Chiyoung Lee, PhD, RN
Assistant Professor (2020.09 – present)
School of Nursing & Health Studies, University of Washington Bothell
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Education

2017 – 2020	**PhD, Duke University, School of Nursing,** Durham, North Carolina, USA
	Dissertation: "Socioeconomic disparities in cardiovascular health among older adults"
2015 – 2017	**MSN, Seoul National University** (Ranked 1st in Korea)**, College of Nursing**, Seoul, South Korea
	Thesis: "Health literacy and participation among older adult patients with heart failure"
2009 – 2013	**BSN, Seoul National University** (Ranked 1st in Korea)**, College of Nursing,** Seoul, South Korea

Professional Affiliations

2023 –	**Faculty Affiliate**
	Center for Studies in Demography and Ecology, University of Washington, Seattle, Washington, USA

Work Experience

2017 – 2017	**Clinical Instructor,** Seoul National University Hospital, Seoul, South Korea
2013 – 2017	**Registered Professional Nurse,** Samsung Medical Center**,** Seoul, South Korea
	Cardiac Intensive Care Unit (2013 – 2017)
	Emergency Department & Emergency Intensive Care Unit (2013)

Current Active Research Collaborations

2022 –	**Secondary data analysis of Heart and Soul Study (https://heartandsoulstudy.ucsf.edu/)**
	Collaborator and advisor: Dr. Mary Whooley, MD (School of Medicine, University of California San Francisco)
2022 –	**Secondary data analysis of AURORA (https://www.med.unc.edu/itr/aurora-study/)**
	Collaborator and advisor: Dr. Xinming An, PhD (School of Medicine, UNC Chapel Hill), Dr. Qing Yang, PhD (School of Nursing, Duke University)
2022 –	**Co-advisor of "iBioML: Collaborative, Interactive, and Interpretable Machine Learning Infrastructure for Bioinformatics" project group**
	Advisor: Dr. Wooyoung Kim (School of STEM, University of Washington Bothell)
2020 –	**Secondary data analysis of randomized controlled trial (personalized medicine effectiveness study in air force primary care among patients with coronary heart disease and type 2 diabetes)**
	Collaborator and advisor: Dr. Ruth Wolever, PhD (School of Medicine, Vanderbilt University)
2020 -	**Electronic Health Record (EHR) outcome study (in collaboration with Duke University)**
	Collaborator and advisor: Dr. Wei Pan, PhD (Duke University, School of Nursing), Eleanor Mcconnell, PhD, RN (Duke University, School of Nursing)

Research Experience Under Mentorship (2017-2019)

2018 – 2019	**Study Coordinator (2019), Research Assistant (2018 – 2019)**
	Duke University, School of Nursing, Durham, North Carolina, USA
	Technology-based Information and Coaching/support program for Asian American breast cancer survivors (R01)
	Research Assistant
	Seoul National University, College of Nursing, Seoul, South Korea

Development of a community-based integrated service model for older adults living alone (funded by the Ministry of Health & Welfare, Republic of Korea)

Technology Skills

Software: SAS, Stata, SPSS, R, Python, KNIME, M*plus*

Techniques

1. Network science: network comparison test, bridge analysis, moderated network analysis, longitudinal network analysis (panel data-graphical vector autoregressive [panelgvar] model, cross-lagged panel network modelling), network psychometrics (exploratory graph analysis, clique percolation), community detection algorithms, comorbidity network analysis (epidemiological perspective)
2. Machine learnings: conventional machine learning algorithms (random forest, AdaBoost, stochastic gradient boosting, XGBoost, support vector machine), artificial neural networks, interpretable machine learning algorithms, generalized additive modelling, generalized additive modeling with survival data
3. Latent modeling: latent class growth analysis, latent transition analysis, multi-group latent modeling, latent profile/class analysis, moderated non-linear factor analysis
4. Others: segmented regression algorithms, survival analysis, propensity matching analysis, structural equation modeling, principal component/factor analysis, multilevel modeling, path analysis, propensity matching analysis, Univariate/multivariate methods, generalized linear models, mixed modeling, graphical reporting, power analysis, confidence intervals/effect sizes
5. Index-based measures of health inequalities: slope/relative index of inequality

Research Methods: Survey research, experimental design, lifespan developmental methodology, systematic literature review, cross-sectional/longitudinal national survey research, meta-analysis, electronic record analysis

Journal Publications

Selected Publications *Corresponding author

2023

1. ***Lee, C.,** Whooley, M. (2023). Networks of C-reactive protein and depressive symptoms in patients with stable coronary heart disease: findings from the Heart and Soul Study. *International Journal of Methods in Psychiatric Research*, e1968.
2. **Lee, C**., Wolever, R. Q., Min, S. H., Vorderstrasse, A., & Yang, Q. (2023). Network psychometrics of the 10-item Perceived Stress Scale among high cardiovascular and type 2 diabetes risk patients using exploratory graph analysis. Accepted in *Journal of Cardiovascular Nursing*
3. ***Lee, C.,** Cao, J., Eagen-Torkko, M., & Mohammed, S. A. (2023). Network analysis of adverse childhood experiences and cardiovascular diseases. *SSM-Population Health,* 101358.
4. ***Lee, C**., & Min, S. H. (2023). Racial disparities in C-reactive protein, social function, and mental health among older adults: moderated network approach. *Biological Research For Nursing,* 10998004231157767.
5. ***Lee, C**., Min, S. H., & Niitsu, K. (2023). C-reactive protein and specific depression symptoms among older adults: an exploratory investigation of multi-plane networks using cross-sectional data from NHANES (2017–2020). *Biological Research For Nursing*, *25*(1), 14-23.
6. **Lee, C**., Park, Y. H., & Cho, B. (2023). Use of exploratory graph analysis in inspecting the dimensionality of the Revised University of California Los Angeles (R-UCLA) Loneliness Scale Among Older Adults. *Research in Gerontological Nursing*, *16*(1), 15-20.
7. ***Lee, C**., Min, S. H., & Niitsu, K. (2023). Non-linear relationship between C-reactive protein and depression among the obese middle-aged. Accepted in *Nursing Research.*
8. **Lee, C**., Park, Y. H., & Cho, B. (2023). Leveraging network analysis to determine sex differences in factors associated with frailty among older adults living alone. *BMC Geriatrics*, *23*(1), 38.
9. Min, S. H., Topaz, M., **Lee, C.**, & Schnall, R. (2023). Understanding changes in mental health symptoms from young-old to old-old adults by sex using multiple-group latent transition analysis. *GeroScience*, 1-11.

10. Xue, T. M., Pan, W., Tsumura, H., Wei, S., **Lee, C.,** & McConnell, E. S. (2023). Impact of dementia on long-term hip fracture surgery outcomes: an electronic health record analysis. *Journal of the American Medical Directors Association*, *24*(2), 235-241.
11. Min, S.H., Schnall, R., **Lee, C.,** & Topaz, M. (2023) An examination of the relationship between cognition and total hemoglobin among the cognitively normal older adults by gender. Accepted in *Journal of Aging and Health.*
12. Min, S.H., **Lee, C.** Yang, Q., & Scroggins, J.K. (2023). Transitions in social networks from young-old to old-old stage of life using latent transition analysis. Accepted in *Journal of Aging and Health.*

2022
1. ***Lee, C.**, & Kim, H. (2022). Machine learning-based predictive modeling of depression in hypertensive populations. *PloS One*, *17*(7), e0272330.
2. **Lee, C.*, & Hu, X. (2022). Sex differences in depressive symptom networks among community-dwelling older adults. *Nursing Research*, *71*(5), 370-379.
3. ***Lee, C.**, Wolever, R. Q., Yang, Q., Vorderstrasse, A., Min, S. H., & Hu, X. (2022). A network analysis of the association between depressive symptoms and patient activation among those with elevated cardiovascular risk. *Global Advances in Health and Medicine*, *11*, 2164957X221086257.
4. **Lee, C.*, McConnell, E. S., Wei, S., Xue, T., Tsumura, H., & Pan, W. (2022). Effect of race/ethnicity, insurance status, and area deprivation on hip fracture outcomes among older adults in the United States. *Clinical Nursing Research*, *31*(3), 541-552.
5. Cao, J., **Lee, C.*, Sun, W., & De Gagne, J. C. (2022). The# StopAsianHate movement on Twitter: a qualitative descriptive study. *International Journal of Environmental Research and Public Health*, *19*(7), 3757.
6. Yang, Q., Zhao, A., **Lee, C.**, Wang, X., Vorderstrasse, A., & Wolever, R. Q. (2022). Latent profile/class analysis identifying differentiated intervention effects. *Nursing Research*, *71*(5), 394-403.
7. Wei, S., Pan, W., **Lee, C.,** Tsumura, H., Xue, T. M., & McConnell, E. S. (2022). Heart failure and hospital utilization trajectories before and after hip fracture surgery. *Journal of the American Medical Directors Association*, *23*(11), 1884-1885.

2021
1. **Lee, C.,** & Yi, J. S. (2021). Socioeconomic classes among oldest-old women in South Korea: a latent class analysis. *International Journal of Environmental Research and Public Health*, *18*(24), 13183.
2. **Lee, C**., Cho, B., Yang, Q., Chang, S. J., Ryu, S. I., Eun-Young, N., & Park, Y. H. (2021). A Psychometric analysis of the 20-item Revised University of California Los Angeles loneliness scale among Korean older adults living alone. *Research in Gerontological Nursing*, 1-12.
3. **Lee, C.**, Cho, B., Yang, Q., Chang, S. J., Ko, H., Yi, Y. M., ... & Park, Y. H. (2021). Psychosocial risk profiles among older adults living alone in South Korea: a latent profile analysis. *Archives of Gerontology and Geriatrics*, *95*, 104429.
4. **Lee, C.**, Yang, Q., Wolever, R. Q., & Vorderstrasse, A. (2021). Health behavior trajectories in high cardiovascular risk populations: secondary analysis of a clinical trial. *Journal of Cardiovascular Nursing*, *36*(6), E80-E90.
5. Cao, J., **Lee, C.,** Liu, X., & Gonzalez-Guarda, R. M. (2021). Risk and protective factors associated with intimate partner violence against Chinese women: a systematic review. *Trauma, Violence, & Abuse*, 15248380211030235.
6. **Lee, C.*, Yang, Q., Im, E. O., McConnell, E. S., Jung, S. H., & Kim, H. (2021). The contribution of material, behavioral, psychological, and social-relational factors to income-related disparities in cardiovascular risk among older adults. *Journal of Cardiovascular Nursing. 36*(4), E38–E50.
7. **Lee, C.*, & Im, E. O. (2021). Socioeconomic disparities in cardiovascular health in South Korea: a systematic review. *Journal of Cardiovascular Nursing*, *36*(1), 8-22.

2020
1. **Lee, C.*, Yang, Q., Im, E. O., McConnell, E. S., Jung, S. H., & Kim, H. (2020). A 10-year trend in income disparity of cardiovascular health among older adults in South Korea. *SSM-population health*, *12*, 100682.

2. ***Lee, C.** (2020). A two-step clustering approach for measuring socioeconomic factors associated with cardiovascular health among older adults in South Korea. *Korean Journal of Adult Nursing*, *32*(6).551-559. [English]

3. Im, E. O., Kim, S., Xu, S., **Lee, C.**, Hamajima, Y., Inohara, A., ... & Chee, W. (2020). Issues in recruiting and retaining Asian American breast cancer survivors in a technology-based intervention study. *Cancer nursing*, *43*(1), E22-E29.

4. *[In abstract]* Xue, T. M., McConnell, E., **Lee, C.,** Tsumura, H., Wei, S., & Pan, W. (2020). Influences of dementia on long-term surgical outcomes in older adults after hip fracture. *Innovation in Aging*, *4*(Suppl 1), 878-879.

2019

1. ***Lee, C,** & Lee, Y. H. (2019). Measurement of socioeconomic position in research on cardiovascular health disparities in Korea: a systematic review. *Journal of Preventive Medicine and Public Health*, *52*(5), 281-291.

2. **Lee, C.,** Cho, B., Cho, Y., & Park, Y. H. (2019). Older adults' perceptions of age-friendliness with an emphasis on community supports and health services in a city in South Korea. *Journal of Korean Academy of Community Health Nursing*, *30*(2), 234-242. [English]

3. *[In abstract]* **Lee, C.,** Chee, W., & Im, E. O. (2019). TCTAP A-098 Inequalities in cardiovascular health among older adults in South Korea: the role of personal-, provider-and system-level factors. *Journal of the American College of Cardiology*, 73(15 Supplement), S52.

4. *[In abstract]* **Lee, C.,** Chee, W., Im, E. O., & Kim, S. (2019). TCTAP A-107 Socioeconomic inequalities in cardiovascular risk factors: a two-step cluster analysis. *Journal of the American College of Cardiology*, 73(15 Supplement), S55.

2018

1. **Lee, C.,** & Park, Y. H. (2018). Health literacy and participation among older adult patients with heart failure in Korean culture. *Journal of Transcultural Nursing*, *29*(5), 429-440.

2. **Lee, C.,** Lee, M. H., Lee, S. H., & Park, Y. H. (2018). Nurses' views on infection control in long-term care facilities in South Korea: a focus group study. *Korean Journal of Adult Nursing*, *30*(6), 634-642 [English]

3. Im, E. O., Kim, S., **Lee, C.,** Chee, E., Mao, J. J., & Chee, W. (2018). Decreasing menopausal symptoms of Asian American Breast cancer survivors through a technology-based information and coaching/support program. *Menopause (New York, NY)*, *26*(4), 373-382.

4. Park, Y. H., Lee, S. H., Yi, Y. M., **Lee, C.,** & Lee, M. H. (2018). Compliance with respiratory infection preventive behaviors and its related factors in older adults using a senior center. *Journal of Korean Academy of Community Health Nursing*, *29*(3), 322-334.

5. Park, Y. H., Lee, S. H., Lee, Y. M., **Lee, C.,** & Lee, M. H. (2018). Development of evidence-based guidelines for nursing home's infection control in Korea. *Journal of Muscle and Joint Health*, *25*(2), 135-147.

Publications Under Review [2023.03 – present]

1. Exploring the moderation effects of race on the relationship among sex hormones, biomarkers, and psychological symptoms in female older adults in *GeroScience* **[Co-author]**

2. Relationships between hemoglobin and specific cognitive domain among older adults using network analysis in *Aging & Mental Health* **[Co-author]**

3. Comparison of symptoms between midlife women in peri-menopause and post-menopause using network comparison test in *Women's Health* **[Senior author]**

4. Impact of Dementia on Incidence and Severity of Postoperative Pulmonary Complications Following Hip Fracture Surgery Among Older Patients in Clinical Nursing Research **[Co-author]**

Publications in Revision

1. The application of clique percolation method in health disparities research in *Journal of Advanced Nursing* **[First & corresponding author]**

2. Identification of relationships among resilience factors by using network analysis: a pilot study in *Journal of the American Psychiatric Nurses Association* **[Second author]**

Publications in Preparation

1. Machine learning-based predictive modeling of depression in patients with stable coronary heart disease **[First author]**
2. Health coaching impacts stage-specific transitions in multiple health behaviors for patients at high risk for cardiovascular disease and type 2 diabetes: a multi-group latent transition analysis **[First author]**
3. Stage-specific transitional changes in multiple health behaviors after genetic risk-mitigating intervention for patients at high risk for cardiovascular disease and type 2 diabetes: a latent transition analysis **[First author]**
4. Prospective evaluation of C-reactive protein, metabolic markers, and depression symptoms among older adults: a cross-lagged panel network analysis **[First & corresponding author]**
5. The application of generalized additive modeling in health disparities research **[First & corresponding author]**
6. Understanding onset, dynamic transitions, and associated inequality risk factors for adverse posttraumatic neuropsychiatric sequelae after trauma exposure **[First & corresponding author]**
7. Comorbidity patterns among older patients undergoing hip fracture surgery **[First & corresponding author]**
8. A network-based approach to explore comorbidity patterns among community-dwelling older adults living alone **[First author]**
9. Interactions between serotonin transporter gene and adverse childhood experience by using generalized additive model: a pilot study **[Second author]**

Conference Papers (Abstract-Reviewed)

1. Transitions in mental health symptoms from young-old to old-old by gender using latent transition analysis. In Sigma's 34th International Nursing Research Congress 2022.
2. Short- and long-term outcomes after hip surgery in older adults with and without heart failure. In GSA 2022.
3. Im, E. O., Chee, E., Kim, S. M., & **Lee, C.** Menopausal symptoms of breast cancer survivors: Asian americans. Cancer Forum Poster Session-Treatment, Survivorship, and Supportive/Palliative Care. In APHA's 2020 VIRTUAL Annual Meeting and Expo (Oct. 24-28). American Public Health Association.
4. **Lee, C.,** Kim, S. M., Chee, W., Tsai, H., & Im, E. O. The effect of physical activity on cognitive symptoms among Asian American midlife women: a pilot study of web-based physical activity promotion program. Southern Research Society Conference (SNRS) 33rd annual conference. Poster conference abstract presentation.
5. **Lee, C.,** Kim, S. M., Chee, W., Tsai, H., & Im, E. O. A culturally tailored web-based physical activity promotion program: effect on cardiovascular symptoms and physical activity among Asian American midlife women. Southern Research Society Conference (SNRS) 33rd annual conference. Symposium
6. Im, E. O., **Lee, C.,** Hu, Y., Kim, S. M., Choi, H., Hamajima, Y., Chee, E., & Chee, W. What to consider in a culturally tailored technology-based cancer pain management program. Global Breast Cancer Conference (GBCC). Poster conference abstract presentation.
7. Im, E. O., **Lee, C.,** Hu, Y., Kim, S. M., Choi, H., Hamajima, Y., Chee, E., & Chee, W. Challenges in a culturally tailored technology-based interventions for Asian American Breast cancer survivors. Global Breast Cancer Conference (GBCC). Poster conference abstract presentation.

Research Support in Preparation

Targeting May- July, 2023

1. **National Science Foundation, Faculty Early Career Development Program (CAREER)**
   Title: "Machine learning-based biological prediction modeling of clinical depression in patients with stable coronary heart disease"
2. **NIHM, R03, PI,** Notice of Special Interest (NOSI): Secondary Analysis of Posttraumatic Psychopathology Data Notice Number: NOT-MH-22-045

Title: "The longitudinal course of adverse post-traumatic neuropsychiatric sequelae: a cross-lagged panel network analysis"

3. **National Science Foundation, Co-PI**
   Title: "iBioML: Collaborative, Interactive, and Interpretable Machine Learning Infrastructure for Bioinformatics"
4. **American Nurses Psychiatric Association, PI**
   Title: Unique longitudinal relationships between C-reactive protein, metabolic markers, and depression symptoms among older adults: a cross-lagged panel network analysis
5. **Global Engagement Fellows, PI**
   Title: Developing Machine Learning Infrastructure for the Tri-Campus
   University of Washington, Seattle, Washington, USA

Research Support Submitted

2023
1. **UW Bothell Scholarship, Research, and Creative Practice (SRCP) Seed Grant Program (PI, not funded, $10,825)**
   Title: "Leveraging network analysis to explore the relationships between adverse childhood experiences and cardiovascular diseases"
2. **Royalty Research Fund (PI, submitted on 2/24/2023, $13,434)**
   Title: "Patterns and predictors of adverse posttraumatic neuropsychiatric sequelae among trauma survivors: an equity perspective"
   University of Washington, Seattle, Washington, USA

Research Support Received

2022-2023
1. **CSDE Population Research Planning Grants (PI, $3,520)**
   Title: "Networks of C-reactive protein and depressive symptoms in patients with stable coronary heart disease: findings from the Heart and Soul Study"
   Center for Studies in Demography and Ecology, University of Washington, Seattle, Washington, USA
3. **The Sigma Theta Tau Psi at-Large Chapter Research Grant (PI, $1,249)**
   Title: "Leveraging a network-based approach to explore comorbidity patterns in older patients undergoing hip fracture surgery"
2. **SNHS Two-Week Summer Research Fellowship (PI, $5,412)**
   Title: "Network psychometrics of the 10-item perceived stress scale among high cardiovascular risk patients using Exploratory Graph Analysis"
   University of Washington Bothell, Bothell, Washington, USA
3. **The Sigma Theta Tau Psi at-Large Chapter Research Grant (PI, $700)**
   Title: "C-reactive protein and specific depression symptoms among older adults: an exploratory investigation of multi-plane networks using cross-sectional data from NHANES (2017–2020)"

2021
1. **Research Program funded by the Korea Disease Control and Prevention Agency (co-PI, $3,000)**
   Title: "Socioeconomic classes among oldest-old women in South Korea: a latent class analysis"
2. **SNHS Two-Week Summer Research Fellowship (PI, $5,412)**
   Title: "A network analysis of the association between depressive symptoms and patient activation among those with elevated cardiovascular risk"
   University of Washington Bothell, Bothell, Washington, USA

2015-
1. **Student Pilot Funding**
   Duke University, Durham, North Carolina, USA
2. **Academic Honors Scholarship**
   Seoul National University, Seoul, Korea

Graduate Supervision

2020 – 2021	**Committee, Master of Biostatistics**
	Duke University, Department of Biostatistics, Durham, North Carolina, USA
	"Searching for subgroups with enhanced intervention effect with clinical trial data: a latent class/profile approach"
2020 –	**Supervisor, Master's Capstone Project**
	University of Washington Bothell, Bothell, Washington, USA

Teaching Experiences

2020 –	**Course Taught,** School of Nursing & Health Studies, University of Washington Bothell, Bothell, Washington, USA
	BNURS 297 Biological Research in Nursing
	BHLTH 226 A Race, Socioeconomic Status, And Health
	BHLTH 297 Disparities in Health and Health Care Across the United States
	BNURS 360 Critical Reading and Information Literacy in Nursing
	BHLTH 497 Global Health Challenges
	BNURS 297 Leadership in Science
	BNURS 460 Translating Scholarly Knowledge To Nursing Practice
2022.07	**Guest Lecture,** University of Victoria (UVic), Victoria, Canada
	HINF485 AI in Health Care "Interpretable machine learning algorithms"
2022.06	**Guest Lecture**, Seoul National University, Seoul, Korea
	"Socioeconomic disparities in cardiovascular health; introducing index-based disparity measures"
2020 Spring	**Mentored Teaching Practicum,** Duke University, School of Nursing, Durham, North Carolina, USA
	Nursing 718 Data Analytics I
2019 Fall	**Mentored Teaching Practicum,** Duke University, School of Nursing, Durham, North Carolina, USA
	Nursing 966 Quantitative Methods for Evaluating Health Care Practices

Teaching Support

COIL Fellows (PI, 2022)

Collaborative Online International Learning (COIL) Fellows programs at UW Bothell and UW Tacoma support faculty in developing COIL courses

University of Washington Bothell, Bothell, Washington, USA

School Services

2023 –	**Diversity, Equity, and Inclusion (DEI) committee**
	University of Washington Bothell, School of Nursing & Health Studies, Bothell, Washington, USA
2023 –	**Campus Global Initiatives Board**
	University of Washington Bothell, Bothell, Washington, USA
2020 –	**Faculty advisor, Sigma Theta Tau International Honor Society of Nursing**
	University of Washington Bothell, Bothell, Washington, USA
2020.09 –	**The Master of Nursing Curriculum Committee (MNCC)**
2022.06	University of Washington Bothell, Bothell, Washington, USA

Professional Licenses & Scholarly Societies

Licensure	Registered Nurse, the Washington State Department of Health (DOH), USA
	Registered Nurse, Ministry of Health and Welfare, Korea
Societies	**Sigma Theta Tau International Nursing Honor Society (**2019 –**)**
	Psi-at-Large Chapter (2021 – present)

Beta Epsilon Chapter (2019 – 2021)
Western Institute of Nursing (2022 –)
American Nurses Psychiatric Association (2023 –)

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Professional Training

2019	**Teaching Credential Training Course,** Certificate in College Teaching program
	Duke University School of Nursing, Durham, North Carolina, USA
	Duke Machine Learning Summer School
	Duke University School of Nursing, Durham, North Carolina, USA
	Analysis of National Health Survey data
	School of Public Health, University of Maryland, College Park, USA