

Community-Engaged Lifestyle Medicine: Building Health Equity Through Preventive Medicine Residency Training

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Vulnerable populations in the U.S. experience persistent disparities in chronic disease and associated lifestyle-based risk factors. Because of environmental, cultural, and health systems barriers affecting vulnerable populations, lifestyle medicine interventions may miss those at highest risk for chronic disease. Numerous reports suggest that graduate medical education (GME) inadequately prepares physicians to promote healthy lifestyles and health equity in vulnerable groups. General Preventive Medicine/Public Health (GPM/PH), the medical specialty dedicated to health promotion and disease prevention in populations, can fill this gap. However, virtually no published reports describe health equity-oriented GPM/PH residency programs. The authors describe implementation of the novel Community-Engaged Lifestyle Medicine at the University of Texas Rio Grande Valley GPM/PH residency program between 2017 and 2018. Community-Engaged Lifestyle Medicine applies community engagement principles to lifestyle medicine practice, training residents in multilevel, intersectoral approaches promoting behavior change and health equity. Community-Engaged Lifestyle Medicine is described in the context of health equity and the local border community, along with associated curricular objectives and experiences. In 2017, the authors assessed first-year Community-Engaged Lifestyle Medicine process outcomes, fidelity to health equity mechanisms, and feasibility in a GPM/PH residency, by mapping Community-Engaged Lifestyle Medicine activities to American Council of Graduate Medical Education and the American College of Lifestyle Medicine competencies. The Community-Engaged Lifestyle Medicine framework was successfully implemented in 2017, meets all American Council of Graduate Medical Education competency domains, and demonstrates fidelity to mechanisms of community engagement, health equity, and the practice of lifestyle medicine. Community-Engaged Lifestyle Medicine represents a feasible and valid framework to promote health equity via GPM/PH and GME training and practice.

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INTRODUCTION

Health disparities refer to differences in health quality, healthcare access, and health status systematically impacting populations of particular race/ethnicity, gender, or SES.¹ Health disparities affecting vulnerable populations in the U.S. arise from systematic adverse lifestyle exposures. Lifestyle risk factors, including tobacco use, poor nutrition, inactivity, and alcohol use, are perpetuated by lifestyle exposures and represent the top actual (external) causes of death in the U.S.²

Persistent health disparities engender calls to balance “sick care” with evidence-based preventive approaches promoting health equity.^{3–7} Health equity is defined as

“the principle underlying a commitment to reduce—and, ultimately, eliminate—disparities in health and in its

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0749-3797/\$36.00

<https://doi.org/10.1016/j.amepre.2018.04.012>

determinants, including social determinants.”⁸ Training in Preventive Medicine (PM), the Graduate Medical Education (GME) specialty dedicated to health promotion and disease prevention in defined populations, can fill this void by spearheading participatory, culturally tailored and intersectoral programs associated with health equity.⁹ GME strongly influences physician practice and career choice, as physicians trained in culturally tailored health promotion in underserved settings are more likely to remain and practice effectively in these settings.^{3,6,10,11}

However, literature describing health equity training in U.S. GME programs is sparse. Further, no published reports were found describing health equity-oriented training models in PM residency programs. Only one report describes a PM program’s strategic aim to build capacity of a local underserved community.¹²

Addressing this gap, this report presents the Community-Engaged Lifestyle Medicine (CELM) training model of the University of Texas Rio Grande Valley (UTRGV) School of Medicine General Preventive Medicine/Public Health (GPM/PH) residency as a framework promoting health equity in the underserved Texas–Mexico border community of the Rio Grande Valley (RGV). The report describes the CELM context, objectives, and activities. Results of two evaluation processes are presented: (1) process analysis evaluating alignment of Year 1 program activities to CELM health equity goals; and (2) competency mapping assessing feasibility of CELM within GME programs by linking CELM activities with American College of Lifestyle Medicine and American Council of Graduate Medical Education (ACGME) GPM/PH competencies.

COMMUNITY-ENGAGED LIFESTYLE MEDICINE CONTEXT—THE RIO GRANDE VALLEY

The RGV, a four-county region in South Texas, is home to 1.3 million people.¹³ The RGV’s demographic profile reflects key drivers of health disparities. Thirty-five percent of the population lives in poverty, compared with 18% and 17% at the state and national levels. Per capita incomes (\$14,454) are almost half those of state (\$26,513) and national (\$28,555) levels.^{13,14} Only 62% are high school graduates compared with 82% in Texas and 86% nationally.¹⁵ Forty-five percent of the population aged 18–64 years lacked health insurance in 2014, and more than one third are ineligible for state or federal health assistance programs.^{16,17}

Adverse social determinants in the RGV perpetuate poor health outcomes in the predominantly Hispanic

population. Twenty-eight percent report poor/fair health, compared with 18% in Texas and 10% nationally.¹⁸ A total of 45% of the population is obese (BMI ≥ 30) compared with 35% nationally.¹⁴ In 2012, the population that had diabetes comprised 22%—higher than state (16%) and national (14%) prevalence—and 15% of them reported diabetes control, compared with 19% statewide and nationally.^{14,19} These trends are exacerbated in low-income residents: A recent sample of 350 low-income RGV county health clinic patients (average age 39 years, 99.7% Hispanic) revealed 60% reporting fair or poor health, 57% obese, and 30% overweight.²⁰

In response to the region’s growing healthcare needs, the UTRGV GPM/PH residency was established and accredited in April 2015, with the first class of residents matriculating July 2017. The residency is a 2-year GME program preparing residents for board certifications in both PM and Lifestyle Medicine (LM; a certifying exam offered by the American Board of Lifestyle Medicine).²¹

COMMUNITY-ENGAGED LIFESTYLE MEDICINE RATIONALE AND FRAMEWORK

To develop the CELM training approach as a novel GPM/PH training model promoting health equity, UTRGV PM program faculty engaged in a 2-year process (2015–2017). This process included literature review, expert consultation, focus groups and panel discussions, review of published reports on PM and primary care residency curricula, community-based focus groups, and local and regional workshops.²² The authors define CELM as the practice of preventing chronic disease and promoting healthy lifestyle behaviors via collaborative, multistakeholder, and community-engaged delivery of LM in diverse, low-income populations.

Recognized by the American College of Preventive Medicine, LM involves the use of evidence-based lifestyle therapeutic approaches, such as nutrition, physical activity, tobacco cessation, stress management, and other non-drug modalities, to prevent, treat, and reverse lifestyle-related chronic disease.²³ Competencies of LM are presented in [Appendix Figure 1](#) (available online).²⁴ Although proven to reduce and prevent lifestyle-based risk of chronic disease, LM could inadvertently widen health disparities if less accessible populations at highest risk of chronic disease are not reached in lieu of the “worried well.”^{25,26} This phenomenon is apparent in past public health efforts targeting lifestyle risk factors for cardiovascular disease prevention, where high-income groups experienced the largest reductions in mean serum cholesterol, education- and income-related disparities worsened for smoking, and diabetes prevalence increased the most in lowest-income groups.^{26–28}

Participatory principles of community engagement (CE) can extend the health benefits of LM interventions to vulnerable populations.^{29,30} CE, an intervention structure along the community-based participatory research spectrum, refers to stakeholder partnership and involvement along all stages of health interventions. Interventions support creation of culturally tailored programs and build capacity, buy-in, sustainability, and motivation for health in communities.³¹ CE-based interventions show theoretic and practical value in achieving improved health outcomes in underserved settings.^{32,33}

To promote health equity, CELM emphasizes community-clinic linkages and facilitates processes including multilevel approaches, patient-centered care, cultural responsiveness, care coordination, and intersectoral partnerships, in the promotion of lifestyle change. Multilevel approaches involving the individual, peer/family group, healthcare team, neighborhood resources, and cultural context in clinical and lay settings reinforce healthy “default” contexts for behavior change in vulnerable groups.^{34,35} Patient-centered care allows providers to “partner with patients and their families to enable them to become active participants in their own care and receive services designed to focus on their individual needs and preferences.”³⁶ Culturally responsive care is the ability to “interact effectively with people from different cultures, languages and backgrounds, built on a set of attitudes, skills behaviors, and policies enabling healthcare providers to deliver services that are respectful of and responsive to the health beliefs, practices, and cultural needs of diverse patients.”³⁷ Coordinated care enables team members to carry out defined roles and share expertise, allowing providers to better address barriers influencing health behaviors of vulnerable groups and reducing physician burnout associated with nonclinical job demands.³⁵ In lay and clinical settings, CELM activities operate through intersectoral partnerships, (e.g., coordination of clinical services with participation and resources drawn from social, political, environmental, and economic sectors). Each approach above is recognized as a pathway for health equity, by potentially extending health benefits outside the health system and ameliorating contextual health barriers in underserved settings.³⁸

The CELM objectives modify the ACGME GPM/PH competencies and milestones (link available in [Appendix Figure 2](#), available online) to incorporate LM core competencies and processes of health equity and

^{T1} CE.^{24,39} CELM objectives ([Table 1](#)) are grouped into “Three E’s”: Engagement, Education, and Evaluation/Assessment. They are intended to align with ACGME GPM/PH program requirements and prepare residents to independently deliver preventive lifestyle interventions

via evidence-based and collaborative approaches associated with health equity.

COMMUNITY-ENGAGED LIFESTYLE MEDICINE EXPERIENCES

The UTRGV GPM/PH program implements the CELM framework through clinical activities, didactic training, research, and teaching.

Clinical Activities

Residents provide direct patient care inside and out of the healthcare system to build practical competency in lifestyle-based primary, secondary, and tertiary disease prevention ([Tables 2 and 3](#)). Inside the healthcare setting, ^{T2} residents participate in the Lifestyle Consult. Residents ^{T3} work individually with chronic disease patients at a free clinic to conduct LM health risk assessments, improve health literacy, target specific lifestyle risk factors through Health Action Plans, and build self-efficacy for improved nutrition, physical activity, and emotional health. Residents also lead shared medical appointments and peer sessions (Social Linkages for Health), in order to address social factors influencing health behaviors. Outside the clinical setting (Health Outside the Hospital), residents create and reinforce partnerships with non-clinical stakeholders and the interdisciplinary team, which includes a staff *promotora* (community health worker); physician assistant; and social worker. Residents co-lead LM community workshops in nonclinical settings, and conduct home visits of selected patients with a *promotora*. Finally, residents work with nutritionists in grocery stores to engage patients in selecting healthy foods reflecting individual budget and tastes. Residents also contribute to quality/process evaluation, set-up, and ongoing improvement of clinical care activities (Quality Improvement and Assessment). Such partnerships enable residents to gain self-efficacy in creating, implementing, and measuring multilevel systems for lifestyle change.

Didactic Training

Residents complete a Master of Public Health (Epidemiology) during training. The coursework provides a solid foundation of essential public health and PM topics and enables residents to conduct needs assessments, analyses, and evaluation plans within CELM projects.

The initial 10-week Orientation and Experiential Learning experience introduces residents to practical and didactic aspects of CELM. Residents complete the American College of Lifestyle Medicine Core Competencies Curriculum⁴⁰ and instruction in CE research, and work with a PM faculty and community mentor to

Table 1. Three E's: Community-Engaged Lifestyle Medicine Objectives in the UTRGV GPM/PH Program^a

Component	Objective
Engagement	
Patient-centered care	Deliver clinical care integrated with evidence-based preventive and lifestyle medicine services, by applying patient-centered approaches (e.g., shared decision-making) in vulnerable individuals and groups to encourage healthy lifestyle and behavior
Intersectoral network creation	Understand the role of intersectoral and multilevel partnerships in promoting the wellness of vulnerable populations; identify relevant clinical, academic, public health, and non-clinical stakeholders influencing health behaviors; facilitate information-sharing and partnerships between stakeholders to promote systems-level improvements in vulnerable settings
Collaborative prioritization	Conduct needs assessments in a vulnerable population using processes that involve multiple stakeholders; guide creation of a shared health agenda that reflects community and cultural priorities in addition to objective, measurable criteria such as epidemiologic impact and cost-effectiveness
Participatory involvement	Design and implement lifestyle-based interventions tailored to culture and context, by adopting participatory processes that involve stakeholders in needs assessment, program delivery and design, and reporting of results
Capacity-building and sustainability	Identify and facilitate processes for sustainability and capacity-building, such as involving stakeholders in resource identification and allocation, collaborative grant writing, training of lay staff, establishing infrastructure for communication, and advisory board oversight
Education	
Dissemination of information	Clearly communicate information in written and oral formats, including epidemiology of modifiable risk factors, level of health risk, rationale for behavior change, lifestyle recommendations, and program results, to professional and lay stakeholder groups using empathetic, culturally sensitive approaches
Counseling in vulnerable populations	Apply tailored and motivational techniques in individual and group settings to increase health literacy, knowledge, and self-efficacy for healthy behavior and lifestyle
Curriculum leadership and teaching	Lead design and dissemination of educational curricula and modules in undergraduate, graduate, and interprofessional medical education, with the objective of increasing awareness and competency in skills of health promotion/lifestyle-based counseling for vulnerable populations
Training of lay staff	Promote evidence-based understanding of topics such as chronic disease physiology, social determinants of health, healthy lifestyle behaviors, and culturally responsive care approaches, by training lay stakeholders such as community workers, peer educators, and non-clinical stakeholders involved in health interventions
Evaluation/Assessment	
Clinical risk	Assess an individual's disease risk using clinical, contextual, and public health knowledge, characterize attributable risk from sociodemographic, modifiable, and behavioral risk factors
Epidemiology	Characterize the health of an underserved or vulnerable community through qualitative and quantitative methods and systematic literature reviews; appropriately design and conduct an epidemiologic study addressing a targeted objective relevant to local context and culture
Culture	Identify ethnic, cultural, and social factors underlying health priorities and incorporate such factors into tailored health interventions; assess and help facilitate cultural responsiveness of healthcare settings and resources
Resources	Describe organizational structure and existing community resources surrounding a specific health issue; identify human and financial resources needed to address issue
Regulatory landscape	Identify and evaluate policy landscape, including presence of laws and regulations relevant to health need and extent of effectiveness
Logical integration	Develop and implement intersectoral health interventions using process mapping tools such as logic models, to integrate available resources and community preferences to achieve desired health outcomes
Program evaluation	Evaluate quality, accessibility, and effectiveness of a specific health intervention on individuals and populations by selecting and applying appropriate statistical analysis, including database programming, process analysis, computational, and geographical methods
Comparative analysis	Conduct systematic literature review to evaluate effectiveness of various approaches to health promotion and prevention; identify common themes and "best practices" predictive of desired health outcomes
Health informatics	Measure effectiveness of health interventions by analyzing electronic records and data

^aDeveloped over a 2-year period through stakeholder consultation, community focus groups, and curricular review. UTRGV, University of Texas Rio Grande Valley; GPM/PH, General Preventive Medicine and Public Health

Table 2. Components and Activities of the Lifestyle Medicine Clinic

Component	Key activities
Lifestyle medicine consult	<ul style="list-style-type: none"> • Lifestyle consult in primary care clinic for patient with key CD risk factors • Patient and PM physician develop Health Action Plan and tailored schedule of follow-up (in clinic, home, grocery store and neighborhood sites) • Plan communicated back to PCP • Bi-monthly team case reviews to troubleshoot patient needs and barriers
Social linkages for health	<ul style="list-style-type: none"> • Clinic patients enrolled in group visits to create peer linkages and reinforce motivation for behavior change • Groups led by interdisciplinary team, including PM physician; cover CD curriculum such as nutrition, physical activity, and mental health • Bi-directional learning: PM faculty and residents train team members in LM, PM, and community-engagement principles; learn from team members about community-specific topics
Quality improvement and assessment	<ul style="list-style-type: none"> • Conduct quality improvement studies to assess fidelity of clinical services to culturally responsive and community engaged process, identify areas for improvement and value-building strategy • Measure outcomes and value associated with preventive services and PMC activities • Identify opportunities for improving patient care and workflow, billing/coding • Identify areas to minimize staff burnout • Disseminate findings to clinic personnel • Implement tracking processes to measure savings and improved health
Health outside the hospital	<ul style="list-style-type: none"> • Home and community visits to reach higher-risk patients • Connect patients with nutrition consults in local grocery store; patients access personalized nutrition consultation and guidance tailored to weekly budget, health needs, and preferences • Participate in town halls, local conferences, and community workshops on LM topics at partner community sites, including schools and public health departments

CD, chronic disease; HbA1c, hemoglobin A1c; LM, lifestyle medicine; PCP, primary care physician; PM, preventive medicine; PMC, preventive medicine consultancy.

develop an individualized learning plan identifying strengths and career goals. Resident engagement occurs via training, site visits, and structured networking opportunities with diverse community stakeholders and local public health leaders. The Orientation and Experiential

Learning immerses residents in the unique, local border health culture, history, and context, with field experiences covering issues such as influences of policy and power struggles on current border health dynamics. Residents visit *colonias* (unincorporated border settle-

Table 3. Intended Outcomes of the Lifestyle Medicine Clinic

Category	Intended outcomes
Primary prevention	<ul style="list-style-type: none"> • Improve health literacy scores • Improve behaviors affecting CD outcomes (nutrition, stress management, activity, sleep) • Improve self-rated health and self-efficacy for healthy behaviors
Secondary and tertiary prevention	<ul style="list-style-type: none"> • Improve CD health outcomes (blood pressure, cholesterol, HbA1c %) • Improve severity of depression, anxiety • Reduce preventable hospitalizations • Increase self-efficacy and motivation for CD control and healthy lifestyle • Improve comorbidities and risk factors affecting CD outcomes (BMI, WHR, tobacco and alcohol dependence, depression/anxiety scores, nutrition, activity)
Capacity building and advocacy	<ul style="list-style-type: none"> • Increase employment and training opportunities for <i>promotoras</i> and staff • Increase participation of social and community stakeholders in clinical care • Reduce environmental barriers to health and to healthcare access • Create peer linkages for health behavior change • Increase communication and expand networks linking hospital, university, and community resources • Participate in and create advocacy opportunities for vulnerable groups
Quality improvement	<ul style="list-style-type: none"> • Increase cultural responsiveness and reduced cultural/communication barriers in the healthcare setting • Identify “best practices” of PM clinic activities • Increase frequency of tailored lifestyle counseling in vulnerable groups • Increase adoption of LM and PM practice guidelines by clinic staff • Decrease provider burnout and increased provider self-efficacy for care of vulnerable populations

CD, chronic disease; HbA1c, hemoglobin A1c; LM, lifestyle medicine; PM, preventive medicine; WHR, waist-hip ratio.

ments often lacking in infrastructure and public utilities, such as sewage and electricity); experience the philosophies of *curandarismo* (folk healing); and build networks with *promotoras* and other health professions. These experiences enable residents to identify relevant CELM project ideas and build meaningful community relationships.

Didactic conferences and journal clubs occur throughout the year. The residency developed a state and national network of LM/PM educators and practitioners, enabling speakers across the country to virtually lead conferences. PM faculty and residents also lead didactic sessions for partner educational institutions. Shared didactics enable residents to discuss how LM and PM is practiced in multiple settings, troubleshoot challenges, and identify best practices.

Intersectoral Immersion Experiences

Residents spend 5 months working with the public health stakeholder through rotations at state and local public health departments. Residents complete policy analyses, assess surveillance data, and participate in statewide campaigns promoting lifestyle management of disease.

The insurance organization, a key stakeholder influencing healthcare delivery, health equity, and sustainability of health care, is another intersectoral partner. Residents rotate at Humana Government Business, Inc., a managed care support contractor. Two PM faculty mentor residents through health informatics projects, including analysis of large-scale community health data and assessment of cost, value, and funding streams of preventive health policies. This experience, co-taught locally and in San Antonio, strengthens practical skills in policy analysis and quality, and supports a systems-level approach to community health improvement. Residents learn to evaluate best practices of preventive and lifestyle interventions in a defined population, understand the structure of managed care administration, and quantify value added by CE approaches.

Research in Action

The CE Research Project enables residents to translate didactic skills via participatory approaches into actionable steps addressing health disparities. Residents collaboratively design, deliver, and evaluate a health intervention based on a locally relevant need. Resident projects must incorporate at least one component promoting sustainability and community capacity. Example components include local community-based task forces, training lay workers in new and specific skills, or engaging in collaborative grant writing to secure funds. Over time, collective impact and continuation of research projects can generate meaningful benefits to the

local community in areas of health promotion and environmental change.

Residents as Educators

An innovative component of the UTRGV PM program is the development of residents as educators and leaders. Through partnerships, PM residents play an active teaching role in the allied health professions, undergraduate, and GME. PM residents engage first- and second-year medical students in LM topics via problem-based learning and group lecture formats. Residents also can teach a diabetes prevention class to local high school and undergraduate students. Finally, PM residents co-learn and lead interactive lectures with partner GME programs and other allied health professions (Social Work, Dietetics, Public Health). These avenues provide enriching LM-based multispecialty and interprofessional interactions and experiences across residency programs.

The UTRGV PM program also leads *promotora* partnership and education efforts. *Promotoras* travel regularly to homes and build patient trust, representing a vital link promoting health literacy and buy-in for lifestyle change. PM residents lead monthly workshops with *promotoras* and nurse case workers to spread awareness on lifestyle-based techniques shown to benefit diabetes, obesity, and women's health. Reflecting the CELM aim of building health "outside the hospital," these educational sessions are held in both clinical and community settings, such as grocery stores and local high schools.

The UTRGV PM residency also offers two medical student electives: Wellness and Resilience, and CELM Clinical Skills and Research. Through the Wellness rotation, PM residents and faculty engage with medical students to increase personal wellness practices, self-efficacy, competency for emotional health, and burnout prevention. Through the CELM rotation, PM residents and faculty work with medical students on CELM research projects and involve medical students in the LM clinical consult model.

YEAR 1 PROGRAM EVALUATION

The program's evaluation plan reflects the goal of CE to "enhance a community's ability to address its own health needs and health disparities issues while ensuring that researchers understand community priorities."⁴¹ Figure 1 illustrates CELM inputs (Three E's); continuous process measures; and intended outcomes (short, medium-term, long-term) leading to ultimate goals of health and health equity. A 10-year evaluation timeline is shown in Appendix Figure 3 (available online). Ongoing evaluation includes annual process evaluation, community reporting,

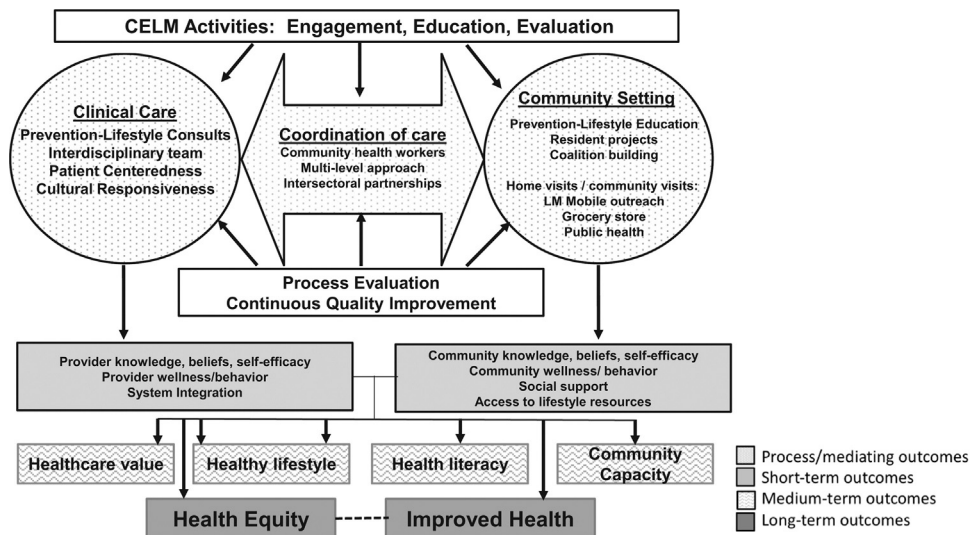


Figure 1. Model for Community-Engaged Lifestyle Medicine (CELM).

resident assessment, and stakeholder meetings, all of which enable iterative program changes and expansion.

Year 1 evaluation is presented in [Table 4](#). Process questions were identified, and analysis conducted by two authors in December 2017. Resident activity logs, calendar logs, meeting minutes, job postings, program memoranda of understanding, and individual stakeholder communication informed process data. The program demonstrated fidelity to CE principles: incorporating mechanisms to engage multiple stakeholders; building multilevel, intersectoral approaches; and reaching an uninsured, vulnerable population in high-risk ZIP codes. Specific capacity-building mechanisms occurred through resident community projects, LM training, acquiring grant funding to create new LM *promotora* positions, and the joint establishment of an LM clinic in a local center. Beginning August 2017, residents engaged in frequent (more than once per month) opportunities to serve as educators in community and clinical settings, and projects reflect CELM principles.

Competency mapping was conducted in 2017 to assess the CELM model's feasibility within an ACGME-accredited GPM/PH program, and fidelity to LM competencies and health equity goals. Each activity (described in the section above and [Table 2](#)) was linked to associated CELM objectives, CE principles, LM competencies, and ACGME GPM/PH competencies. Each curricular activity was also associated with previously mentioned pathways of health equity (cultural responsiveness, patient-centeredness, coordination of care, multilevel and intersectoral approaches, health literacy, and addressing environmental barriers). Results, presented in [Appendix Table 1](#) (available online), indicated that

CELM activities mapped to all health equity and CE processes. Moreover, each activity mapped to objectives in each of the three CELM categories (Education, Engagement, Evaluation) and covered the entire spectrum of LM and ACGME GPM/PH competencies.

CONCLUSIONS

Health disparities in lifestyle-preventable diseases and risk factors undermine not only the sustainability and mission of healthcare systems, but also our nation's welfare. GME can, and must, help turn the tide of health inequity by training the next generation of physicians to promote health in vulnerable populations. This paper describes the theoretic framework and activities of CELM, which seeks to build health equity by training physicians in participatory LM. The authors show that the CELM model applies theoretically sound approaches to address certain causes of health disparities and trains residents in American College of Lifestyle Medicine core competencies as well as competencies required by ACGME (GPM/PH). A first-year process analysis indicates that the program's clinical, research, and community-based activities align with CE principles, and incorporate multilevel, intersectoral, and culturally tailored mechanisms to build health equity.

Developing a health equity framework in resident education is the first step to improving population health outcomes. The next step is linking theory to intended outcomes, necessitating an iterative and multilevel evaluation process. Subsequent analysis of outcomes in Years 3–10 will apply the RE-AIM (Reach, Efficacy,

Table 4. Year 1 Process Goals and Outcomes for UTRGV GPM/PH CELM Implementation

CELM health equity goal	Process question	Process measures/Goals (Year 1)	Process outcomes (Year 1)
LM reaches those at greatest risk of chronic disease	Is the population served representative of known vulnerable groups in the RGV?	Location characteristics of ongoing LM delivery; Number of patients seen; baseline conditions and demographics; ZIP codes served; number completing program	LM clinic established at local indigent clinic in August 2017 (90% diabetes, 100% uninsured); 46 clinic-based LM encounters since August 2017; 153 non-clinic based LM participants; 4 mobile LM outreach sessions held at local <i>colonias</i> ^a and other rural locations in 4 high-risk ZIP codes; 1 patient completed program (at goal HbA1c%)
Apply multi-level process to target health equity	Do current processes demonstrate a multi-level approach?	Number of hours of interventions held at each level of health ecosystem (individual, family, neighborhood)	180 hours of LM consult (individual); 8 hours' group sessions held (family/peer); 25 hours of sessions in community (e.g., grocery store [neighborhood])
Apply intersectoral process to target health equity	Do partnerships connect distinct sectors (intersectoral)?	Number of partners within each sector and number of activities connecting each sector	Public and private partners within each of three sectors (social, economic, health care) were connected, including 4 environmental (grocery store, insurance, schools, public health department); 3 healthcare sector (clinic, UME, GME); 3 social (coalitions, state Medicaid programs, community resource centers)
Build capacity	What distinct approaches are in place to remove barriers to care and health for vulnerable groups?	System established to identify top patient barriers from community; interventions established to address top barriers	Financial, transportation, and logistics identified as top barriers; addressed through free LM Mobile clinic bringing ongoing LM services to underserved settings; began monthly <i>promotora</i> ^b and layworker training for logistical support; created/currently hiring 5 new <i>promotora</i> positions within GPM/PH department; partnered with local coalition for diabetes prevention (<i>Unidos Contra La Diabetes</i> ^c)
Apply community-engagement techniques	Are multiple stakeholders involved in program design, delivery, implementation, and reporting?	Task force presence; number of stakeholder groups involved; number of intervention stages that include non-medical stakeholders; description of community role	Community-academic partnership established; > 4 stakeholder categories involved in designing LM consult; community stakeholders involved 3 stages of research (design, data collection, delivery); patient engagement as peer leaders; clinic staff trained in data collection and intake
Improve coordination of care	Is care effectively coordinated in the clinical team?	Mechanisms established to communicate patient needs between clinical providers	Established LM messaging system between primary provider and LM consultant; began case reviews to discuss complex patients
Deliver patient- and community-centered care	Does care delivered to population represent community priorities, culture preferences?	Needs assessment initiated; percentage of staff acquiring skills training; patient satisfaction surveys at completion of program	2 state- and regional-level stakeholder meetings, 2 clinic focus groups/5 community focus groups including local Hispanic leaders; 100% staff trained in motivational interviewing; community-wide training held on cultural responsiveness
Create system to track and report outcomes and quality measures	Does the program track key measures of health, behavior, and well-being?	Metrics and process established and for measuring outcomes of LM clinic program component	Timeline for evaluation completed; submitted IRB; identified outcome metrics in two areas (diabetes and women's health), including anthropometric, biologic, and behavioral; bloodwork, survey intake and interview completed at start of program
Engage residents as educators and practitioners of LM in clinical and community setting	Do residents have opportunity to share/learn LM skills with other healthcare professionals, students, <i>promotoras</i> ?	Number of sessions delivered by residents; types of learners reached, number of sessions in clinical and community setting; subjects of topics taught	24 sessions delivered by residents (5 in community setting) since July 2017 with high participant satisfaction; categories of learners include patients, medical students, undergraduate students; residents, <i>promotoras</i> , and behavioral health

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Table 4. Year 1 Process Goals and Outcomes for UTRGV GPM/PH CELM Implementation (*continued*)

CELM health equity goal	Process question	Process measures/Goals (Year 1)	Process outcomes (Year 1)
Resident research applies CELM to address a community health need	Do resident projects involve community stakeholders and include mechanisms to build capacity?	Description of need addressed by resident project; number of stakeholders involved in research; description of community capacity mechanism	Projects address (1) suboptimal health of pregnant and postpartum women and (2) logistical barriers preventing retention and participation in community programs; 3 stakeholders involved; capacity mechanisms are ongoing, but include development of online curriculum, training, and creation of new triage system

^a*colonias*: rural, unincorporated border areas often lacking basic facilities (sewage, electricity) and services.

^b*promotoras*: community health workers.

^c*Unidos Contra La Diabetes*: United Against Diabetes.

CEL, Community-Engaged Lifestyle Medicine; GPM/PH, General Preventive Medicine/Public Health; GME, Graduate Medical Education; HbA1c, hemoglobin A1c; LM, Lifestyle Medicine; RGV, Rio Grande Valley; UME, Undergraduate Medical Education; UTRGV, University of Texas Rio Grande Valley, a tri-campus institution in the counties of Hidalgo and Cameron.

Adoption, Implementation, Maintenance) framework at various sites to assess impact on longer-term goals, identify best practices for health promotion from the perspective of multiple stakeholders, including residents, and quantify the practical impact of curricular innovation.⁴²

CEL, activities are described in the context of the RGV. However, other GME programs can translate CELM themes of education, engagement, and evaluation to increase resident skill in addressing health disparities. Programs can enhance didactic and experiential training in LM, determinants of equity and disparity, cultural responsiveness, motivational interviewing, and other CE processes. External stakeholders, including grocery stores, public health departments, and insurance organizations, can serve as partners and sponsor resident research opportunities that address multiple levels of the social and healthcare ecosystem. Finally, programs can orient clinical activities through the health equity lens by integrating local community resources with clinical practice (taking health outside the hospital), training residents to conduct lifestyle risk assessments in individuals, groups, and community settings.

In line with CE principles, achieving outcomes of health equity must ultimately extend beyond a single GPM/PH program's efforts. A limitation of the CELM framework is its inability to target power dynamics and structural discrimination perpetuating health disparities. Sustainable partnerships boosting capacity of GPM/PH programs at the national, regional, and local level are needed, engaging stakeholders to address upstream causes of poverty, and increasing grassroots community momentum and ownership of health-building programs. Nevertheless, systemic transformation can begin via innovation in medical education: translating theoretically effective CELM mechanisms in

residency programs to build equitable and efficacious pathways for health.

ACKNOWLEDGMENTS

The authors wish to acknowledge the following individuals and groups for their input, feedback, and partnership in developing the Community-Engaged Lifestyle Medicine model and enabling the creation of the manuscript: Kathleen Carter and Stephanie Sharpe, Aaronson Library, University of Texas Rio Grande Valley School of Medicine; Eduardo "Eddie" Olivarez, Chief Academic Officer, Hidalgo County Department of Public Health; Robert Nelson, MD, Chair, Department of Pediatrics and Preventive Medicine; and Belinda Reininger, DrPH, Interim Chair of the Department of Population Health and Behavioral Sciences, University of Texas Rio Grande Valley and Professor.

Author contributors are as follows: Janani Krishnaswami, MD MPH, documented all aspects of the model and evaluation and wrote the manuscript. Raymond A. Howard, MBA, MPH, assisted in the evaluation framework development and process evaluation. Paresh A. Jaini, MSIV, contributed to the revision and reorganization of manuscript content. Suad Ghaddar, PhD, conducted the analysis on health disparities and context of the Rio Grande Valley.

The conceptual development, framework, and activities of Community-Engaged Lifestyle Medicine were presented at the Southern Group on Educational Affairs Conference, April 2016, and the American College of Lifestyle Medicine Annual Conference, October 2017.

No financial disclosures were reported by the authors of this paper. This study received no independent sources of support (grants, equipment, etc.).

SUPPLEMENTAL MATERIAL

Supplemental materials associated with this article can be found in the online version at <https://doi.org/10.1016/j.amepre.2018.04.012>.

REFERENCES

- Hasnain M, Massengale L, Dykens A, Figueroa E. Health disparities training in residency programs in the United States. *Fam Med*. 2014;46(3):186–191.
- Mokdad AH, Marks JS, Stroup DF, Geberding JL. Actual causes of death in the United States, 2000. *JAMA*. 2004;291(10):1238–1245. <https://doi.org/10.1001/jama.291.10.1238>.
- National Academies of Sciences, Engineering, and Medicine. *A Framework for Educating Health Professionals to Address the Social Determinants of Health*. Washington, DC: The National Academies Press, 2016.
- Committee on Educating Public Health Professionals for the 21st Century. Institute of Medicine. Who Will Keep the Public Healthy? In: Gebbie K, Rosenstock L, Hernandez LM, eds. *Educating Public Health Professionals for the 21st Century*. Washington, DC: National Academies Press, 2003.
- Association of American Medical Colleges. *Addressing Racial Disparities in Health Care: A Targeted Action Plan for Academic Medical Centers*. Washington, DC: Association of American Medical Colleges, 2009.
- Betancourt JR. Eliminating racial and ethnic disparities in health care: what is the role of academic medicine? *Acad Med*. 2006;81(9):654–665. <https://doi.org/10.1097/00001888-200609000-00004>.
- Institute of Medicine. *Health Professions Education: A Bridge to Quality*. Washington, DC: National Academy Press; 2002.
- Braveman P. What are health disparities and health equity? We need to be clear. *Public Health Rep*. 2014;129(S2):5–8. <https://doi.org/10.1177/00333549141291S203>.
- Ducatman AM, Vanderploeg JM, Johnson M, et al. Residency training in preventive medicine: challenges and opportunities. *Am J Prev Med*. 2005;28(4):403–412. <https://doi.org/10.1016/j.amepre.2005.01.014>.
- Kaprielian VS, Silberberg M, McDonald MA, et al. Teaching population health: A competency map approach to education. *Acad Med*. 2013;88(4):626–637. <https://doi.org/10.1097/ACM.0b013e31828acf27>.
- Gregg J, Solotaroff R, Amann T, Michael Y, Bowen J. Health and disease in context: a community-based social medicine curriculum. *Acad Med*. 2008;83(1):14–19.
- Hill L, Patrick K, Avila P. Training physicians to care for the underserved: preventive medicine residency-community health center linkages. *Am J Prev Med*. 1996;12(3):156–160. [https://doi.org/10.1016/S0749-3797\(18\)30335-0](https://doi.org/10.1016/S0749-3797(18)30335-0).
- U.S. Census Bureau. Population Division. 2015 Annual Estimates of the Resident Population.
- Institute for Health Metrics and Evaluation (IHME). *U.S. County Profiles*. Seattle, WA: IHME; 2015.
- U.S. Census Bureau. *American Community Survey 5-year estimates*. 2010–2014. www.census.gov/programs-surveys/acs/.
- U.S. Census Bureau. *Small Area Health Insurance Estimates*. 2014. www.census.gov/programs-surveys/sahie.html.
- Health Resources and Services Administration, Bureau of Health Workforce. *Area Health Resource Files, 2015–2016*. Rockville, MD: HHS, 2015.
- Centers for Disease Control and Prevention (CDC). National Center for Health Statistics. *Health Indicators Warehouse*. 2006–2012 BRFSS data.
- Fisher-Hoch SP, Vatcheva KP, Rahbar MH, McCormick JB. Undiagnosed diabetes and pre-diabetes in health disparities. *PLoS One*. 2015;10(7):e0133135. <https://doi.org/10.1371/journal.pone.0133135>.
- Ghaddar S. Operation Lone Star 2015: Summary Report. *South Texas Border Health Disparities Center, University of Texas Rio Grande Valley*. 2015.
- Become a Certified Diplomate of the American Board of Lifestyle Medicine. American Board of Lifestyle Medicine website. <https://ablm.col/>. Accessed November 2017.
- Krishnaswami J. Toward better health in the Rio Grande Valley: Community Engaged Lifestyle Medicine in the UTRGV Preventive Medicine Residency Program. UTRGV Preventive Medicine White Paper. *University of Texas Rio Grande Valley*. July 2017.
- What is Lifestyle Medicine. American College of Lifestyle Medicine website. www.lifestylemedicine.org. Accessed July 2017.
- Lianov L, Johnson M. Physician competencies for prescribing lifestyle medicine. *JAMA*. 2010;304(2):202–203. <https://doi.org/10.1001/jama.2010.903>.
- Riley R, Coghill N, Montgomery A, Feder G, Horwood J. Experience of patients and healthcare professionals of NHS cardiovascular health checks: a qualitative study. *J Public Health*. 2016;38(3):543–551. <https://doi.org/10.1093/pubmed/fdv121>.
- Capewell S, Graham H. Will cardiovascular disease prevention widen health inequalities? *PLoS Med*. 2010;7(8):e1000320. <https://doi.org/10.1371/journal.pmed.1000320>.
- Kanjilal S, Gregg EW, Cheng YJ, et al. Socioeconomic status and trends in disparities in 4 major risk factors for cardiovascular disease among U.S. adults, 1971–2002. *Arch Intern Med*. 2006;166(21):2348–2355. <https://doi.org/10.1001/archinte.166.21.2348>.
- Oldroyd J, Burns C, Lucas P, Haikerwal A, Waters E. The effectiveness of nutrition interventions on dietary outcomes by relative social disadvantage: a systematic review. *J Epidemiol Comm Health*. 2008;62(7):573–579. <https://doi.org/10.1136/jech.2007.066357>.
- Wallerstein N, Duran B. Community-based participatory research contributions to intervention research: the intersection of science and practice to improve health equity. *Am J Public Health*. 2010;100(S1):S40–S46. <https://doi.org/10.2105/AJPH.2009.184036>.
- Esperat MC, Feng D, Owen DC, Green AE. Transformation for health: a framework for health disparities research. *Nurs Outlook*. 2005;53(3):113–120. <https://doi.org/10.1016/j.outlook.2005.03.003>.
- Minkler M, Wallerstein NB. *Community-Based Participatory Research for Health*. San Francisco: Josey-Bass, 2008.
- Golden SH, Tanjala P, Halbert JP, et al. A community-engaged cardiovascular health disparities research training curriculum: implementation and preliminary outcomes. *Acad Med*. 2014;89(10):1348–1356. <https://doi.org/10.1097/ACM.0000000000000426>.
- Krishnaswami J, Martinson M, Wakimoto P, Anglemeyer A. Community-engaged interventions on diet, activity and weight outcomes in U.S. schools: a systematic review. *Am J Prev Med*. 2012;43(1):81–91. <https://doi.org/10.1016/j.amepre.2012.02.031>.
- Frieden TR. A framework for public health action: the health impact pyramid. *Am J Public Health*. 2010;100(4):590–595. <https://doi.org/10.2105/AJPH.2009.185652>.
- Peek ME, Cargil A, Huang ES. Diabetes health disparities: a systematic review of health care interventions. *Med Car Res Rev*. 2007;64(5 suppl): 10S–156S. <https://doi.org/10.1177/1077558707305409>.
- Agency for Healthcare Research and Quality. *Expanding Patient-Centered Care To Empower Patients and Assist Providers*. Rockville, MD: Agency for Healthcare Research and Quality; 2002.
- Saha SB. Patient centeredness, cultural competence/responsiveness, and healthcare quality. *J Natl Med Assoc*. 2008;100(11):1275–1285. [https://doi.org/10.1016/S0027-9684\(15\)31505-4](https://doi.org/10.1016/S0027-9684(15)31505-4).
- WHO. *Intersectoral Action on Health*. Kobe, Japan: WHO Centre for Health Development, 2011.
- American Council on Graduate Medical Education. ACGME program requirements for Graduate Medical Education in Preventive Medicine. Revised 2016. www.acgme.org/Portals/0/PFAssets/ProgramRequirements/380_preventive_medicine_2017-07-01.pdf?ver=2017-04-27-134836-257. Accessed September 2016.
- American College of Lifestyle Medicine. Lifestyle Medicine Core Competencies Program. www.lifestylemedicine.org/Lifestyle-Medicine-Core-Competencies-Program. Accessed October 2016.
- Ahmed SM, Palermo AS. Community engagement in research: Frameworks for education and peer review. *Am J Public Health*. 2010;100(8):1380–1387. <https://doi.org/10.2105/AJPH.2009.178137>.
- Glasgow RE, Vogt TM, Boles SAM. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. *Am J Public Health*. 1999;89(9):1322–1327. <https://doi.org/10.2105/AJPH.89.9.1322>.