

Association Between Caesarean Delivery and Overweight in Children: A Birth Cohort Study

学位名	修士(公衆衛生学)
学位授与機関	聖路加国際大学
学位授与年度	2020
学位授与番号	32633公修専第069
URL	http://hdl.handle.net/10285/00016431

References

- Ahlqvist, V. H., Persson, M., Magnusson, C., & Berglind, D. (2019, Dec). Elective and nonelective cesarean section and obesity among young adult male offspring: A Swedish population-based cohort study. *PLoS Med*, *16*(12), e1002996. <https://doi.org/10.1371/journal.pmed.1002996>
- Ajslev, T. A., Andersen, C. S., Gamborg, M., Sorensen, T. I., & Jess, T. (2011, Apr). Childhood overweight after establishment of the gut microbiota: the role of delivery mode, pre-pregnancy weight and early administration of antibiotics. *Int J Obes (Lond)*, *35*(4), 522-529. <https://doi.org/10.1038/ijo.2011.27>
- Almgren, M., Schlinzig, T., Gomez-Cabrero, D., Gunnar, A., Sundin, M., Johansson, S., Norman, M., & Ekstrom, T. J. (2014, Nov). Cesarean delivery and hematopoietic stem cell epigenetics in the newborn infant: implications for future health? *Am J Obstet Gynecol*, *211*(5), 502 e501-508. <https://doi.org/10.1016/j.ajog.2014.05.014>
- Arisaka, O., Sairenchi, T., Ichikawa, G., & Koyama, S. (2017, Apr 1). Increase of body mass index (BMI) from 1.5 to 3 years of age augments the degree of insulin resistance corresponding to BMI at 12 years of age. *J Pediatr Endocrinol Metab*, *30*(4), 455-457. <https://doi.org/10.1515/jpem-2016-0227>
- Azad, M. B., Konya, T., Maughan, H., Guttman, D. S., Field, C. J., Chari, R. S., Sears, M. R., Becker, A. B., Scott, J. A., Kozyrskyj, A. L., & Investigators, C. S. (2013, Mar 19). Gut microbiota of healthy Canadian infants: profiles by mode of delivery and infant diet at 4 months. *CMAJ*, *185*(5), 385-394. <https://doi.org/10.1503/cmaj.121189>
- Backhed, F., Roswall, J., Peng, Y., Feng, Q., Jia, H., Kovatcheva-Datchary, P., Li, Y., Xia, Y., Xie, H., Zhong, H., Khan, M. T., Zhang, J., Li, J., Xiao, L., Al-Aama, J., Zhang, D., Lee, Y. S., Kotowska, D., Colding, C., Tremaroli, V., Yin, Y., Bergman, S., Xu, X., Madsen, L., Kristiansen, K., Dahlgren, J., & Wang, J. (2015, May 13). Dynamics and Stabilization of the Human Gut Microbiome during the First Year of Life. *Cell Host Microbe*, *17*(5), 690-703. <https://doi.org/10.1016/j.chom.2015.04.004>
- Barker, D. J. (1990, Nov 17). The fetal and infant origins of adult disease. *BMJ*, *301*(6761), 1111. <https://doi.org/10.1136/bmj.301.6761.1111>

- Bleich, S. N., Vercammen, K. A., Zatz, L. Y., Frelief, J. M., Ebbeling, C. B., & Peeters, A. (2018, Apr). Interventions to prevent global childhood overweight and obesity: a systematic review. *Lancet Diabetes Endocrinol*, *6*(4), 332-346. [https://doi.org/10.1016/S2213-8587\(17\)30358-3](https://doi.org/10.1016/S2213-8587(17)30358-3)
- Bramante, C. T., Thornton, R. L. J., Bennett, W. L., Zhang, A., Wilson, R. F., Bass, E. B., & Tseng, E. (2019, Jan). Systematic Review of Natural Experiments for Childhood Obesity Prevention and Control. *Am J Prev Med*, *56*(1), 147-158. <https://doi.org/10.1016/j.amepre.2018.08.023>
- Brophy, S., Rees, A., Knox, G., Baker, J. S., & Thomas, N. E. (2012). Child fitness and father's BMI are important factors in childhood obesity: a school based cross-sectional study. *PLoS One*, *7*(5), e36597. <https://doi.org/10.1371/journal.pone.0036597>
- Cai, M., Loy, S. L., Tan, K. H., Godfrey, K. M., Gluckman, P. D., Chong, Y. S., Shek, L. P., Cheung, Y. B., Lek, N., Lee, Y. S., Chan, S. Y., Chan, J. K. Y., Yap, F., & Ang, S. B. (2018, Nov 2). Association of Elective and Emergency Cesarean Delivery With Early Childhood Overweight at 12 Months of Age. *JAMA Netw Open*, *1*(7), e185025. <https://doi.org/10.1001/jamanetworkopen.2018.5025>
- Cioffi, C. C., Tavalire, H. F., Neiderhiser, J. M., Bohannon, B., & Leve, L. D. (2020). History of breastfeeding but not mode of delivery shapes the gut microbiome in childhood. *PLoS One*, *15*(7), e0235223. <https://doi.org/10.1371/journal.pone.0235223>
- Collaborators, G. B. D. O., Afshin, A., Forouzanfar, M. H., Reitsma, M. B., Sur, P., Estep, K., Lee, A., Marczak, L., Mokdad, A. H., Moradi-Lakeh, M., Naghavi, M., Salama, J. S., Vos, T., Abate, K. H., Abbafati, C., Ahmed, M. B., Al-Aly, Z., Alkerwi, A., Al-Raddadi, R., Amare, A. T., Amberbir, A., Amegah, A. K., Amini, E., Amrock, S. M., Anjana, R. M., Arnlov, J., Asayesh, H., Banerjee, A., Barac, A., Baye, E., Bennett, D. A., Beyene, A. S., Biadgilign, S., Biryukov, S., Bjertness, E., Boneya, D. J., Campos-Nonato, I., Carrero, J. J., Cecilio, P., Cercy, K., Ciobanu, L. G., Cornaby, L., Damtew, S. A., Dandona, L., Dandona, R., Dharmaratne, S. D., Duncan, B. B., Eshrati, B., Esteghamati, A., Feigin, V. L., Fernandes, J. C., Furst, T., Gebrehiwot, T. T., Gold, A., Gona, P. N., Goto, A., Habtewold, T. D., Hadush, K. T., Hafezi-Nejad, N., Hay, S. I., Horino, M., Islami, F., Kamal, R., Kasaeian, A., Katikireddi, S. V., Kengne, A. P., Kesavachandran, C. N., Khader, Y. S., Khang, Y. H., Khubchandani, J., Kim, D., Kim, Y. J., Kinfu, Y., Kosen, S., Ku, T., Defo, B. K., Kumar, G. A., Larson, H. J., Leinsalu, M., Liang, X., Lim, S. S., Liu, P., Lopez, A. D., Lozano, R.,

Majeed, A., Malekzadeh, R., Malta, D. C., Mazidi, M., McAlinden, C., McGarvey, S. T., Mengistu, D. T., Mensah, G. A., Mensink, G. B. M., Mezgebe, H. B., Mirrakhimov, E. M., Mueller, U. O., Noubiap, J. J., Obermeyer, C. M., Ogbo, F. A., Owolabi, M. O., Patton, G. C., Pourmalek, F., Qorbani, M., Rafay, A., Rai, R. K., Ranabhat, C. L., Reinig, N., Safiri, S., Salomon, J. A., Sanabria, J. R., Santos, I. S., Sartorius, B., Sawhney, M., Schmidhuber, J., Schutte, A. E., Schmidt, M. I., Sepanlou, S. G., Shamsizadeh, M., Sheikhabaie, S., Shin, M. J., Shiri, R., Shiue, I., Roba, H. S., Silva, D. A. S., Silverberg, J. I., Singh, J. A., Stranges, S., Swaminathan, S., Tabares-Seisdedos, R., Tadese, F., Tedla, B. A., Tegegne, B. S., Terkawi, A. S., Thakur, J. S., Tonelli, M., Topor-Madry, R., Tyrovolas, S., Ukwaja, K. N., Uthman, O. A., Vaezghasemi, M., Vasankari, T., Vlassov, V. V., Vollset, S. E., Weiderpass, E., Werdecker, A., Wesana, J., Westerman, R., Yano, Y., Yonemoto, N., Yonga, G., Zaidi, Z., Zenebe, Z. M., Zipkin, B., & Murray, C. J. L. (2017, Jul 6). Health Effects of Overweight and Obesity in 195 Countries over 25 Years. *N Engl J Med*, *377*(1), 13-27. <https://doi.org/10.1056/NEJMoa1614362>

Committee, J. S. f. P. E. J. G. S. A. J. S. (2011). Basic concept regarding the evaluation of the physique of Japanese children [日本人小児の体格の評価に関する基本的な考え方]. *Journal of Japan Society for Growth*, *17*(2), 84-89. <http://mol.medicalonline.jp/library/journal/download?GoodsID=dh6auxol/2011/001702/005&name=0084-0099j&UserID=202.21.163.142>

de Onis, M., Onyango, A. W., Borghi, E., Siyam, A., Nishida, C., & Siekmann, J. (2007, Sep). Development of a WHO growth reference for school-aged children and adolescents. *Bull World Health Organ*, *85*(9), 660-667. <https://doi.org/10.2471/blt.07.043497>

Ek, A., Sorjonen, K., Eli, K., Lindberg, L., Nyman, J., Marcus, C., & Nowicka, P. (2016). Associations between Parental Concerns about Preschoolers' Weight and Eating and Parental Feeding Practices: Results from Analyses of the Child Eating Behavior Questionnaire, the Child Feeding Questionnaire, and the Lifestyle Behavior Checklist. *PLoS One*, *11*(1), e0147257. <https://doi.org/10.1371/journal.pone.0147257>

Endocrinology, T. J. S. f. P. (2011). *Anthropometric index calculation file*. Retrieved Nov 8 from http://jspe.umin.jp/medical/chart_dl.html

Eriksson, J. G., Forsen, T., Tuomilehto, J., Osmond, C., & Barker, D. J. (2003, Feb). Early adiposity rebound in childhood and risk of Type 2 diabetes in adult life. *Diabetologia*, *46*(2), 190-194. <https://doi.org/10.1007/s00125-002-1012-5>

- Fallani, M., Amarri, S., Uusijarvi, A., Adam, R., Khanna, S., Aguilera, M., Gil, A., Vieites, J. M., Norin, E., Young, D., Scott, J. A., Dore, J., Edwards, C. A., & The Infabio, T. (2011, May). Determinants of the human infant intestinal microbiota after the introduction of first complementary foods in infant samples from five European centres. *Microbiology (Reading)*, *157*(Pt 5), 1385-1392. <https://doi.org/10.1099/mic.0.042143-0>
- Hayata, E. N., M. (2020). Recent trends in Caesarean section and Caesarean section according to patient wishes [帝王切開の最近の動向と患者希望による帝王切開]. *Obstetrics and Gynecology Practice*, *69*(6), 541-547. <https://doi.org/https://doi.org/10.18888/sp.0000001293>
- Huh, S. Y., Rifas-Shiman, S. L., Zera, C. A., Edwards, J. W., Oken, E., Weiss, S. T., & Gillman, M. W. (2012, Jul). Delivery by caesarean section and risk of obesity in preschool age children: a prospective cohort study. *Arch Dis Child*, *97*(7), 610-616. <https://doi.org/10.1136/archdischild-2011-301141>
- Hyde, M. J., Mostyn, A., Modi, N., & Kemp, P. R. (2012, Feb). The health implications of birth by Caesarean section. *Biol Rev Camb Philos Soc*, *87*(1), 229-243. <https://doi.org/10.1111/j.1469-185X.2011.00195.x>
- Inde, Y. N., A. (2010). Recent trends in cesarean delivery in Japan [我が国における帝王切開分娩の最近の動向]. *Perinatal Medicine*, *40*(10), 1441-1447. <http://mol.medicalonline.jp/library/journal/download?GoodsID=aq9syuse/2010/004010/001&name=1441-1447j&UserID=202.21.163.142>
- Isojima, T., & Yokoya, S. (2019, Jun). The value of anthropometric indices for childhood obesity in Japan. *Ann Hum Biol*, *46*(4), 293-297. <https://doi.org/10.1080/03014460.2019.1643404>
- Jacquot, A., Neveu, D., Aujoulat, F., Mercier, G., Marchandin, H., Jumas-Bilak, E., & Picaud, J. C. (2011, Mar). Dynamics and clinical evolution of bacterial gut microflora in extremely premature patients. *J Pediatr*, *158*(3), 390-396. <https://doi.org/10.1016/j.jpeds.2010.09.007>
- Kelley, G. A., Kelley, K. S., & Pate, R. R. (2017, May). Exercise and BMI z-score in Overweight and Obese Children and Adolescents: A Systematic Review and Network Meta-Analysis

- of Randomized Trials. *J Evid Based Med*, 10(2), 108-128. <https://doi.org/10.1111/jebm.12228>
- Kim, J., Lee, I., & Lim, S. (2017, Dec). Overweight or obesity in children aged 0 to 6 and the risk of adult metabolic syndrome: A systematic review and meta-analysis. *J Clin Nurs*, 26(23-24), 3869-3880. <https://doi.org/10.1111/jocn.13802>
- Koletzko, B., Godfrey, K. M., Poston, L., Szajewska, H., van Goudoever, J. B., de Waard, M., Brands, B., Grivell, R. M., Deussen, A. R., Dodd, J. M., Patro-Golab, B., Zalewski, B. M., & EarlyNutrition Project Systematic Review, G. (2019). Nutrition During Pregnancy, Lactation and Early Childhood and its Implications for Maternal and Long-Term Child Health: The Early Nutrition Project Recommendations. *Ann Nutr Metab*, 74(2), 93-106. <https://doi.org/10.1159/000496471>
- Koyama, S., Ichikawa, G., Kojima, M., Shimura, N., Sairenchi, T., & Arisaka, O. (2014, Jan). Adiposity rebound and the development of metabolic syndrome. *Pediatrics*, 133(1), e114-119. <https://doi.org/10.1542/peds.2013-0966>
- Kubo, T. (2014, Jul). Common approach to childhood obesity in Japan. *J Pediatr Endocrinol Metab*, 27(7-8), 581-592. <https://doi.org/10.1515/jpem-2014-0047>
- Kuhle, S., Tong, O. S., & Woolcott, C. G. (2015, Apr). Association between caesarean section and childhood obesity: a systematic review and meta-analysis. *Obes Rev*, 16(4), 295-303. <https://doi.org/10.1111/obr.12267>
- Li, C., Kaur, H., Choi, W. S., Huang, T. T., Lee, R. E., & Ahluwalia, J. S. (2005, Feb). Additive interactions of maternal prepregnancy BMI and breast-feeding on childhood overweight. *Obes Res*, 13(2), 362-371. <https://doi.org/10.1038/oby.2005.48>
- Li, H. T., Zhou, Y. B., & Liu, J. M. (2013, Jul). The impact of cesarean section on offspring overweight and obesity: a systematic review and meta-analysis. *Int J Obes (Lond)*, 37(7), 893-899. <https://doi.org/10.1038/ijo.2012.195>
- Masukume, G., O'Neill, S. M., Baker, P. N., Kenny, L. C., Morton, S. M. B., & Khashan, A. S. (2018, Oct 11). The Impact of Caesarean Section on the Risk of Childhood Overweight and Obesity: New Evidence from a Contemporary Cohort Study. *Sci Rep*, 8(1), 15113. <https://doi.org/10.1038/s41598-018-33482-z>

- Ministry of Health, L. a. W. (2017). *2017 Medical Facility (Static / Dynamic) Survey / Hospital Report Overview* <https://www.mhlw.go.jp/toukei/saikin/hw/iryosd/17/>
- Ministry of Health, L. a. W. (2020). *2018 National Health and Nutrition Survey Report*. Retrieved Dec 22 from <https://www.mhlw.go.jp/content/10900000/000688863.pdf>
- Ministry of Health, L. a. W., Child and Family Policy Bureau. (2002). *National growth survey report on preschool children in 2000*. <https://www.mhlw.go.jp/houdou/0110/h1024-4.html>
- Mueller, N. T., Mao, G., Bennet, W. L., Hourigan, S. K., Dominguez-Bello, M. G., Appel, L. J., & Wang, X. (2017, Apr). Does vaginal delivery mitigate or strengthen the intergenerational association of overweight and obesity? Findings from the Boston Birth Cohort. *Int J Obes (Lond)*, *41*(4), 497-501. <https://doi.org/10.1038/ijo.2016.219>
- Nagata, S., Chiba, Y., Wang, C., & Yamashiro, Y. (2017, Aug 24). The effects of the *Lactobacillus casei* strain on obesity in children: a pilot study. *Benef Microbes*, *8*(4), 535-543. <https://doi.org/10.3920/BM2016.0170>
- Nagpal, R., Kurakawa, T., Tsuji, H., Takahashi, T., Kawashima, K., Nagata, S., Nomoto, K., & Yamashiro, Y. (2017, Aug 30). Evolution of gut Bifidobacterium population in healthy Japanese infants over the first three years of life: a quantitative assessment. *Sci Rep*, *7*(1), 10097. <https://doi.org/10.1038/s41598-017-10711-5>
- Nishijima, S., Suda, W., Oshima, K., Kim, S. W., Hirose, Y., Morita, H., & Hattori, M. (2016, Apr). The gut microbiome of healthy Japanese and its microbial and functional uniqueness. *DNA Res*, *23*(2), 125-133. <https://doi.org/10.1093/dnares/dsw002>
- Nittari, G., Scuri, S., Petrelli, F., Pirillo, I., di Luca, N. M., & Grappasonni, I. (2019, May-Jun). Fighting obesity in children from European World Health Organization member states. Epidemiological data, medical-social aspects, and prevention programs. *Clin Ter*, *170*(3), e223-e230. <https://doi.org/10.7417/CT.2019.2137>
- Ogawa, K., Morisaki, N., Sago, H., Fujiwara, T., & Horikawa, R. (2018, Aug 1). Association between women's perceived ideal gestational weight gain during pregnancy and

pregnancy outcomes. *Sci Rep*, 8(1), 11574. <https://doi.org/10.1038/s41598-018-29936-z>

Pei, Z., Heinrich, J., Fuertes, E., Flexeder, C., Hoffmann, B., Lehmann, I., Schaaf, B., von Berg, A., Koletzko, S., Influences of Lifestyle-Related Factors on the Immune, S., the Development of Allergies in Childhood plus Air, P., & Genetics Study, G. (2014, May). Cesarean delivery and risk of childhood obesity. *J Pediatr*, 164(5), 1068-1073 e1062. <https://doi.org/10.1016/j.jpeds.2013.12.044>

Penders, J., Thijs, C., Vink, C., Stelma, F. F., Snijders, B., Kummeling, I., van den Brandt, P. A., & Stobberingh, E. E. (2006, Aug). Factors influencing the composition of the intestinal microbiota in early infancy. *Pediatrics*, 118(2), 511-521. <https://doi.org/10.1542/peds.2005-2824>

Reilly, J. J., Armstrong, J., Dorosty, A. R., Emmett, P. M., Ness, A., Rogers, I., Steer, C., Sherriff, A., Avon Longitudinal Study of, P., & Children Study, T. (2005, Jun 11). Early life risk factors for obesity in childhood: cohort study. *BMJ*, 330(7504), 1357. <https://doi.org/10.1136/bmj.38470.670903.E0>

Rolland-Cachera, M. F., Deheeger, M., Bellisle, F., Sempe, M., Guilloud-Bataille, M., & Patois, E. (1984, Jan). Adiposity rebound in children: a simple indicator for predicting obesity. *Am J Clin Nutr*, 39(1), 129-135. <https://doi.org/10.1093/ajcn/39.1.129>

Rooney, B. L., Mathiason, M. A., & Schauberger, C. W. (2011, Nov). Predictors of obesity in childhood, adolescence, and adulthood in a birth cohort. *Matern Child Health J*, 15(8), 1166-1175. <https://doi.org/10.1007/s10995-010-0689-1>

Rutayisire, E., Wu, X., Huang, K., Tao, S., Chen, Y., & Tao, F. (2016, Nov 3). Cesarean section may increase the risk of both overweight and obesity in preschool children. *BMC Pregnancy Childbirth*, 16(1), 338. <https://doi.org/10.1186/s12884-016-1131-5>

Sutharsan, R., Mannan, M., Doi, S. A., & Mamun, A. A. (2015, Dec). Caesarean delivery and the risk of offspring overweight and obesity over the life course: a systematic review and bias-adjusted meta-analysis. *Clin Obes*, 5(6), 293-301. <https://doi.org/10.1111/cob.12114>

- Svensson, E., Hyde, M., Modi, N., & Ehrenstein, V. (2013, Mar). Caesarean section and body mass index among Danish men. *Obesity (Silver Spring)*, *21*(3), 429-433. <https://doi.org/10.1002/oby.20310>
- Umer, A., Kelley, G. A., Cottrell, L. E., Giacobbi, P., Jr., Innes, K. E., & Lilly, C. L. (2017, Aug 29). Childhood obesity and adult cardiovascular disease risk factors: a systematic review with meta-analysis. *BMC Public Health*, *17*(1), 683. <https://doi.org/10.1186/s12889-017-4691-z>
- UNICEF. (2019). *The State of the World's Children 2019* <https://www.unicef.org/reports/state-of-worlds-children-2019>
- van Elten, T. M., van de Beek, C., Geelen, A., Gemke, R., Groen, H., Hoek, A., Mol, B. W., van Poppel, M. N. M., & Roseboom, T. J. (2019, Oct 14). Preconception Lifestyle and Cardiovascular Health in the Offspring of Overweight and Obese Women. *Nutrients*, *11*(10). <https://doi.org/10.3390/nu11102446>
- Yamashiro, Y. N., S.; Sato, H. (2015). Gut flora and childhood health and disease susceptibility: Does Caesarean section affect the future health of the infant? [腸内細菌と小児期の健康および疾病感受性—帝王切開は児の将来の健康に影響を及ぼす?—]. *Japanese journal of pediatrics*, *68*(3), 343-354. <http://mol.medicalonline.jp/library/journal/download?GoodsID=ag1snrsd/2015/006803/002&name=0343-0354j&UserID=202.21.163.142>
- Yu, Z., Han, S., Zhu, J., Sun, X., Ji, C., & Guo, X. (2013). Pre-pregnancy body mass index in relation to infant birth weight and offspring overweight/obesity: a systematic review and meta-analysis. *PLoS One*, *8*(4), e61627. <https://doi.org/10.1371/journal.pone.0061627>
- Zhou, L., He, G., Zhang, J., Xie, R., Walker, M., & Wen, S. W. (2011, Nov). Risk factors of obesity in preschool children in an urban area in China. *Eur J Pediatr*, *170*(11), 1401-1406. <https://doi.org/10.1007/s00431-011-1416-7>