

Stanford WELL for Life
YEAR IN REVIEW 2019
Accelerating the **science** of well-being

STANFORD WELL FOR LIFE



What Is Well-Being?

Well-being means different things to different people. Without a clear definition, it is difficult to measure well-being. In July 2019, Stanford Prevention Research Center (SPRC) faculty, based on our findings of our project, developed our working definition of well-being.

"Well-being is a holistic synthesis of a person's biological, psychological, and spiritual experiences, resulting from interplay between individuals and their social, economic, and physical environments that promotes living a fulfilling life." SPRC 2019

The Stanford WELL for Life Study has generated and will continue to generate high-quality data to gain better insight into what well-being means to most individuals and how it can be measured more accurately. This study will also yield important data on how well-being can be improved in individuals and communities.

What Is The Stanford WELL for Life Study?

The Stanford WELL for Life Study (WELL) is a unique longitudinal study that uses novel methods to define, assess, and promote the multiple dimensions of well-being in the U.S. and globally. The study collects comprehensive and multidimensional data from participants across six international study sites that span from the San Francisco Bay Area to China (Hangzhou), Taiwan (Taipei), Taiwan (Changhua), Singapore, and Thailand (Bangkok).

Why WELL?

Well-being extends beyond physical health and the absence of disease; we believe that individuals can actively improve their own well-being and that of their communities. With the help of our global team, Stanford Global WELL is

building the science of well-being and learning how to improve well-being in people around the world.

How We Measure Well-Being

WELL uses a data-driven approach to define and measure well-being, identify factors related to well-being, and evaluate the impact of interventions on well-being. We used qualitative interviews (semi-structured narrative interviews) to identify the key domains (components) of well-being for individuals from various countries and cultures. The petals of the WELL flower reflect the components of well-being. We developed a novel WELL survey tool (a questionnaire with 76-100 questions for various countries) to assess and measure well-being. We then established an algorithm to combine the scoring of these questions into one overall index (WELL score). Currently, the overall score ranges from 0 to 100, with each domain having a maximum of 10 points. Each WELL participant receives an overall score and 10 domain-specific scores. To date, the score's performance on psychometric characteristics (personality traits) is good and is relevant and useful in the four multicultural WELL sites.



OUR RESEARCH MATTERS



Well-Being and the Neighborhood Environment



Dr. Ben Chrisinger, SPRC post-doctoral research scholar and current faculty member at University of Oxford, found associations between key components of well-being and factors at the

neighborhood zip code level, such as education, median income percent of preventable hospital stays, and commuting patterns of residents.

Gut Microbiome and Fat Distribution



A dynamic community of trillions of microbes comprise the human gut microbiome. An analysis led by Yan Min, PhD candidate at Stanford, found that differences in gut microbiome signatures in

men and women may explain differences in fat distribution patterns, often referred to as "apple and pear" body types.

Dry Eyes and Sleep Quality

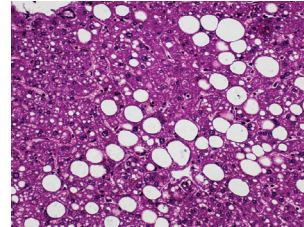


Dry eye is linked to sleep dysfunction and many chronic diseases, and affects 10 to 50 percent of the population worldwide. An analysis led by Dr. Xiaoning Yu of the WELL China team showed that

poor sleep quality may increase the severity of dry eye, suggesting that improved sleep quality could alleviate the more severe symptoms of dry eye.

Non-Alcoholic Fatty Liver Disease and Body Fat Distribution

Non-alcoholic fatty liver disease (NAFLD) is one of the most common forms of liver disease, affecting 1.8 billion people worldwide. Julianna Hsing, master's student at Stanford,



reported that male pattern "android" fat is a risk factor for NAFLD, while muscle mass is linked with lower risk of NAFLD, suggesting interventions focusing on decreasing android fat

and increasing muscle mass may be important for the prevention of NAFLD.

CITATIONS:

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2. Min Y, Ma X, Sankaran K, Ru Y, Chen L, Baiocchi M, Zhu S. **Sex-specific association between gut microbiome and fat distribution.** *Nature Communications.* 2019 Jun 3;10(1):2408. doi: 10.1038/s41467-019-10440-5.
3. Yu X, Guo H, Liu X, Wang G, Min Y, Chen SS, Han SS, Chang RT, Zhao X, Hsing A, Zhu S, Yao K. **Dry eye and sleep quality: a large community-based study in Hangzhou.** *Sleep.* 2019 Oct 21;42(11). pii: zsz160. doi: 10.1093/sleep/zsz160.
4. Hsing JC, Nguyen MH, Yang B, Min Y, Han SS, Pung E, Winter SJ, Zhao X, Gan D, Hsing AW, Zhu S, Wang CJ. **Associations Between Body Fat, Muscle Mass, and Nonalcoholic Fatty Liver Disease: A Population-Based Study.** *Hepatology Communications.* 2019 Jun 27;3(8):1061-1072. doi: 10.1002/hep4.1392.

In the Pipeline

HEALTH AND WELL-BEING IN TAIWAN

Dr. Patricia Rodriguez Espinosa analyzed narrative interviews of 24 WELL Taiwan participants to better understand how they view health and well-being. While similar themes emerged for both concepts, important differences were also found. Physical health and lifestyle behaviors (such as diet and physical activity) were key for health, while family and finances emerged as key domains for well-being. Findings highlighted culturally-relevant components of health and well-being that can help strengthen public health programs.

WELL CHINA COHORT PROFILE

We submitted a manuscript recently describing the process of subject recruitment of 10,000 individuals in WELL China. The team conducted in-person interviews composed of more than 1,000 questions and clinical examinations that assessed lung function, eye health, body fat, and fatty liver disease. Biospecimens, including blood, stool, hair, and toenail, were collected from study participants.

26,572 WELL PARTICIPANTS AND OVER 300,000 BIOSPECIMENS



WELL Bay Area

The Bay Area site has recruited about 5,000 individuals. This year we have several new initiatives added to our registry.

LONGITUDINAL DATA

Over 400 participants completed a second WELL survey at least one year after their first survey, enabling us to investigate changes in well-being (WELL score) over time, factors related to these changes, and where the most effective interventions can be directed.

DOMAIN RANKING

About 1,750 WELL Bay Area participants took part in a domain ranking exercise. They ranked the 10 WELL domains in order of personal importance to their well-being. The participants varied widely in their domain ranking but physical health, emotional health, and finances were chosen by the most people as among their top three domains. We are examining how people's choices are associated with both demographics and their levels of well-being.

WELL China

On May 26, 2019, under the able leadership of Professor Shankuan Zhu, Principal Investigator of WELL China, and Dr. Sherry Zhao, Project Manager, WELL China raced to the finish line, completing baseline recruitment of 10,000 individuals. Data collection included in-person surveys of over 1,000 questions; clinical assessment of blood pressure, EKG, body fat, eye health, and abdominal ultrasound; and biospecimens, including blood, stool, hair, and toenail. Congratulations to the entire WELL China team!

WELL Singapore

WELL Singapore, a collaboration with the National University of Singapore, joined the WELL Global Family in 2017 and has been recruiting rapidly and efficiently. To date, over 7,500 individuals have been enrolled with total recruitment of 10,000 expected by March 2020. We congratulate Dr. Rob Van Dem, Principal Investigator of WELL Singapore, Dr. Hwee Lin Wee, Co-investigator, and Linda Tan, Project Manager, for their success!

WELL Taiwan

WELL Taiwan 1, a collaboration with Fu Jen Catholic University, closed their site in March of this year after concluding recruitment of 3,000+ individuals. All data items as well as 45,000 biospecimens from Taiwan are now stored at Stanford for future biochemical and molecular studies. Kudos to the WELL Taiwan 1 team led by Principal Investigator Professor Chien-An Sun, and Research Coordinator Hui-Ting Yang.

EXPANSION IN TAIWAN: WELL TAIWAN 2

National Taiwan University (NTU) joined the WELL Global Family to launch WELL Taiwan 2 to recruit an additional 10,000 individuals for the study. Professor Chang-Chuan Chan, Dean of the School of Public Health, will serve as Principal Investigator. WELL Taiwan 2 will recruit subjects in the central part of Taiwan throughout 2020 and 2021, leveraging infrastructure and ongoing cohorts at the NTU Center for Population Health. Stanford Professor Ann Hsing, Principal Investigator of WELL Taiwan 2, and Dr. Cathy Heaney conducted a successful site visit in October 2019.

WELL Thailand

WELL Thailand joined the WELL family in 2019. Stanford WELL is collaborating with a team at Chulalongkorn University led by Principal Investigator Dr. Nipat Pichayayothin. WELL Thailand has completed qualitative interviews of 50 individuals in an effort to illuminate the nature of well-being among people residing in Bangkok. The goal is to create a WELL Thailand flower of domains and pursue quantitative interviews of 2,000 participants in 2020. We welcome WELL Thailand to the Global WELL Family!

Data and Informatics Integration

Katy Peng, WELL for Life IT Manager, has been busy developing a standardized infrastructure to house data from all sites and harmonize them for cross-country comparisons to enhance future international collaborations.

COMMUNITY ENGAGEMENT



WELL has continued its strong partnerships with local and national community organizations, providing valuable information and resources about the well-being of their community members. This year we completed several new initiatives, including understanding well-being among people with disabilities, supporting underserved health centers, and improving resources for the elderly.

2019 WELL Summit

In March 2019, WELL hosted the 2nd WELL Summit at Stanford. Over 160 Global WELL researchers, local community partners, advisory board members, and industry partners gathered to celebrate WELL accomplishments and industry partners gathered to celebrate WELL's accomplishments, present research, and share resources from all four sites. Dr. Lloyd Minor, Dean of the Stanford University School of Medicine, gave a heartwarming address recognizing the importance of WELL's mission and values.

Disability and Well-Being

WELL partnered with the San Mateo County Commission on Disabilities to explore the nature of well-being among people with disabilities. Data showed that individuals who identified as having a disability had lower overall well-being, including higher levels of stress, less financial security, and lower physical health scores. These data will help inform the County about specific resources needed to support individuals with disabilities.

Serving Local Community Health Organizations



This year WELL contributed to the community assessments conducted by two community organizations, the Mayers Memorial Healthcare District and the San Mateo Aging and Adult Services' New

Beginnings Coalition. These assessments are required Community Health Needs Assessments (CHNAs) for organizations continuing to receive federal funds.

IN THEIR WORDS

"To be part of WELL, we can create something together for a better life for human beings."

Professor Shankuan Zhu is the WELL China Principal Investigator in China, Founding Director of the Chronic Disease Research Institute, and Chair of the Department of Nutrition and Food Hygiene at the School of Public Health, Zhenjiang

"It is an irresistible offer to collaborate with Stanford University, a top-ranking university. The journey has been exhilarating and a great eye-opener."

Dr. Hwee Lin Wee is a co-investigator of WELL Singapore and associate professor of the National University of Singapore.

"The WELL China project continuously helps me discover my potential by coordinating the operation of field work and developing health networks for participants at individual, community, and social levels."

Dr. Sherry Zhao is the project coordinator for WELL China at the Zhejiang University.

"From day one, I knew WELL will be the flagship of community-based well-being research. Over time, I was deeply touched by the strong bonds we made with the community and thrilled by the impact WELL had on its residents. I just cannot stop loving this project, period."

Yan Min is a PhD Student at Stanford and a WELL research assistant.

"I really enjoy working as part of a team of talented individuals trying to truly understand what makes for a fulfilling life and turning it into a reality for all."

Dr. Patricia Rodriguez Espinosa, WELL post-doctoral research scholar, Stanford University.

A GLIMPSE INTO OUR FUTURE

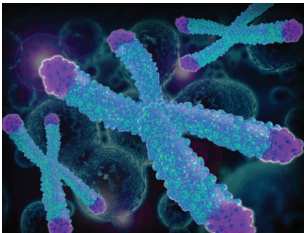


Many exciting analyses and projects are planned for 2020 and beyond. Here are a few to share with you.

Traditional Chinese Medicine and Well-Being

We will explore the association of well-being and the 9 body types measured by a Traditional Chinese Medicine (TCM) questionnaire to understand how body constitutions affect well-being. Dr. Wang Ji from Beijing University of Chinese Medicine will join us for a year at Stanford to analyze these important data, which will provide insights for targeted interventions to enhance well-being in the future.

Telomere Length and Well-Being Study



Telomeres, the protective caps on the ends of the strands of DNA, shorten with age, which can affect the health and lifespan of an individual. We are planning to submit a grant proposal to NIH in 2020

to seek support for a study on the relationship between telomere length and well-being.

Short and Sweet

WELL surveys contain between 76 and 100 questions and are designed to capture the unique cultural aspects of well-being in the various WELL countries. Our intent is to shorten the survey to about 20 questions using various statistical data reduction methods to ensure we can sufficiently capture well-being with fewer questions. The ease of administering a briefer survey will greatly expand WELL's global reach.

Wearable Device

We hope to incorporate wearable technology into Global WELL for Life for real-time data capture and continuous monitoring of heart rate, body temperature, mobility, and sleep. These devices will provide a vast number of biometrics and allow us to investigate the impact of these measures on well-being.

IN THE NEWS

Well-Being and Precision Health

WELL Asia Principal Investigator Dr. Ann Hsing was invited to present a seminar on precision well-being at the Stanford Precision Health and Integrated Diagnostics Center (PHIND) in August. She promoted the concept of well-being within precision health research and shared accomplishments of the Stanford WELL for Life study with scholars, fellows, and students at PHIND.

Aldehyde Dehydrogenase and Well-Being

The aldehyde dehydrogenase (*ALDH2*) gene metabolizes alcohol. Mutation in the *ALDH2* gene affects one's ability to metabolize alcohol, with one billion people in the world having *ALDH2* deficiency. We assessed the extent of *ALDH2* deficiency and its relationship with well-being in Taiwan I DNA samples. Dr. Hsing presented preliminary data at the International Conference on *ALDH2* in Taiwan.

Well-Being and Diabetes

Dr. Amy Li, Physician and Stanford Community Health and Prevention Research master's student, gave a presentation at the American Diabetes Association Annual Clinical Conference describing her analysis of differences in well-being based on diabetes status. Diabetes may change people's perception of their physical well-being.

MENTORING AND TRAINING



WELL has provided training opportunities for young scientists and students. Our mentees at Stanford include over 20 post-doctoral and clinical fellows, master's students in prevention research, and over a dozen human biology undergraduates. Our reach extends beyond Stanford to include over 25 graduate students from China, Taiwan, and the UK.



Dr. Benjamin Chrisinger

WELL POST-DOCTORAL RESEARCH SCHOLAR, STANFORD UNIVERSITY

Dr. Benjamin Chrisinger, completed a post-doctoral research scholar at SPRC in 2019, and is currently an Associate Professor of Evidence-Based Policy Evaluation at University of Oxford, Department of Social Policy and Intervention. He conducts interdisciplinary research on the relationships between place and health, and how place-based policies can improve health equity.



Dr. Patricia Rodriguez Espinosa

WELL POST-DOCTORAL RESEARCH SCHOLAR, STANFORD UNIVERSITY

Dr. Espinosa is a second-year post-doctoral research fellow at SPRC with specialties in behavioral health and cultural factors. She received her PhD and MPH from the University of New Mexico and led the analysis of data to develop the WELL Taiwan flower. She is leading two WELL-related manuscripts on well-being among Latino adults, and physical activity intervention for improving well-being.



Dr. Sherry Zhao

WELL POST-DOCTORAL RESEARCH SCHOLAR, ZHEJIANG UNIVERSITY

Dr. Zhao is a post-doctoral research fellow at the Zhejiang University School of Public Health. She received her PhD in Health Behavior at Indiana University Bloomington and is currently the research and administrative coordinator of WELL China. Dr. Zhao is leading the paper on the WELL China flower, an analysis of WELL China qualitative data from study participants in Hangzhou, China.



Dr. Yuan Ru

POST-DOCTORAL RESEARCH SCHOLAR, ZHEJIANG UNIVERSITY

Dr. Ru is a second-year post-doctoral fellow at Zhejiang University and a registered dietitian. She received her PhD in nutrition from Cornell University and clinical training at Rochester University. Currently, she is using WELL China data for analysis of dietary patterns, metabolomics, and microbiome.



Yan Min

PHD CANDIDATE, STANFORD UNIVERSITY

Yan Min is a PhD candidate in the Department of Epidemiology and Population Health at Stanford University, with background in clinical medicine and health economics. Dr. Min helped design the infrastructure of WELL China and published a study on gut microbiome and fat distribution using WELL China data. She is currently leading another study on body fat distribution, microbiome and metabolomics.

**LIVE WELL AND BETTER.
IMPROVE AND SUSTAIN
WELL-BEING GLOBALLY.**



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Thank You

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