individuals to monitor their nutritional intake and achieve health goals. This paper explores the functionalities and benefits of nutrition applications, their role in weight management and overall wellness, and their challenges. Additionally, we present the development of CIShrana, Serbia's first nutrition application, designed to offer precise dietary guidance based on a localised food database. The CIShrana app results from a collaboration between the Center for Sports Nutrition and Supplementation (CIS) and the Synchronized Swimming Federation of Serbia. This pioneering initiative provides Serbian users with a scientifically backed dietary tracking tool. The paper highlights the app's features, development process, and potential impact on public health and professional nutrition practice.

#### Keywords:

Nutrition Apps, Health Technology, Digital Health, Dietary Tracking, Public Health Innovation.

### INTRODUCTION

Maintaining a balanced diet has become increasingly challenging due to fast-paced lifestyles, sedentary habits, urbanisation, and the widespread consumption of processed foods. Highly processed foods, often rich in sugars, unhealthy fats, and artificial additives, have contributed to rising rates of obesity and diet-related diseases globally [1] [2]. In response to these challenges, nutrition applications have emerged as essential tools that help users track food intake, manage calories, and plan their diets. These digital platforms enable users to monitor their eating habits, analyse nutrient intake, and receive personalised recommendations to achieve specific health goals [2].

With chronic conditions such as obesity, diabetes, and cardiovascular diseases on the rise, personalised nutrition guidance is more critical than ever. Studies indicate that nutrition apps improve adherence to dietary recommendations by providing real-time feedback and educational resources [3] [4] [5].



Advanced nutrition apps leverage machine learning algorithms, artificial intelligence, and comprehensive food databases to offer individualised meal plans, making them more effective than traditional dietary counselling alone [6].

Additionally, modern digital nutrition tools increasingly integrate biometric data from wearable devices, allowing users to track physiological responses to their dietary choices in real time [7].

Several global nutrition apps, including MyFitnessPal, Yazio, and Cronometer, have effectively promoted weight management and healthier eating habits [3] [8] [9]. However, many of these applications rely on Western food databases, limiting their suitability for non-Western populations due to differences in dietary patterns and available food items [9]. CIShrana was developed to address this gap, offering the first Serbian nutrition application to accommodate local nutritional habits and food availability [10]. By integrating a locally sourced food database, CIShrana enables accurate meal tracking and planning aligned with Serbian users' dietary needs.

This paper explores the role of nutrition applications in modern health and wellness, their influence on dietary habits, and the challenges they face. Additionally, it introduces the development of CIShrana, detailing its functionalities, objectives, and anticipated contributions to public health.

#### 1.1. DEVELOPMENT OF THE CISHRANA APP

Recognising the demand for localised nutrition solutions, the Center for Sports Nutrition and Supplementation (CIS - https://cis.edu.rs/) partnered with the Synchronized Swimming Federation of Serbia (https://www.synchro-serbia.org.rs/index.php) developed CIShrana. This initiative was part of the FINA OASP programme, which promotes athlete development through nutrition education. CIShrana was explicitly designed to meet the dietary needs of Serbian users by incorporating local food databases, including EuroFIR/ FoodEXplorer. The app lets users track caloric intake, analyse meal composition, and receive personalised dietary recommendations.

Despite the development of mobile applications aimed at monitoring nutritional intake, most tools available globally are designed based on foreign food databases, lack culturally relevant items, and are not adapted to the specific dietary habits, items and portion sizes typical of the Serbian population. In response to this gap, we developed the first Serbian mobile application to serve as a user-friendly, scientifically grounded nutrition diary. The app is available on Android and iOS platforms. It includes an extensive database of Serbian food items with localised portion measurements and nutritional values derived from verified national and international sources. It enables users to log daily meals, monitor macronutrient and micronutrient intake, and gain personalised insights into their dietary patterns.

CIShrana integrates national food data, ensuring accurate nutritional assessments. It is designed for athletes and the general population and features an intuitive interface that simplifies dietary tracking. The application was developed with the assistance of Alchemy Engine experts (https://www.alchemyengine.io/), ensuring a seamless user experience. It is available on Android and iOS platforms, with planned updates to enhance functionalities based on user feedback and ongoing nutritional research.

The app includes several key features, including:

- A meal-tracking system that calculates daily macronutrient and micronutrient intake;
- A visual representation of nutritional summaries;
- A detailed food database with Serbian-specific items.

## 1.2. EXAMPLE OF THE APP INTERFACE

48 10 🔳 🕲	0 74	92%
	3	
mart	2025	•
4 5	7 8	9
lai obrok	-	
	Ť	+
	~	+
	~	+
	~	+
	~	+
	~	+
0.00% masti	0.00% 0.0 uglj.hidrad pro	10% mini
		C.

Figure 1. CIShrana - Meal intake tracking interface



Figure 2. CIShrana - Summary of daily caloric and nutrient intake

		1 Xe-11		· · · · · · · ·		
Izvestaji		Izvestaji	Izvestaji		Izvestaji	
Dan Nedelja Proizvoljno	Saluvano	Dan Nedelja Pro	oizvoljno Sačuvano	Dan Nedelja	Proizvoljno Sačuvan	
Dnevni izveštaji	Sačuvaj 🗢	Dnevni izveštaji	Sačuvaj 🗢	Dnevni izveštaji	Secure) C	
< 3/6/2025 >		< 3/6/2025	>	< 3/6/20	.25 >	
10000		Ugljeni hidrati		Minerali		
Masti		fibre, total dietary	2.159	ash	1.89	
cholesterol	28.20mg	fibre, water-insoluble	0.00g	calcium	387.10m	
fatrn	0.14g	fibre, water-soluble	0.00g	chloride	0.00m	
fatty acid 18.1 (octadecenoic acid)	1.21g	lactose	400.00mg	chromium	3.19µ	
fatty acid 18:1 n-9 cis (oleic acid)	0.009	starch, total	22.00g	copper	0.10m	
fatty acid 18.2	0.459	sucrose	0.00g	iodide	33.28µ	
fatty acid 18/2 n-6 cis,cis	0.00g	sugars, total	5.75g	iron, haem	0.00	
fatty acid 18:3	0.00mg			iron, non-haem	0.00	
fatty acid 18:3 n-3 all-cis	0.03g	Proteini		iron, total	1.36m	
fatty acids, polyunsaturated, total n-3	0.04g	organic acids, total	0.00g	magnesium	34.60m	
tatty acids, polyunsaturated, total n-6	0.45g			manganese	0.02m	
ratty acros, total monounsaturated	2.829	Minerali		molybdenum	0.00	
fatty acids, total polyunsaturated	0.299	ash	1.89g	phosphorus	439.80m	
narry acros, roral saturated	o.oog	calcium	387.10mg	potassium	337.70m	
Unlieni hidrati		chloride	0.00mg	selenium, total	7.36p	
films total distance	2 150	chromium	3.19µg	sodium	546.20m	

Figure 3. CIShrana - Detailed nutritional report

The app interface presented in Figures 1, 2, and 3 shows the app's usability, accuracy, and potential applications in clinical practice, sports nutrition, public health education, and personal health monitoring. The user can choose from thousands of different nutrition items, adjust the dosage, and add them to one of five meals (breakfast, lunch, dinner, and snacks). In Figures 2 and 3, the daily report with represented macro and micronutrient values is easy for users to read and determine how many calories, fluids, vitamins, and minerals are in every meal.

This paper aims to present the application's structure, development process, and validation methodology, with a focus on its usability, accuracy, and potential applications in clinical practice, sports nutrition, public health education, and personal health monitoring. We discuss the relevance of integrating culturally tailored digital health tools into everyday medical and lifestyle practice and the broader implications for digital transformation in nutrition science.

# 2. DISCUSSION

Modern nutrition applications are evolving into sophisticated tools that facilitate healthier eating habits through technology. The primary function of most nutrition apps is to enable users to log their daily food intake and receive feedback on calorie and nutrient consumption. However, it is well-established that food items vary significantly in macronutrient and micronutrient content across different regions. Regional differences in sugar content, fortified nutrients, and preservatives can substantially affect the accuracy of global food databases. In response, CIShrana utilises the EuroFIR food database, incorporating data from local food items to ensure the precision of dietary calculations. This app is further supported by information from Calories in Everyday Life, a comprehensive book by Dr. Nedeljko Jokić, which presents tables of local food ingredients, further enhancing its regional relevance.

Scientific research supports the notion that individuals who track their food intake are more likely to make healthier choices and maintain balanced diets [3]. By incorporating a locally adapted food database, CIShrana offers a user-friendly approach that allows individuals to search for familiar, locally sourced food items in the local language. This makes it not only accessible but practical for Serbian users who are accustomed to their regional dietary habits.

The development of this application represents the culmination of over a decade of dedicated work in sports nutrition, driven by the Center for Sports Nutrition and Supplementation (CIS). Although the concept of creating a calorie and nutrient tracking app had been in the works for several years, it was not until 2023, through a collaboration with the Synchronised Swimming Federation of Serbia and the support of the FINA OASP programme, that the initiative came to fruition. This international programme, which supports the development of aquatic sports, provided both the financial and organizational resources needed to turn this vision into reality. The app was initially conceived as an educational tool for athletes, particularly those in aesthetic sports such as synchronised swimming, where nutrition and body image are essential. It was designed to support athletes in managing their nutritional intake more effectively. Through nutrition workshops and educational lectures provided by CIS experts, it became apparent that an intuitive, mobile platform was the most practical solution for translating complex concepts such as energy balance and portion control into athletes' daily routines. Unlike generic nutrition applications that serve a broad global audience, CIShrana is explicitly tailored to the Serbian population. This focus ensures that users receive dietary assessments that reflect local food ingredients, portion sizes, and standard nutritional practices. While many nutrition apps incorporate barcode scanners for packaged food items, they often rely on international databases, which may not accurately reflect the nutritional composition of locally produced foods. As part of its ongoing development, CIShrana aims to integrate a barcode scanning feature specifically for Serbian food products, further enhancing its accuracy and usability.

The future of nutrition tracking applications lies in their ability to integrate with wearable fitness devices, such as Fitbit, Apple Watch, and Google Fit. These integrations will enable a comprehensive view of a user's health by linking dietary intake with physical activity levels, creating a more holistic approach to health management. CIShrana is designed with a modular framework that allows for future updates, including such integrations, ensuring the app remains at the forefront of digital health solutions.

In addition to food logging, many modern nutrition apps offer meal-planning tools, recipe suggestions, and dietary adjustments based on users' nutritional preferences or restrictions. This functionality particularly benefits users looking to develop structured eating habits, increase meal variety, and meet specific health or fitness goals. In future iterations, CIShrana plans to include advanced features, such as personalised meal-planning formulas tailored to individual health objectives, such as weight management, athletic performance, or chronic disease prevention.

The effectiveness of digital tools like nutrition apps in promoting healthier eating behaviors is well-documented. Studies have shown that consistent self-monitoring of food intake leads to improved weight management, better glycaemic control in individuals with diabetes, and greater adherence to dietary recommendations [5]. Nutrition apps provide immediate insight into caloric intake, macronutrient distribution, and micronutrient adequacy — data that would otherwise be difficult for individuals to estimate accurately without professional guidance. These apps empower individuals by offering real-time feedback and personalised insights, which is critical in improving long-term dietary adherence.

The adoption of nutrition apps offers significant benefits, both for individuals and healthcare professionals. Self-monitoring has been linked to improved diet quality, enhanced adherence to nutritional guidelines, and more successful management of chronic conditions. CIShrana is designed not only to appeal to individuals aiming to improve their lifestyle and nutrition but also to professionals such as dietitians and medical doctors. The app is already being embraced by a growing community, including students and professionals in nutrition and supplementation, particularly at the Faculty of Medical Sciences in Kragujevac. An active online forum further facilitates community engagement, allowing users to suggest new food items to be added to the app's database.

However, despite their benefits, nutrition apps are not without challenges. Some apps rely on incomplete or outdated nutritional information, leading to inaccuracies in dietary assessments. Additionally, continuously logging food intake may be perceived as tedious, potentially reducing long-term user adherence. To address these challenges, CIShrana has been designed to simplify the user experience while maintaining a high level of accuracy. Streamlined food tracking and automated, personalised dietary reports ensure that novice users and field experts can easily integrate the app into their routines. From a public health perspective, mobile nutrition apps represent a scalable solution for educating and empowering individuals to adopt healthier eating habits. Their integration into clinical workflows - particularly in preventive medicine, chronic disease management, and sports nutrition can reduce healthcare systems' burden and improve long-term health outcomes. The future of mobile nutrition apps lies in their ability to integrate diverse data sources and offer real-time, personalised dietary guidance. As technology advances, these apps will likely become an essential component of a data-driven approach to public health.

In conclusion, while CIShrana was initially designed as a tool for synchronised swimmers, its broad potential as Serbia's first mobile nutrition diary underscores the power of sports science to inspire solutions that benefit the wider population. This application represents only the beginning of a much broader digital transformation in nutrition. As the field of nutrition continues to evolve, future versions of CIShrana will further personalise dietary guidance, integrate biometric data, and contribute to a more comprehensive, data-driven approach to nutrition management.

# 3. CONCLUSION

Nutrition applications promote healthier lifestyles by providing real-time dietary tracking, meal planning, and personalised nutritional guidance. While these apps have certain limitations, their ability to enhance dietary awareness and promote informed food choices is undeniable. The development of the first Serbian mobile nutrition diary marks a significant step toward localised, culturally sensitive digital health tools that bridge the gap between evidence-based nutrition and everyday practice. While global applications offer general frameworks for food logging, they often fail to reflect national dietary customs, leading to limited accuracy and poor user engagement in local populations. By incorporating national food items, meal structures, and portion sizes, our application addresses a long-standing need for a tailored approach in nutritional self-monitoring within the region.

CIShrana represents a significant milestone in Serbia's digital health landscape, offering the public localised, scientifically backed nutrition insights. As the application evolves, its impact on public health, athletic performance, and professional dietetics is expected to grow, reinforcing the importance of digital nutrition tools in contemporary wellness management.

# 4. ACKNOWLEDGEMENTS

We want to acknowledge the help of the Center for Sports Nutrition and Supplementation (CIS) and the Synchronized Swimming Federation of Serbia, who helped develop that idea into real everyday life and used by all people interested in their nutrition habits.

## REFERENCES

- W. H. O. (WHO), "Diet, nutrition and the prevention of chronic diseases. World Health Organ Tech Rep Ser. 2003;916," WHO Library Cataloguing-in-Publication Data, Geneva, 2002.
- [2] M. C. G. T. R. D. G. N. I. C. M. P. E. &. G. R. Vitale, "Ultra-Processed Foods and Human Health: A Systematic Review and Meta-Analysis of Prospective Cohort Studies.," *Adv Nutr*, vol. 15, no. 1, p. https:// doi.org/10.1016/j.advnut.2023.09.009, 2024.
- [3] W. M. S. J. M. J. H. D. S. S. Coughlin SS, "Smartphone Applications for Promoting Healthy Diet and Nutrition: A Literature Review.," *Jacobs J Food Nutr.*, vol. 2 (3), no. 021, p. https://pmc.ncbi.nlm. nih.g, 2015.
- P. S. H. D. e. a. Paramastri R, "Comput Methods Programmes Biomed.," *Use of mobile applications to improve nutrition behaviour: A systematic review.*, vol. 192:105459, p. doi:10.1016/j.cmpb.2020.105459. , 2020.
- [5] M. L. J. C. M. A. N. N. Ghelani DP, "Mobile Apps for Weight Management: A Review of the Latest Evidence to Inform Practice.," *Front Endocrinol (Lausanne)*. 2020;11:412., vol. 11, no. 412, p. doi:10.3389/fendo.2020.00412. https://doi.org/10, 2020.
- [6] N. K. K. J. K. H. Theodore Armand TP, "Applications of Artificial Intelligence, Machine Learning, and Deep Learning in Nutrition: A Systematic Review.," *Nutrients*, vol. 16(7), no. 1073, p. doi:10.3390/nu16071073, 2024.
- [7] H. W. A. J. C.-N. K. DiFilippo KN, "The use of mobile apps to improve nutrition outcomes: A systematic literature review.," *J Telemed Telecare*. 2015;21(5): , vol. 21 , no. 5, pp. 243-253. doi:10.1177/1357633X15572203 , 2015.
- [8] T. M. K. M. P. C. Payne JE, "Adherence to mobileapp-based dietary self-monitoring-Impact on weight loss in adults.," *Obes Sci Pract.*, vol. 28, no. 8(3), pp. 279-288. doi: 10.1002/osp4.566., 2021.
- [9] H. L. N. M. M. e. a. Hauptmann, "Effects and challenges of using a nutrition assistance system: results of a long-term mixed-method study.," User Model User-Adap Inter, vol. 32, no. 923–975, pp. https://doi.org/10.1007/s11257-021-09301-y, 2022.

[10] A. K. J. M. L. S. M. R. & S. T. Böhm, "Real-World Evidence of User Engagement With Mobile Health for Diabetes Management: Longitudinal Observational Study.," *JMIR Mhealth Uhealth.*, vol. 8, no. 11, PMID: 32975198; PMCID: PM, p. doi: 10.2196/22212., 2020.

460