The effectiveness of mHealth interventions using a 'mobile healthcare in community health centers' app

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Background

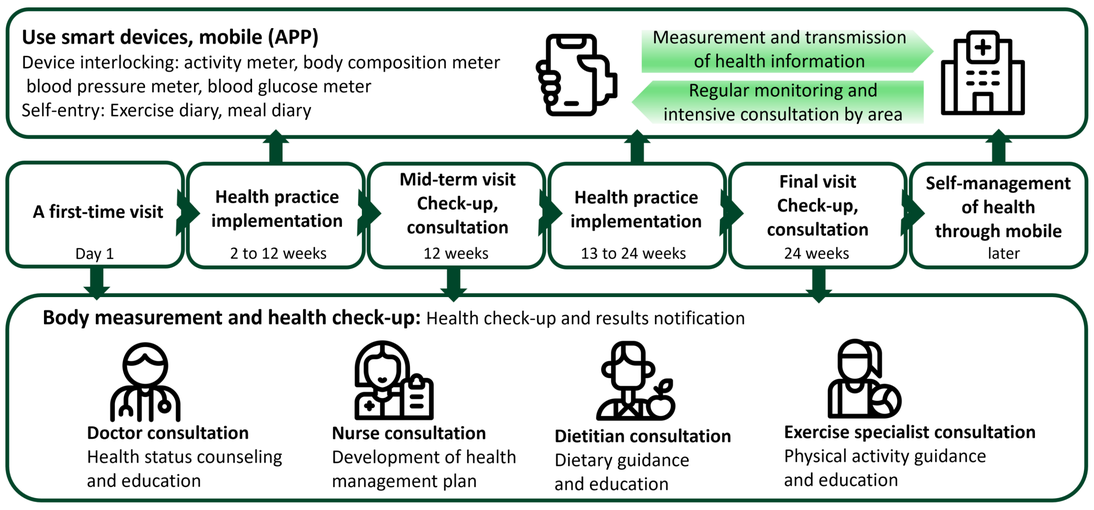
- After the COVID-19 situation, demand for non-face-to-face healthcare has increased and conditions have been set up for the spread of digital healthcare.
- In order to effectively manage chronic diseases, it is crucial to develop and disseminate digital health care service.
- Using mobile applications(Apps) and devices, community health centers in Korea provide smart healthcare program that are specifically tailored to the needs of people who are at risk for developing chronic diseases.
- Therefore, the need for research on the effects of mhealth interventions as a strategy to improve sustainability and health equity is increasingly emphasized.

Objective

- The purpose of this study is to identify the difference in effectiveness of mhealth intervention in community health centers in Korea.

Method

- We examined the health status and service log of mobile healthcare app users. The process of the program from which data was collected is as follows.



- ✓ For 24 weeks, the program offers health care services tailored to individual health status, such as managing physical activity and nutrition, consulting with healthcare providers in centers, monitoring health state and behaviors, providing health information, setting goals for a healthy lifestyle, and rewarding.

- The following **measures** were used
  - ✓ Actual usage log data of mobile App and device users and pre-post survey and medical examination
  - ✓ Health status: Body mass index(BMI), body fat percentage, systolic and diastolic blood pressure(SBP and DBP), waist circumference(WAIST), fasting blood sugar(FAST), and blood lipid profile(Triglyceride(TG), HDL cholesterol(HDL-C), LDL cholesterol(LDL-C))
  - ✓ Service log: device interoperability(activity meter(AM), Bioelectrical Impedance Analysis(BIA), Sphygmomanometer(BP), blood sugar meter(BSM)) user logs(food diary, exercise diary)

- We conducted a **paired t-test** to determine whether there was a significant difference in health status before and after the intervention. Then, we performed a **linear regression analysis** to examine the relationship between service log data and improvements in health status, as well as a **multiple regression analysis** to assess regional differences.

- Data analysis and result visualization were conducted using **R version 4.4.1.**

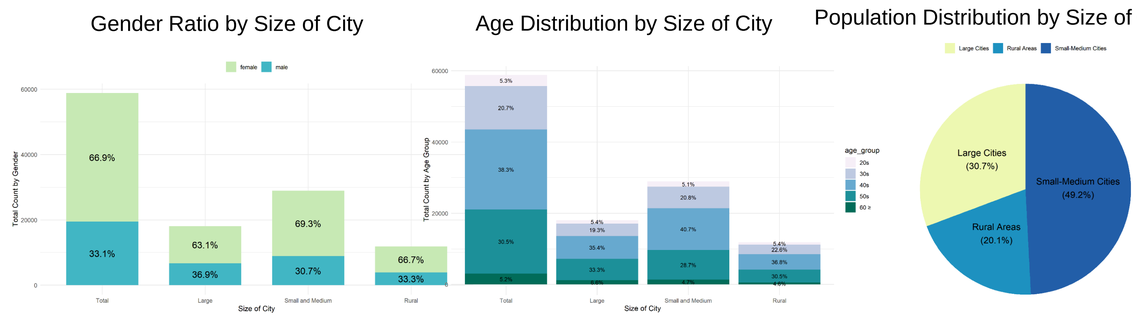
Conclusion

- Our findings highlight significant regional disparities in the effectiveness of mHealth interventions in reducing metabolic syndrome risk factors.
- Notably, mid-sized cities demonstrated higher levels of mHealth usage and more substantial health improvements compared to other regions.
- These results underscore the need for tailored mHealth interventions to address the specific needs of different populations and promote health equity.

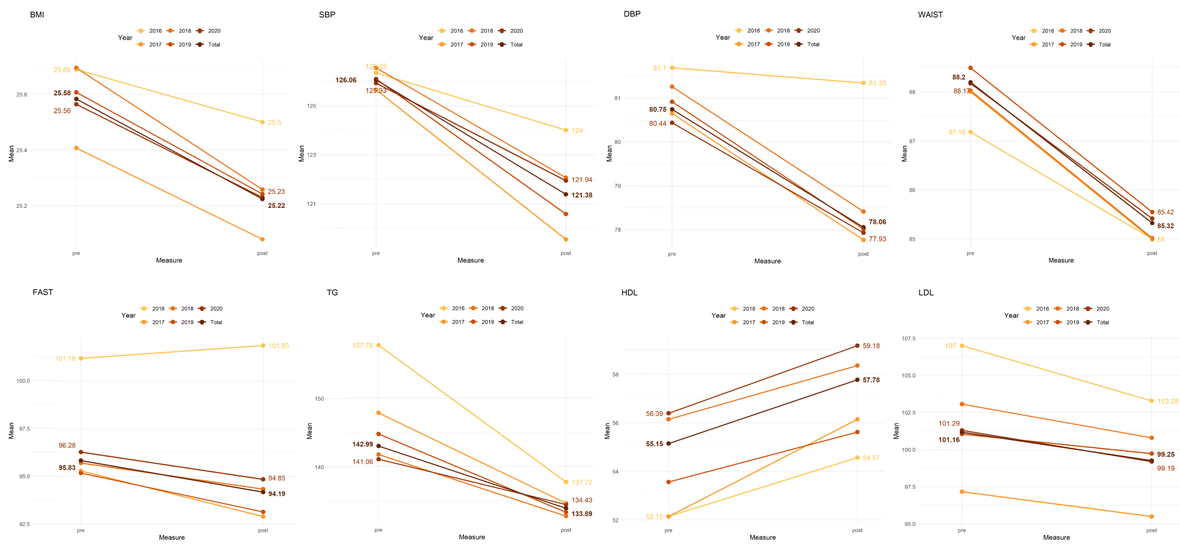
- ✓ Our analysis revealed that **mid-sized cities and rural areas** experienced the **higher improvements in health status** compared to large cities, as indicated by significant reductions in **SBP, HDL, LDL**. However, improvements in TG were significantly lower in all regions compared to large cities.
- ✓ Also, **mid-sized cities and rural areas** exhibited **higher service usage** compared to large cities. Service usage was higher across **all indicators in mid-sized cities,** while **rural areas** showed **particularly high usage of dietary logs.**

Results

- Data were collected from a **total of 58,828 people**
  - ✓ **By gender ratio,** there were more female(6.9%) than male(33.1%) for 33.8%p.
  - ✓ **By age,** those in their 40s(38.3%) were the most common, followed by those in their 50s(30.5%) and those in their 30s(20.7%).
  - ✓ **By population distribution,** small and medium-sized cities(49.2%) were the most, followed by large cities(30.7%) and rural areas(20.1%).



- The results of the **pre-post differences of Health status** are as follows.
  - ✓ BMI fell 0.36(25.58→25.22)
  - ✓ SBP decreased by 4.68(126.06→121.38)
  - ✓ DBP decreased by 2.69(80.75→78.06)
  - ✓ WAIST decreased by 2.88(88.20→85.32)
  - ✓ FAST decreased by 1.64(95.83→94.19)
  - ✓ TG decreased by 9.1(142.99→133.89)
  - ✓ HDL increased by 2.63(55.15→57.78)
  - ✓ LDL decreased by 1.91(101.16→99.25)



- Based on the linear regression analysis of service logs and health status**, devices were effective** in achieving the desired management outcomes.
  - ✓ **The use of AM** was associated with significant improvements in multiple health parameters, such as **BMI, SBP, and WAIST**(*p* <.001).
  - ✓ **BIA utilization** was positively correlated with reductions in **WAIST**(*p* <.001).
  - ✓ **BP intervention** resulted in substantial improvements in **both SBP and DBP**(*p* <.001).
  - ✓ **BSM implementation** had a notable influence on metabolic syndrome markers, including **FAST and HDL levels**(*p* <.001).

- The results of the multiple regression analysis of regional differences in health status improvements and service log usage are as follows.

	small-medium sized cities		rural areas	
	Estimate	***p***	**Estimate**	***p***
Health status improvement[1]				
BMI	0.0682	<.001	-0.0129	<.001
SBP	**1.6908**	**<.001**	**1.0966**	**<.001**
DBP	0.4910	<.001	0.6065	<.001
WAIST	0.0197	<.001	0.2121	<.001
FAST	0.0370	0.75	-0.3030	<.05
TG	-3.2454	<.001	-9.1555	<.001
HDL	**3.9028**	**<.001**	**3.6001**	**<.001**
LDL	**3.6724**	**<.001**	**2.1093**	**<.001**
Service logs[2]				
AM	**2.1269**	**<.001**	-0.8836	<.05
BIA	**2.4408**	**<.001**	**1.0459**	**<.001**
BP	**3.6724**	**<.001**	**1.0928**	**<.001**
BSM	**1.1761**	**<.001**	0.2104	<.1
Food diary	**3.5910**	**<.001**	**6.7953**	**<.001**
Exercise diary	**2.5324**	**<.001**	**1.7184**	**<.1**

[1]A higher estimate value indicates a greater improvement in health outcomes.
[2]A larger estimate value corresponds to a higher level of service usage.

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