Cooking for Health Optimization with Patients (CHOP) Protocol

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1. Study aim, background, and design

There is a global nutrition-related chronic disease epidemic. The research supports how nutrition education classes with hands-on cooking can be a very effective way to improve people's health individually and in families. But there are not many studies that say what is the best combination of nutrition educating and cooking classes, or who to show such classes work with patients and with medical professionals like doctors.

Tulane University has a pioneering medical school-based teaching kitchen, The Goldring Center for Culinary Medicine (GCCM), that wants to know what is best type of such classes to teach medical professionals and trainees how to counsel patients on nutrition, and the best classes to teach patients how to improve their health while still eating the meals they enjoy individually and with their families. To do this, GCCM will lead the research study, Cooking for Health Optimization with Patients (CHOP), as the world's first and largest study of its kind to compare effectiveness of hands-on cooking and nutrition education classes to the standard of nutrition education care. This will help answer how teaching medical professionals how to educate patients about nutrition impact their dietary habits and attitudes and competencies (DACs) educating patients, and how their DACs impact their patients' health, in addition to how classes for non-medical professionals directly improves their health.

CHOP is a prospective observational cohort study with four tracks ([1] medical professionals, [2] community, [3] employee, and [4] randomized controlled trial [RCT]) to allow results to be compared among the subjects in the four tracks. [1] Current and future medical professionals will be trained in classes within their track in how to educate patients about nutrition, and their results for their DACs will be compared to those who receive traditional clinical education. [2] Adults, adolescents, and children 7 years and older will be offered classes in their community track to allow comparison of their DACs and health metrics with those who do not take the classes. [3] Employees and their families who take the GCCM classes as employee wellness programing will have their DAC and health metrics compared to employees who do not take the classes. And finally, [4] subjects with such chronic health conditions as diabetes will be randomized with equal 50% chance to either taking the GCCM classes or receiving medical nutrition therapy (MNT) with a registered dietician (RD).

DAC surveys will take place for the first track at the beginning and end of each academic year. Surveys will take place for the last three tracks at the first and last class for the treatment (GCCM) class group, and the beginning of the study and 2-3 months later for the control groups (those who do not take the classes). The same adult and children surveys will be used across tracks [2]-[4] for adults 18 years and older and children 7-17 respectively. Medical professionals in [1] will have the same survey.

CHOP unites such analyses as diffusion of innovation (DOI), social network, and simulation-based medical education with deliberate practice (SBME-DP) along with rigorous statistical methods to answer these questions and hopefully benefit society. Results will be strengthened by using self regulation survey with Tulane marketing students to better design the DAC survey based on understanding what DACs predict

certain nutrition behavior, in addition to comparison to the de-identified National Health and Nutrition Examination Survey (NHANES) for national trends in diet and similar health metrics and behaviors.

2. Subject Population

[1] Medical professionals track: All participants (over 17) who have matriculated to the Tulane University Health Sciences Center as students or residents in addition to physicians participating in the curriculum as continuing medical education (CME) credits for a target sample of 10,000 respondents. Subjects will be offered the survey from medical school through residency and into medical practice. Up to 1,000 marketing students will be offered a self-regulation survey.

[2] Community track: Adults 17 years and older and children 7-17 in the Greater New Orleans area for a target sample of 6,000 subjects (3,000 taking the classes and the rest not). Subjects will be followed for three years after their class participation or lack thereof based upon standards for such studies.

[3] Employee track: Employees and their family members 7 years and older affiliated with Laitram, LLC for a target sample of 3,000 subjects (1,500 taking the classes and the rest not). Subjects will be followed for three years after their class participation or lack thereof based upon standards for such studies.

[4] RCT track: Adults 17 years and older with diagnosed diabetes, hypertension, hyperlipidemia, cardiovascular disease, or past history of cerebrovascular disease or their pre-diagnosis conditions (i.e. pre-diabetes as the condition at risk for developing diabetes) for a target sample of 500 subjects. Subjects will be followed for three years after their class participation or lack thereof based upon standards for such studies.

3. Procedure

[1] Medical professionals track: An internet link will be distributed to subjects through the list-serves for each class at the beginning and end of each academic year after they have had the opportunity to participate or not in the voluntary GCCM classes. Residents and practicing physicians who identify themselves through the GCCM website will be subsequently offered the survey. Marketing students will be offered an online survey about self-regulation and nutrition through their marketing class to improve the medical professionals survey.

[2] Community, [3] Employee, and [4] RCT tracks: Subjects in the treatment group will receive up to 20 evidence-based classes (50 hours) of cooking and nutrition education that cover the Mediterranean diet, food shopping, cooking, and storage. Subjects in the control groups for [2] and [3] will not receive the classes, and control subjects in [4] will receive MNT. Control subjects in [2] will additionally have the opportunity to receive either healthy food vouchers for 2 months or have nutrition education for their children before they enroll in the classes in order to compare if increased healthy food access and education compared to GCCM classes best prepares them to benefit from nutrition education. DAC surveys will be used at the beginning and end of the classes for the treatment group, and beginning of the study and 2-3 months later for the control group. Health metrics will be assessed from health records for subjects retrospectively 3 years before and 3 years after their treatment or control exposure, once subjects provide release to the study team of their records with appropriate safeguards to protect

the safety of their data. Recruitment for [2] will be through GCCM's website, [3] will be through Laitram that promotes the classes to their employees, and [4] through Tulane University Hospital and Clinic (including the Internal Medicine Practice, Uptown Square clinic, Endocrinology clinic, and Metairie Multispecialty clinic) by study staff. Health metrics will be obtained for [2,4] from Tulane University Hospital and Clinic if subjects' information is stored there, from Marathon Health the third party provider of health care for [3], and from non-Tulane health care institutions for [2,4]. Marathon and non-Tulane facility health information release forms will be provided to subjects as needed at the time of informed consent.

4. Risks

There are no foreseeable risks. However, if subjects feel at all uncomfortable, they may cease participation at any time and forgo participation. Subjects' names will not appear anywhere on the surveys, but stored rather than dummy IDs that subjects generate themselves. Survey data for tracks [1-4] and health metric data will for tracks [2-4] will be stored on an encrypted computer owned by Tulane University using files that will be password protected. Electronic backup will be made to a secure shared drive hosted by Tulane University Information Technology Services. Only study staff will have direct access to the data. Only study staff will have access to the code key that identifies participants. This will be stored on a separate dataset on a secure, password protected Tulane hard drive. Subject survey responses are also protected by being collected through Qualtrics, an advanced online survey system used by research teams. Servers are protected by high-end firewall systems, and scans are performed regularly to ensure that any vulnerabilities are quickly found and patched. Complete penetration tests are performed yearly. All services have quick failover points and redundant hardware, with complete backups performed nightly. The confidential system component design uses multiple checks to certify that packets from one subsystem can only be received by a designated subsystem. Access to systems is severely restricted to specific individuals, whose access is monitored and audited for compliance. Customer data are stored in a specific location; it does not float around in the "cloud." In addition, all data are processed in that location, and are not moved to another jurisdictional area. In other words, if data are collected in the U.S., all data are processed in the U.S. Qualtrics uses Transport Layer Security (TLS) encryption (also known as HTTPS) for all transmitted data. Qualtrics also protects surveys with passwords and HTTP referrer checking. Qualtrics services are hosted by trusted data centers that are independently audited using the industry standard SSAE-16 method. Qualtrics deploys the general requirements set forth by many Federal Acts, including the FISMA Act of 2002. They meet or exceed the minimum requirements as outlined in FIPS Publication 200. Qualtrics safeguards all responder data, and uses secure data centers to ensure the highest protection as per requirements of HITECH (Health Information Technology for Economic and Clinical Health Act) to ensure that data are properly protected and best security practices followed. In the case of an emergency for the treatment group (though not expected), please exit GCCM through the labeled exits and follow the instructions of the class facilitators familiar with the facility.

5. Benefits

Subjects may benefit from the cooking classes or MNT sessions (control group for [4]) as they have both been shown to improve health, and society may benefit in general.

6. Remuneration

There will be no payment for participation in this research study.

7. Academic or Extra Credit

The GCCM classes will not affect the grades for trainees in [1] so that answers can be given without concern for their impact on grades (class instructors who control grades will not receive the survey responses). Marketing students who take the self-regulation survey can receive 1.33 credits for their marketing class based only on participation, and not for any particular responses so there be no pressure to answer in certain ways.

8. Costs

There will be no costs to the subject for participating in this research study.

9. Alternatives

The alternative is that the subjects do not have to participate in the research.

10. Consent process and documentation

[1] Medical professionals track: A waiver of documentation of consent has been attached to this package for both medical professionals and trainees and marketing students, due to the information necessary for informed consent being provided in the recruitment email and the significant logistical challenges of documenting consent individually for such a large number of respondents remotely accessing the survey through the confidential online survey link. Email addresses are collected to verify the accuracy of the self-generated dummy IDs for subjects who respond to repeat surveys, and then the emails are deleted from the dataset used for longitudinal analysis.

[2] Community, [3] Employee, and [4] RCT tracks: A full description of the research will be discussed with subjects regarding both study groups. Discussion about the risks and benefits will be undertaken with prospective participants. This will mirror the written information in the consent form. After full information is discussed and questions are answered the participants the consent form will be reviewed and subjects will be asked to sign the form if they are interested in being involved (adults) or assent (children). Telephone numbers are collected based on GCCM experience over the past four years that class participants find reminders about classes helpful.

11. Qualifications of the investigators

Principal Investigator: Dominique J. Monlezun, Ph.D.(c), M.P.H.
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Co-Investigator: Timothy S. Harlan, M.D.
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12. Survey links

[1] CHOP-Medical Professionals: http://tulane.qualtrics.com/SE/?SID=SV_57Pu9twXUczA4gR.
[2-4] CHOP-Community, -Employees, -RCT Adults:
http://tulane.qualtrics.com/SE/?SID=SV_5C5tqoWuaGK4esR.
[2-4] CHOP-Community, -Employees Children:
http://tulane.qualtrics.com/SE/?SID=SV_08RuXreVqaFzV0F.
[Supplemental] Self-regulation: http://tulane.qualtrics.com/SE/?SID=SV_beARYSuPFbCp9pH.

13. References

Monlezun DJ, Kasprowicz E, Tosh K, Nix J, Urday P, Tice D, Sarris L, Harlan TS. Medical school-based teaching kitchen improves HbA1c, blood pressure, and cholesterol for patients with type 2 diabetes: results from a novel randomized controlled trial. Diabetes Research and Clinical Practice. 2015; 109(2): 420-6. doi: 10.1016/j.diabres.2015.05.007.

Monlezun DJ, Leong B, Joo E, Birkhead AG, Sachs BP, Sarris L, Harlan TS. Novel longitudinal and propensity-score matched analysis of hands-on cooking and nutrition education versus traditional clinical education among 627 medical students. Advances in Preventive Medicine. 2015; 2015: 656780. http://dx.doi.org/10.1155/2015/656780.

Birkhead A, Foote S, Monlezun DJ, Loyd J, Joo E, Leong B, et al. Medical student-led community cooking classes: a novel preventative medicine model easy to swallow. Am J Prev Med 2014;46(3):e41–2.

Spencer EH, Frank E, Elon LK, et al. Predictors of nutrition counseling behaviors and attitudes in US medical students. Am J Clin Nutr 2006;84:655–62.

Walsh CO, Ziniel SI, Delichatsios HK, et al. Nutrition attitudes and knowledge in medical students after completion of an integrated nutrition curriculum compared to a dedicated nutrition curriculum: a quasi-GCCM study. BMC Med Educ 2011;11:58.

Trichopoulou A, Costacou T, Bamia C, et al. Adherence to a Mediterranean diet and survival in a Greek population. N Eng J Med 2003;348(26):2599–608.

Franz M, Powers M, Leontos C, et al. The evidence for medical nutrition therapy for type 1 and type 2 diabetes in adults. J Am Diet Assoc 2010;110(12):1852–89.

Norris S, Nichols P, Caspersen C, et al. Increasing diabetes self-management education in community settings: a systematic review. Am J Prev Med 2002;22(4S):39–66.

Estruch R, Ros E, Salas-Salvado´ J, Covas MI, Corella D, Aro´ s F, et al. Primary prevention of cardiovascular disease with a Mediterranean diet. N Engl J Med 2013;368(14):1279–90.

Itsiopoulos C, Brazionis L, Kaimakamis M, Cameron M, Best JD, O'Dea K, et al. Can the Mediterranean diet lower HbA1c in type 2 diabetes?. Results from a randomized cross-over study. Nutr Metab Cardiovasc Dis 2011;21(9):740–7.

Ajala O, English P, Pinkney J. Systematic review and meta analysis of different dietary approaches to the management of type 2 diabetes. Am J Clin Nutr 2013;97(3):505–16.

Kushner R. Barriers to providing nutrition counseling by physicians: a survey of primary care practitioners. Prev Med 1995;24:546–52.

Statistical Analysis Plan

Power Analysis

The required calculated sample size to achieve 80% power and detect an odds ratio (OR) of at least 1.50 with a two-sided test set at 5% was 263 cases.

Machine Learning and Statistical Analysis

The first phase of the analysis was conducted with ML within a supervised learning framework to test 43 algorithms with 10-fold cross-validation, selected based upon the data type. Algorithm performance was assessed favorably based on higher accuracy, lower root relative squared error (RRSE) with model acceptability set at 100% (for comparison among ML algorithms), and lower root mean squared error (RMSE, for comparison to traditional statistical models). Performance could be improved further if the relevant ML algorithms would be additionally permitted to select which variables should be included in the models. But to improve comparison to traditional statistical results, all the variables based on the above literature to be included in the statistical regression models were included first in the ML algorithms. The following algorithms by type were tested: Bayesian (Bayes Net, Naive Bayes, Naive Bayes Multinomial Text, and Naive Bayes Updateable), Functions (Logistic, Multilayer perceptron, SGD, SGD Text, Simple Logistic, SMO, and Voted Perceptron), Lazy (IBK, KStar, and LWL), Meta (AdaBoostM1, Attribute Selected Classifier, Bagging, Classification via Regression, CV Parameter Selection, Iterative Classifier Optimizer, Logit Boost, Multiclass Classifier, Multiclass Classifier Updateable, Multi-Scheme, Random Committee, Randomizable Filtered Classifier, Random Sub-Space, Stacking, Vote, and Weighted Instances Handler Wrapper), Miscellaneous (Input Mapped Classifier), Rules (Decision Table, JRip, OneR, Part, and ZeroR), and Trees (Decision Stump, Hoeffding Tree, J48, LMT, Random Forest, Random Tree, and REP Tree).

The second phase of analysis was conducted with traditional statistics using a novel integration of three statistical methods. Panel analysis of longitudinal data with triply robust propensity score (PS) adjusted multilevel mixed effects multivariable regression was conducted for causal inference. There is extensive, well-accepted statistical literature that causation can be inferred in observational trials without randomization through certain rigorous statistical methods, with fixed effects and propensity score being two of the most popular and well validated particularly with panel data.

Doubly robust estimation features a dual strategy of outcome regression that also accounts for the likelihood of receiving an exposure or treatment, such as with a PS. Simply using multivariable regression or PS analysis can lead to biased treatment estimates if either model is incorrectly specified. But with doubly robust estimation using both concurrently, only one model must be correctly specified to produce unbiased estimates. Of all the forms of PS analysis (i.e., matching, stratification, weighting, and adjustment), regression that includes the PS as one of the adjusted variables has quantitative evidence as being the top performing PS method. Finally, mixed effects regression further provides a powerful approach to causal inference. This mixed method contains both fixed effects (FE) and random effects (RE) components, with FE having the distinct advantage of controlling even for nonobserved traits by controlling for all time-invariant traits. FE does this by setting each individual subject as his/her own control and thus models within-person effects. Aside from the theoretical advantages, FE has shown quantitative strengths over competing methods. RE was used to control for what FE cannot,

namely, time-varying traits at the individual level with repeated observations over time (as students progressed through their medical education). The multilevel aspect was used to account for the hierarchical nature of the data in which medical trainees responded from different medical institutions. Inverse-variance weighted fixed effects (IVWFE) meta-analysis was used to produce a composite estimate across the 25 competency topics.

This triply robust approach can be represented by the following mathematical formula:

$$\Pr(y_{ij} = 1 \mid u_j) = H(x_{ij}\beta + z_{ij}u_j) \quad (1)$$

for M independent clusters conditioned on random effects u_j for $j = 1,\ldots, M$ clusters with cluster j constituting $i = 1,\ldots, n_j$ observations, outcome y_{ij}, FE covariate x_{ij}, RE covariate z_{ij}, and regression coefficient β, all within a logistic regression equation with logistic cumulative distribution function of $H(\bullet)$. The PS is utilized as an additional variable in the above model and is represented as

$$e(x_i) = \Pr(z_i = 1 \mid x_i) \quad (2)$$

in which exposure probability is conditioned on the covariate x_i observed.

The competing causal inference methods of instrumental variable and difference in difference analyses were not utilized due to their methodological weaknesses, respectively, of having varying degrees of reliable instrumental variables and having a prevalence of unobserved confounders exerting time-varying effects before and after the exposure/treatment. The above methods of doubly robust PS adjustment in multivariable regression were therefore integrated with multilevel mixed effects to provide a novel triply robust approach to causal inference. Aside from controlling for the likelihood of receiving GCCM education (via the PS) and unobserved time-invariant traits (via FE) and time variant along with intracluster correlation (via RE), this integrative method controlled via regression for age, gender, race, prior nutrition education, special diet, school year, intended specialty, and medical school. This multilevel approach has a Bernoulli conditional distribution of the response given the random effects and logistic cumulative distribution function for the success probability.

All results are reported as fully adjusted ORs. ORs rather than relative risks were calculated due to the complex data source described above and due to the rare disease assumption. Statistical significance was set at a two-tailed p value < 0.05. ML analysis was performed in R 3.3.2 (The R Foundation for Statistical Computing, Vienna, Austria). Statistical analysis was performed in STATA 14.2 (STATACorp, College Station, Texas, United States of America). Ethics approval was obtained through the Institutional Review Board (IRB) of Tulane University.