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## MEMORANDUM

**To:** Julio Frenk  
University President

**From:** Tomás A. Salerno  
Chair, Faculty Senate

**Date:** November 1, 2018

A handwritten signature in blue ink, appearing to read 'Tomás A. Salerno'.

**Subject:** Faculty Senate Legislation #2018-18 (B) – Create a Master of Science in Climate and Health (with 4 tracks), Miller School of Medicine in Partnership with Rosenstiel School of Marine and Atmospheric Sciences (RSMAS)

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The Faculty Senate, at its October 31, 2018 meeting, voted unanimously to approve the *amended* proposal to create a Master of Science in Climate and Health (with 4 tracks) degree. The proposed interdisciplinary and cross-school MS in Climate and Health program will be administered by the Department of Public Health Sciences in the Miller School of Medicine and co-directed with the Department of Atmospheric Science in Rosenstiel School of Marine and Atmospheric Science (RSMAS).

*A friendly amendment was accepted to exchange course 371 Psychology with a suitable Graduate-level course.*

The program will include existing courses from a variety of disciplines as well as newly developed courses including three content courses and two courses related to the required thesis. The degree will require successful completion of 36 credit hours which include 21 credit hours of core courses, 9 credit hours of electives, and 6 credit hours of a required master's thesis. Students will be required to choose one of four tracks: 1) Public Health Sciences track; 2) Marine and Atmospheric Science track; 3) Climate and Health—Analytical track; or 4) Toxicology track.

The Faculty Senate does not approve budget concepts, therefore no budget information is included here.

This legislation is now forwarded to you for your action.


TAS/rh

Enclosure

cc: Jeffrey Duerk, Provost and Executive Vice President for Academic Affairs  
Roni Avissar, Dean, RSMAS  
Henri Ford, Dean, Miller School of Medicine  
Guillermo Prado, Dean, Graduate School  
Naresh Kumar, Associate Professor, Miller School of Medicine

CAPSULE: Create a Master of Science in Climate and Health (with 4 tracks), Miller School of Medicine in Partnership with Rosenstiel School of Marine and Atmospheric Sciences (RSMAS)

**PRESIDENT'S RESPONSE**

APPROVED:  DATE: 12/18/18  
(President's Signature)

OFFICE OR INDIVIDUAL TO IMPLEMENT: Dean Henri Ford and Dean Roni Avissar

EFFECTIVE DATE OF LEGISLATION: IMMEDIATELY  
(if other than June 1 next following)

NOT APPROVED AND REFERRED TO: \_\_\_\_\_

REMARKS (IF NOT APPROVED): \_\_\_\_\_



UNIVERSITY OF MIAMI  
MILLER SCHOOL  
of MEDICINE

Naresh Kumar, PhD  
Associate Professor  
1063 Clinical Research Building

Date: October 22, 2018  
Email: nkumar@med.miami.edu  
Tel: (305) 243-4854

Tomás Salerno, Chair  
Faculty Senate  
University of Miami

Reference: Master of Science in Climate and Health (MSCH) program in partnership between Miller School of Medicine and Rosenstiel School of Marine and Atmospheric Sciences (RSMAS).

Dear Professor Salerno,

Thank you for the opportunity to present the MSCH program, referenced above, to the General Welfare Committee (GWC) on October 17, 2018. I am writing you in response to the committee's suggestion to include psychology courses in the MSCH program. We know that climate and extreme weather are linked to psychological disorders. Some of these issues are covered in two of the core courses of the program: a) CPH 601 – Climate and Health course, and b) CPH 607 – Policies and Management of the Health Effects of Climate.

In addition, we have included the following elective courses in the "Public Health Sciences" tract of the program:

- EPH 611 - Mindfulness in Public Health and Medicine
- PSY 371 - Stress Management

Students, who wish to pursue their dissertation in the area of psychology disorder and climate, can benefit from the above courses. The MSCH leadership will discuss and request the instructors of the above courses to consider the possibility of incorporating topics on psychological disorders that stem from exposure to extreme weathers, such as hurricanes, heatwaves and snowstorms, and their management.

The revised MSCH program reflects upon the above modifications as well as the Graduate Council's recommendations of equal faculty representation from Medical School and RSMAS in the administrative committee of the MSCH Program.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'Naresh Kumar', written over a light blue background.

Naresh Kumar



UNIVERSITY OF MIAMI

Proposal Submission Checklist

Proposals are to be submitted to the Office of Assessment and Accreditation (OAA), if applicable, the Graduate Council (for graduate programs excluding Law and Medical), if applicable, and the Faculty Senate. Refer to the Procedures for Program Changes document for information on the approvals and notifications needed for program changes and the Proposal Submissions Specifications document for an explanation of the process and a list of the materials required.

(Please note that change approvals can take 2 semesters to complete.)

Include this checklist at the beginning of each proposal.

(Complete the information below, save the form as a pdf, and insert it with the background materials that are specified, in the order listed, and send the package electronically as noted above.)

KEY CONTACT PERSONNEL INFORMATION

First Name

Naresh

Last Name

Kumar

Proponent's Title

Associate Professor

Department, if applicable

Public Health Sciences

School/College

Miller School of Medicine

E-mail

nkumar@miami.edu

Phone

3052434854

Title of Proposal

Master of Science in Climate and Health (MSCH) in partnership between Miller School of Medicine and Rosenstiel School of Marine and Atmospheric Sciences (RSMAS)

(-continue to next page-)

## MANDATORY MEMORANDA AND FORMAT

*Please check that each item listed below is included in the proposal package of materials, in the ORDER as listed. The applicable title (i.e. Letter of Explanation, Memo from the Dean, etc. ) is to precede each section in the materials.*

Only proposals conforming to this format will be accepted.

### 1. This completed checklist.

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### 2. Letter of explanation. (2-3 pages only, double spaced, 12 pt font)

Yes      No

If no, explain why:

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### 3. A memo from the dean(s) signifying approval of the faculty of the relevant School(s) / Colleges(s).

Yes      No

If no, explain why:

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### 4. A memo that all affected or relevant School / College Council(s) have approved.

Yes      No

If no, explain why:

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**5. A memo from the department chair(s) signifying approval of the faculty of the relevant department(s).**

Yes          No

If no, explain why:

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**6. A memo from the Office of Accreditation and Assessment (OAA) if the proposal involves academic programs (degrees, certificates, majors, minors, concentrations, specializations, tracks, etc.) such as new programs, closing programs, or program changes (such as changes in requirements, program length, modality, name, location).**

*(To be submitted by OAA to the Graduate Council or the Faculty Senate, as appropriate.)*

Applicable          Not applicable.

If not, explain why:

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**7. A memo from the Graduate School Dean signifying approval of the Graduate Council (for graduate programs only).**

*(To be submitted to the Faculty Senate by the Graduate Council.)*

Applicable          Not applicable.

If not, explain why:

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8. Academic Deans Policy Council (ADPC) approval, for interdisciplinary issues and as appropriate. Please consult with the Dean of the Graduate School or the Secretary of the Faculty Senate to check if this is needed.

Yes      No

If no, explain why:

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9. Additional required documents as listed on the "Proposal Submissions Specifications," i.e. market analysis, budget information, assessment of library collections, etc. as specified.

List additional documents included:

The complete proposal, program competencies, list of all faculty members, supporting letter of different stakeholders, business model and career opportunities are also included in the packet.

Please click on the "Save Form" button below to save this form, then e-mail to [facsen@miami.edu](mailto:facsen@miami.edu).  
To print the form, click "Print Form."

Save Form

Print Form

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End form.



UNIVERSITY OF MIAMI  
MILLER SCHOOL  
of MEDICINE

Naresh Kumar, PhD  
Director, Master of Science in Climate and Health  
Department of Public Health Sciences

September 10, 2018

Guillermo J. Prado, Ph.D.  
Dean Graduate School

Reference: Response to Graduate Council's Queries concerning the MSCH program.

Dear Dean Prado,

On behalf of the Miller School of Medicine and RSMAS, I would like to thank the members of the Graduate Council to take time to review the MSCH graduate program proposal and providing us with an opportunity to respond to the council's queries. See below point-by-point responses to each query. The original queries written in verbatim begin with "**GC Query:**" and the response to the query begins with **MSCH response:**

**GC Query:** Will there be any startup funding for this program and where the resources would come from? The Council thought that this could really maximize the success of the program.

**MSCH response: to be discussed:**

- Yes, both schools are committed to invest in this program and will provide substantive support to jump start the program. In the first three years of the program, 50% of the gross tuition revenue will be used to offer 12 half-time fellowships. This will make the program attractive and help in recruitment process (see letter of support from **Deans Ford and Avissar**).
- Moreover, the Department of Public Health Sciences and RSMAS have already committed administrative and logistic support, including admission, advertising and marketing, and President Abraham and now Dean Ford have already committed laboratory space and initial investment to set up the "toxicology laboratory" for the program (see attached LOS).

**GC Query:** There wasn't even representation between RSMAS and Public Health faculty on the leadership committee.

**MSCH response:** Given this is a joint program, the RSMAS and Public Health faculty ratio is 3:4, which is more balanced than the core competencies ratio (2:5) that both schools will provide. However, if the council members still think it is imbalanced, a 2:2 ratio will be assured in the leadership committee.

**GC Query:** No effort was budgeted for the co-director.



MSCH response: Dr. Elliot's efforts will be fully covered by RSMAS for the first three year. As the student enrollment increases, his efforts will gradually become part of the program's cost.

**GC Query:** Timing of course offerings. Courses are offered every other year. What if the students need to take a course in the off year?

MSCH response: All six of the seven courses will be offered every year. However, after the second year all seven core courses will be offered every year. Therefore, there are no gaps in course offerings and it should not affect students who take a year off.

**GC Query:** Rationale of housing the program at the medical school given that it is an interdisciplinary program.

MSCH response: Given this a joint program between Medical School and RSMAS, the program is jointly housed in both schools to assure interdisciplinary learning experience as well as interaction with the interdisciplinary faculty members across both schools. Both curriculum will be synchronized such that students can spend two days on RSMAS campus and three days on Medical campus during the core course work, and they will have the needed classroom, laboratory, advising and administrative support on both campuses.

Kindly let me know should require any further clarification and/or any additional information and/or supporting documents.

Sincerely yours,



Naresh Kumar



UNIVERSITY  
OF MIAMI

September 10, 2018

Guillermo Prado  
Dean, Graduate School

Reference: Master of Science in Climate and Health (MSCH) program in partnership between Miller School of Medicine and Rosenstiel School of Marine and Atmospheric Sciences (RSMAS).

Dear Dean Prado,

As you already know that the Miller School of Medicine and RSMAS have jointly developed the interdisciplinary MSCH program. Both schools are fully committed to the success of this program and will extend the needed resources and logistic support. Miller School has already committed a laboratory space and an initial investment of \$30k for equipment for the lab. In addition, both schools will commit 50% of the tuition revenue to offer 12 half-time scholarships in the first three years of the program. This will make the program attractive and its successful launch. Moreover, both schools have efficient graduate management programs, and will provide administrative and admission support for MSCH program.

Sincerely yours,

Henri R. Ford M.D., M.H.A.  
Dean and Chief Academic Officer  
University of Miami Leonard M. Miller School of Medicine

Sunil Rao  
Chair, Department of Public Health Sciences

Roni Avissar  
Dean, RSMAS



UNIVERSITY OF MIAMI  
MILLER SCHOOL  
of MEDICINE

Naresh Kumar, PhD  
Associate Professor  
1063 Clinical Research Building

Date: July 18, 2018  
Email: [nkumar@med.miami.edu](mailto:nkumar@med.miami.edu)  
Tel: (305) 243-4854

Guillermo Prado,  
Dean, Graduate School  
University of Miami  
Coral Gables, FL 33146

Reference: Master of Science in Climate and Health (MSCH) program in partnership between Miller School of Medicine and Rosenstiel School of Marine and Atmospheric Sciences (RSMAS).

Dear Dean Prado,

Please see attached the full proposal of the interdisciplinary MSCH program that the department of Public Health Sciences has developed in partnership with RSMAS for the consideration of approval by the Graduate Council.

The proposed program has been reviewed and approved by the office Assessment and Accreditation (memo included in the proposal). In addition, the program and its business model have been reviewed and approved by Deans Abraham and Dean Avissar.

The program has already been approved by the Medical School Faculty Council (approval letter attached). Moreover, the program has the university wide support of all stakeholders (see LOS from all Deans and others) and World Meteorological Society.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'Naresh Kumar'.

Naresh Kumar



UNIVERSITY OF MIAMI  
MILLER SCHOOL  
of MEDICINE

Naresh Kumar, PhD  
Director, MSCH Program  
Associate Professor  
1063 Clinical Research Building

Date: July 18, 2018

Email: [nkumar@med.miami.edu](mailto:nkumar@med.miami.edu)  
Tel: (305) 243-4854

Tomás Salerno  
Chair, Faculty Senate  
University of Miami  
Coral Gables, FL 33146

Reference: Master of Science in Climate and Health (MSCH) in partnership between Miller School of Medicine and Rosenstiel School of Marine and Atmospheric Sciences (RSMAS).

Dear Professor Salerno,

As you already know that Climate change, weather and weather anomalies ( $C^2W^2$ ) and their implications for the environment and human health are the most debated and contentious topics of the 21<sup>st</sup> century not only because they affect us all, but also because their relationships with health are intricate due to differential roles of hierarchical variables including individual, household, neighborhood and regional level variables. Therefore, tremendous uncertainty exists in the disease and disability burden associated with  $C^2W^2$ , largely because of the lack of expertise at the intersection of health and climate. A new generation of manpower is needed to address such an uncertainty and guide future policies to manage the health effects of  $C^2W^2$ .

Miller School of Medicine and Rosenstiel School of Marine and Atmospheric Sciences have developed a new interdisciplinary graduate program Master of Science in Climate and Health (MSCH) to prepare future generations of *professionals, research analysts, planners, decision-makers and leaders* who will have a deep understanding of the intricate relationship between human health and  $C^2W^2$ , and ability to decipher and quantify this relationship at multiple scales ranging from intra- and inter-cellular response to heat stress, to individual's susceptibility to community response to region-wide morbidity and mortality burden of  $C^2W^2$ . The MSCH program will have three specific aims:

1. provide students with conceptual, theoretical and applied understanding of the direct and indirect impacts of  $C^2W^2$  on human health. This will also include the impacts of short- and long-term climate and weather changes on health and well-being,
2. train students in understanding, evaluating, and assessing short- and long-term climate and weather changes, and their direct and indirect impact on disease and disability burden across different communities, and
3. prepare students to develop adaptation, mitigation, healthcare and communication strategies in the light of adaptation and infrastructure capacity of different communities to manage the health effects of  $C^2W^2$ .

We have already developed several of the core courses, and our faculty members are already working in several areas related to climate and health including: a) shifting burden of vector-borne disease and climate, b) health effects of heatwaves, c) climate change and building design, d) extreme weather and unintentional injury in occupational and non-occupational settings, e) climate-mediated health effects of air pollution and f) increasing burden of infectious, allergic and immunological disorders and climate changes. This will offer research opportunities to our students in various application areas of climate and health.

We have state of the art laboratories for measurement, modeling, analysis and surveillance of climate, environment and health, and toxicological analyses. Given *Miami is a live laboratory* to learn, understand and examine the health effects of C<sup>2</sup>W<sup>2</sup>, including the recent Zika outbreak and changing patterns of allergy and infectious disease, the MSCH program at the University of Miami will provide students with a unique learning experience by first-hand witnessing the intricate relationship between C<sup>2</sup>W<sup>2</sup> and various health outcomes. The program has potential to bring the University of Miami to the forefront of climate and health training and research, and to partner with the local, national, and international agencies focusing on this area, including the National Institute of Environmental Health Sciences, Environmental Protection Agency, International Panel on Climate Change, the Florida Department of Health and Florida Institute for Health Innovation.

The MSCH graduates will have tremendous career opportunities in the both public and private sectors and academia. The proposed interdisciplinary MSCH that builds on the interdisciplinary expertise of faculty members across colleagues aligns with the University of Miami's mission to "educate and nurture students, to create knowledge, and to provide service to our community and beyond" by training and preparing the future generation of analytics, leaders and decision-makers needed to understand, assess and manage the burden of disease and disability in response to C<sup>2</sup>W<sup>2</sup>. Moreover, this program also aligns with the mission of the University of Miami Department of Public Health Sciences, which is "to enhance the health of the public, reduce the burden of disease, and create health equity among various segments of the population".

The program has the university wide support of all stakeholders (see LOS from all Deans and others) and World Meteorological Society. I sincerely hope that the program draws enthusiastic support of the faculty senate.

Sincerely yours,



Naresh Kumar



**Office of the Dean**

Science and Administrative Building 107  
4600 Rickenbacker Causeway  
Miami, FL 33149-1031  
Phone: 1 305 421-4000  
Fax: 1 305 421-4711  
Web Site: <http://www.rsmas.miami.edu>

15 December 2017

Naresh Kumar, PhD  
Director, MSCH Program  
Department of Public Health Sciences  
Miller School of Medicine  
University of Miami, Miami FL 33136

Reference: Master of Science in Climate and Health (MSCH) graduate program at the University of Miami (U-MSCH).

Dear Dr. Kumar,

We enthusiastically support the Master of Science in Climate and Health program at the University of Miami (U-MSCH) in joint partnership between the Rosenstiel School of Marine and Atmospheric Science (RSMAS) and the Miller School of Medicine. This program builds on strong existing interdisciplinary partnerships and will foster new and dynamic collaboration across all schools here at the University of Miami. The MSCH program presents a unique and exciting opportunity for our students and faculty to assume a strong leadership role in addressing health and climate challenges within our global community. The introduction of the MSCH program will place the University of Miami at the forefront of scientific advancement as climate change and its implications for the environment and human health continue to be one of the most debated and contentious issues of our time. The MSCH program will prepare future generations of professional research analysts, planners, decision-makers, and leaders who will all have a deep understanding of the intrinsic relationship between climate and human health, and the ability to decipher this relationship.

The RSMAS and Miller Schools have both agreed on a viable business model to share costs and revenues between the Department of Public Health Sciences and RSMAS with 5:7 and 2:7 ratios, respectively. With this agreement, both schools highly recommend the launch of the MSCH program.

Handwritten signature of Roni Avissar in blue ink.

Roni Avissar, Ph.D.  
Dean, RSMAS  
University of Miami

Handwritten signature of Edward Abraham in blue ink.

Edward Abraham, M.D.  
Dean, Miller School of Medicine  
University of Miami

Handwritten signature of Sunil Rao in blue ink.

Sunil Rao, PhD  
Chair Department of Public Health Sciences

UNIVERSITY OF MIAMI  
**ROSENSTIEL**  
**SCHOOL of MARINE &**  
**ATMOSPHERIC SCIENCE**



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Phone: 305-421-4930 Email: [dnolan@rsmas.miami.edu](mailto:dnolan@rsmas.miami.edu)

December 15, 2017

Prof. Naresh Kumar  
Director, MSCH Program  
Department of Public Health Services  
Miller School of Medicine  
University of Miami

Dear Dr. Kumar:

I am happy to report that at the faculty meeting in October, our department voted unanimously in support of the MS degree program in Climate and Health. This program builds on strong existing interdisciplinary partnerships across both department and schools. Given interdisciplinary nature of the program, it will likely foster new and dynamic research collaborations across all schools at the University of Miami.

The RSMAS and Miller Schools have both agreed on a viable business model to share costs and revenues between the Department of Public Health Sciences and RSMAS. Our department strongly supports the launch of the MSCH program.

Sincerely,

David S. Nolan  
Professor and Chair  
Department of Atmospheric Sciences  
Rosenstiel School of Marine and Atmospheric Science  
University of Miami

April 18, 2018

Tomas Salerno, M.D.  
Chair, Faculty Senate  
University of Miami  
Ashe Building, Suite #325  
252 Memorial Drive  
Coral Gables, FL 33146

*Re: Council Approved a Proposal for Master of Science in Climate and Health (MSCH) program.*

Dear Dr. Tomas Salerno,

This is to inform the Faculty Senate that the Medical School Faculty Council met on April 10, 2018 to review the Proposal for Master of Science in Climate and Health (MSCH) program.

The council members voted to *approve* the proposal.

Respectfully submitted,



Sanjoy K. Bhattacharya, M. Tech, Ph.D.  
Speaker, Medical Faculty Council





**MEMORANDUM**

**DATE:** July 17, 2018

**TO:** Naresh Kumar, Associate Professor  
Miller School of Medicine

**FROM:** Patty Murphy, Executive Director  
Office of Assessment and Accreditation *PMW*

**RE:** New MS in Climate and Health Program with 4 Tracks

On June 27, 2018, the Miller School of Medicine (MSOM) notified my office of its intent to offer a new Master of Science (MS) degree program in Climate and Health in partnership with the Rosenstiel School of Marine and Atmospheric Science (RSMAS). The proposed MS in Climate and Health program will require successful completion of 36 credit hours which include 21 credit hours of core courses, 9 credit hours of electives, and 6 credit hours of a required master's thesis. Students will be required to choose one of four tracks: 1) Public Health Sciences track; 2) Marine and Atmospheric Science track; 3) Climate and Health--Analytical track; or 4) Toxicology track.

The curriculum will include existing courses on this topic from a variety of disciplines such as Epidemiology and Public Health, Marine and Atmospheric Science, Biostatistics, Microbiology and Immunology, Economics, and Law. New courses will also be developed including three content courses and two courses related to the required thesis.

**Program Curriculum**

- Required Courses for All Tracks (9 graduate courses, 27 credit hours)
  - CPH 601 An Introduction to Climate and Health (existing course: EPH 646)
  - CPH 602 Toxicology and Climate (new interdisciplinary course to be developed from existing disciplines at the University)
  - CPH 603 Introduction to Weather and Climate (existing course: ATM 614)
  - CPH 604 Climate Change (existing course: ATM 653)
  - CPH 605 Climate, Environment and Health: Data Integration and Management (existing course: EPH 727)
  - CPH 606 Analysis of Health Effects of Climate (new interdisciplinary course to be developed from existing disciplines at the University)
  - CPH 607 Policies and Management of the Health Effects of Climate (new interdisciplinary course to be developed from existing disciplines at the University)
  - CPH 680 Thesis Proposal (new course to be developed but not a content-based course)
  - CHP 681 (new course to be developed but not a content-based course)
- Electives (3 graduate courses or 9 credit hours selected from the courses below or others with permission of advisor)

- *Public Health Sciences Track:*
  - ATM 634 Atmospheric Chemistry (existing course)
  - ATM 637/MPO 637/OCE 637 Natural Hazards: Atmosphere and Ocean (existing crosslisted course)
  - BST 630 Longitudinal and Multilevel Data Analysis (existing course)
  - CPH (Number TBD) Independent Climate and Health Topics (new independent study course to be developed in the future per student demand)
  - ECO 645 Regulation Economics (existing course)
  - EPH 612 Global Health (existing course)
  - EPH 639 Ecology and Control of Vector-Borne Diseases (existing course)
  - EPH 640 Urban Environment (existing course)
  - EPH 641 Environmental Health (existing course)
  - EPH 643 Introduction to Occupational Health (existing course)
  - EPH 724 Molecular and Genetic Epidemiology (existing course)
  - Law 213 Environmental Law (existing course)
  - Law 555 Climate Change (existing course)
  - Law 854 Environmental Justice Clinic Practicum (existing course)
- *Marine and Atmospheric Science Track:*
  - ATM 615 Numerical Weather Prediction (existing course)
  - ATM 624 Applied Data Analysis (existing course)
  - ATM 634 Atmospheric Chemistry (existing course)
  - ATM 636 Hurricanes (existing course)
  - ATM 637/MPO 637/OCE 637 Natural Hazards: Atmosphere and Ocean (existing crosslisted course)
  - ATM 654 Climate Variability (existing course)
  - ATM 661 Tropical Atmosphere and Ocean (existing course)
  - ATM 662 Advanced Weather Forecasting (existing course)
  - ATM 731 Air-Sea Interaction (existing course)
  - ATM 732 Climate Dynamics (existing course)
  - ATM 765 General Circulation of the Atmosphere (existing course)
  - CPH (Number TBD) Independent Climate and Health Topics (new independent study course to be developed in the future per student demand)
- *Climate and Health--Analytical Track:*
  - BST 605 Statistical Principles of Clinical Trials (existing course)
  - BST 630 Longitudinal and Multilevel Data Analysis (existing course)
  - BST 650 Topics in Biostatistical Research (existing course)
  - CPH (Number TBD) Independent Climate and Health Topics (new independent study course to be developed in the future per student demand)
  - EPH 703 Advanced Statistical Methods I (existing course)
  - EPH 705 Advanced Statistical Methods II (existing course)
  - EPH 724 Molecular and Genetic Epidemiology (existing course)
  - Law 555 Climate Change (existing course)
- *Toxicology Track:*
  - CPH (Number TBD) Independent Climate and Health Topics (new independent study course to be developed in the future per student demand)
  - HGG 631 Genes in Populations (existing course)
  - MBS 601 Biochemistry for the Biosciences (existing course)
  - MBS 603 Gross Anatomy and Histology (existing course)
  - MBS 604 Advanced Molecular and Cell Biology (existing course)
  - MBS 605 Cell Physiology (existing course)

- MBS 608 Basic Pathobiology (existing course)
- MIC 728 Principles of Immunology (existing course)
- MIC 751 Advanced Topics in Microbiology and Virology (existing course)
- MIC 755 Microbiology and Immunology Research: Career Skills and Proficiencies (existing course)
- MIC 775 Advanced Microbiology and Immunology (existing course)
- PIB 702 Scientific Reasoning (existing course)

Since this is an interdisciplinary program, it is difficult to find a perfect fit in terms of CIP code but in our discussions we determined that the CIP code for the **Public Health Sciences** track will be **51.2202:**

**Environmental Health:**

Definition: A program that focuses on the application of environmental sciences, public health, the biomedical sciences, and environmental toxicology to the study of environmental factors affecting human health, safety, and related ecological issues, and prepares individuals to function as professional environmental health specialists. Includes instruction in epidemiology, biostatistics, toxicology, public policy analysis, public management, risk assessment, communications, environmental law, occupational health and safety emergency response, and applications such as air quality, food protection, radiation protection, solid and hazardous waste management, water quality, soil quality, noise abatement, housing quality, and environmental control of recreational areas.

The **Marine and Atmospheric Science** track will have a different CIP code, **40.0402: Atmospheric Chemistry and Climatology:**

Definition: A program that focuses on the scientific study of atmospheric constituents, reactions, measurement techniques, and processes in predictive, current, and historical contexts. Includes instruction in climate modeling, gases and aerosols, trace gases, aqueous phase chemistry, sinks, transport mechanisms, computer measurement, climate variability, paleoclimatology, climate diagnosis, numerical modeling and data analysis, ionization, recombination, photoemission, and plasma chemistry.

The **Climate and Health--Analytical and Toxicology** tracks will have a different CIP code, **26.1309: Epidemiology:**

Definition: A program that focuses on the scientific study of disease, disability, and trauma patterns within and across populations and the development of health management mechanisms to prevent and control disease outbreaks and injurious behaviors. Includes instruction in biostatistics, biochemistry, molecular biology, immunology, disease and injury determinants, genetic disease and disability factors, behavioral studies, health services research, environmental disease and injury factors, and population studies.

All of these CIP codes are considered STEM areas by the Department of Homeland Security.

The interdisciplinary and cross-school program will be administered by the Department of Public Health Sciences in the MSOM but will be co-directed by faculty from that department and the Department of Atmospheric Science in RSMAS. Faculty from both departments will teach and advise students in the program. Dr. Naresh Kumar will serve as the program director. He is an Associate Professor of Environmental Health and Biostatistics in the Department of Public Health Sciences at MSOM. He has a PhD in Geography from the University of Durham (England). He has fifteen years of research and teaching experience in environmental health. His research focus includes air pollution toxicity, climate mediated health effects of air pollution, and time-space modeling. Dr. Elliot Atlas will serve as the co-director of the program. He is a Professor in Atmospheric Science at RSMAS. He has a PhD in Chemical Oceanography from Oregon State University His research focuses on the sources, transport and transformation of atmospheric trace gases.

The proposed new program does not “represent a significant departure, either in content or method of delivery” from what we are currently approved by SACSCOC to offer due to the following:

- The proposed program meets the SACSCOC requirement of a minimum of 30 credit hours for a graduate program.
- The proposed program will develop new courses and integrate existing courses from a variety of disciplines (public health, atmospheric sciences, environmental law, biostatistics, etc.). Although some new courses will be developed, they will be derived from existing disciplines at the University, so the content area is not new.
- The proposed program will be supported by current qualified faculty.
- The proposed program will be coordinated by qualified faculty: Dr. Naresh Kumar and Dr. Elliot Atlas.
- The University is already approved by SACSCOC to award a Master of Science degree; this is a proposal for a new major within an existing degree.
- The University is currently approved to offer the following graduate programs in related areas:
  - MA in Environmental Science and Policy
  - Master of Professional Science in Climate and Society
  - Master of Public Health
  - MS in Atmospheric Sciences
  - MS in Biochemistry and Molecular Biology
  - MS in Biomedical Sciences
  - MS in Biostatistics
  - MS in Environmental Health and Safety
  - MS in Public Health
  - PhD in Atmospheric Sciences
  - PhD in Biochemistry and Molecular Biology
  - PhD in Biostatistics
  - PhD in Environmental Science and Policy
  - PhD in Epidemiology
  - PhD in Microbiology and Immunology
  - PhD in Prevention Science and Community Health
- The majority of the program will not be offered via distance education and, in any case, the University is approved to offer 100% distance education programs.
- The program will be offered on the University’s Coral Gables, Marine and Medical campuses.
- The graduate program covers the literature in the field through its required core coursework.
- The graduate program ensures ongoing student engagement in research and/or appropriate professional practice and training experiences through a required master’s thesis.

SACSCOC only requires notification of program changes that represent a significant departure from our current programs. Therefore, no notification or approval is required for this change.

Please contact me if you have any questions at [pattymurphy@miami.edu](mailto:pattymurphy@miami.edu) or (305) 284-3276.

CC: Faculty Senate  
Guillermo Prado, Dean of the Graduate School  
Edward Abraham, Dean of the Miller School of Medicine  
Sunil Rao, Chair, Department of Public Health Sciences  
Roni Avissar, Dean of the Rosenstiel School of Marine and Atmospheric Science  
Karen Beckett, University Registrar  
Carrie Glass, Executive Director of Student Financial Assistance and Employment

## Kumar, Naresh

---

**From:** Rundek, Tatjana  
**Sent:** Thursday, March 1, 2018 8:40 AM  
**To:** Kumar, Naresh  
**Cc:** Bhattacharya, Sanjoy K  
**Subject:** Re: Recommendation for approval to the Medical School Council: MSCH Proposal

Dear Dr. Kumar,

Our Legislative Oversight Committee (LOC) Members has carefully reviewed your responses and budget scenarios for your proposal for the Master of Science in Climate and Health (MSCH) graduate program. You have addressed and clarified all of our comments in details. Your budget projections are reasonable and well planned.

I am please to inform you that our LOC enthusiastically recommends this new MS degree in Climate and Health (MSCH) to the Medical School Council for approval.

Your budget analyses present a model for other MS programs that we would like to follow. Would you mind sharing a spreadsheet of an average model (without program name) for us to recommend to other MS program evaluations.

Thank you so very much.

With best wishes,  
Tatjana Rundek, for the Medical School Legislative Oversight Committee

--  
Tatjana Rundek, MD PhD  
Professor of Neurology  
Executive Vice Chair of Research and Faculty Affairs in Neurology  
Director, Clinical Translational Research Division  
Director, MS CTI Program  
Evelyn F. McKnight Brain Institute  
Department of Neurology, Miller School of Medicine  
1120 NW 12th Street, CRB- 1348, Miami, FL 33136  
Tel 305-243-7847  
[Trundek@med.miami.edu](mailto:Trundek@med.miami.edu)

---

**From:** "Kumar, Naresh" <[NKumar@med.miami.edu](mailto:NKumar@med.miami.edu)>  
**Date:** Wednesday, February 28, 2018 at 8:42 AM  
**To:** UM <[trundek@med.miami.edu](mailto:trundek@med.miami.edu)>



Telephone: (305)284-2394  
Fax: (305) 284-3210

**Patricia D. White**  
Dean and Professor of Law  
[pwhite@law.miami.edu](mailto:pwhite@law.miami.edu)

January 9, 2018

Naresh Kumar, PhD  
Director, Master of Science in Climate and Health  
Department of Public Health Sciences  
University of Miami, Miami, FL

Reference: Letter of support for MSCH program.

Dear Naresh,

Thank you for sharing with me the new proposal of Master of Science in Climate and Health that your department is developing in partnership with the Rosenstiel School of Marine and Atmospheric Science. Given that environmental law and health policy are critically important for managing health effects at all levels of governance, I am delighted to see the involvement of several of my colleagues in the proposal, including Tony Alfieri and Natalie Barefoot who run our Environmental Justice clinic and Ileana Porras who teaches International Sustainable Development.

I enthusiastically support this interdisciplinary MSCH program, and look forward to the opportunity of developing a joint degree program in the near future.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'Patricia D. White'.

Patricia D. White  
Dean and Professor of Law

UNIVERSITY OF MIAMI  
COLLEGE of  
ARTS & SCIENCES



Office of the Dean  
1252 Memorial Drive, Suite 227  
Coral Gables, Florida 33146

Phone: 305-284-4117  
Fax: 305-284-5637  
as.miami.edu

March 1, 2018

Naresh Kumar, PhD  
Director, Master of Science in Climate and Health  
Department of Public Health Sciences

Reference: Letter of support for Master of Science in Climate and Health Graduate Program.

Dear Naresh,

I am delighted to learn that the University of Miami is launching a much-needed interdisciplinary Master of Science in Climate and Health (MSCH) graduate program. I have reviewed the proposal whose objective is to train the future generations of leaders and researchers in climate and health. This MS program will address one of the most challenging issues that our society face today. Given that several of our faculty members in the College of Arts and Sciences work on climate and health-related areas, I am certain that they can mentor students in the program. I am pleased that this graduate program will not only support cross-campus collaboration, but it will also promote interdisciplinary research at UM.

I very enthusiastically support this MSCH program. Let me know if we can assist you to strengthen further this program.

Sincerely yours,

Leonidas Bachas

Dushyantha Jayaweera, M.D.  
*Professor of Medicine*  
*Sr. Associate Dean for Research*

October 20<sup>th</sup> 2017

Naresh Kumar, PhD  
Director  
Master of Science in Climate and Health  
Department of Public Health Sciences

Reference: Letter of support for MSCH program.

Dear Naresh,

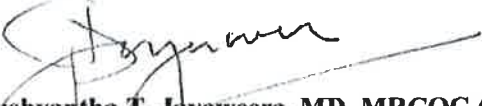
I am extremely pleased to learn that the University of Miami is finally launching a new Master of Science in Climate and Health. I have reviewed the proposal that will train the future generations of leaders and researchers in climate and health, needed to address one of the most challenging issues that our society face today.

I am delighted to know that you have assembled an outstanding group of faculty from all disciplines to enrich this Master's program and provide a well-balanced, innovative science mixed with law, business and social sciences. This program is a testament to your leadership and the interdisciplinary teamwork that exists at the University of Miami where students are the focus. I do believe that over time this Master's Program will attract the best of the best from across the world, especially from Latin America.

As we enter a new era with our new President, Dr. Julio Frenk, who envisions the University of Miami becoming "The Hemispheric University", this Master's Program appears as a most timely and significant research opportunity that expands our horizon in research collaboration and scientific education to the far corners of Latin America. I hereby pledge my strongest commitment to the success of this program. As the Senior Associate Dean for Research and Research Education, I look forward to working with you and your team in the years to come.

Wishing you best success for this important work,

Sincerely yours,,

  
**Dushyantha T. Jayaweera, MD, MRCOG (UK), FACP, CIP**  
*Senior Associate Dean for Research*  
*Miller School of Medicine at the University of Miami*

University of Miami  
Leonard M. Miller School of Medicine  
Don Soffer Clinical Research Center  
Suite 723  
Miami, Florida 33136  
Tel: 305 243 0810  
Fax: 305 243 1976



UNIVERSITY OF MIAMI  
SCHOOL of BUSINESS  
ADMINISTRATION



MEMORANDUM

TO: Naresh Kumar  
Associate Professor of Environmental Health  
Miller School of Medicine

FROM: Anuj Mehrotra, Sr. Vice Dean, School of Business Administration

CC: Patricia Abril, Vice Dean, Graduate Business Programs  
John Quelch, Dean, School of Business Administration

Subject: MS in Climate & Health

Date: January 4, 2018

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I am writing in support of the proposal for the Master of Science in in Climate and Health in the Department of Public Health Sciences. Management of climate and associated health effects and cost-benefit analysis of legislations aimed at reducing adverse health effects will be increasingly significant. Consequently, this Masters degree is a very attractive interdisciplinary proposal.

I understand that you have reached out to some Business School faculty to get their input on developing a few interdisciplinary courses that will be cross-listed once finalized.

I am hopeful that our faculty will collaborate with MSOM faculty to develop attractive classes for the program. I also appreciate that you are open to partnership models that include partial salary support and overload teaching payments for the participating faculty. We look forward to discussing the details when the program is finalized.

UNIVERSITY OF MIAMI  
COLLEGE of ENGINEERING



Jean-Pierre Bardet, Ph.D.  
Dean and Professor

1251 Memorial Drive  
MEB Room 255  
Coral Gables, FL 33146

Ph: 305-284-6035  
Fax: 305-284-2885  
bardet@miami.edu

To: Dr. Naresh Kumar  
MSCH Program Director  
Dept. of Public Health Sciences  
Miller School of Medicine, Miami, FL

From: Jean Pierre Bardet  
Dean, College of Engineering

A handwritten signature in black ink, appearing to read 'JP Bardet'.

Re: Support of new Master of Science in Climate Health

Date: October 25, 2017

As Dean of the College of Engineering, I enthusiastically support Dr. Naresh Kumar's proposal for a new Master of Science in Climate and Health. The program is in an important interdisciplinary topic area, which will enhance the academic programs available at the University of Miami. The College of Engineering offers courses relevant to the program. We welcome MSCH students into these courses assuming that they meet the pre-requisite requirements. We also look forward to the possibility of MSCH students and faculty to collaborate on interdisciplinary research in the topic area.

UNIVERSITY OF MIAMI  
**SCHOOL of  
COMMUNICATION**



Graduate Studies Office  
5100 Brunson Drive  
Coral Gables, FL 33146

Phone: 305-284-5236  
Fax: 305-284-8701  
[www.com.miami.edu/graduate-programs](http://www.com.miami.edu/graduate-programs)

October 19, 2017

Dr. Naresh Kumar  
1063 Clinical Research Building  
Department of Public Health Sciences

Dear Dr. Kumar:

This letter is in support of the proposed Master of Science in Climate and Health (MSCH) program. I believe this program will quickly prove successful. Recent events have made us well aware of the devastating effects of climate change, including how those changes threaten human health (e.g., the lack of potable water in Puerto Rico following hurricane Maria). And, unfortunately, we know things are likely to get worse, with warming oceans.

The University of Miami should be a leader in climate change study and the proposed program will help move us in that direction. I am particularly excited by this proposal, because I think it offers the opportunity to promote interdisciplinary collaboration. I strongly believe that faculty and students in the School of Communication will want to be affiliated with this program and I support it without reservation.

Sincerely,

A handwritten signature in black ink, appearing to read 'Gregory Shepherd'.

Gregory Shepherd, Ph.D.  
Dean  
School of Communication

UNIVERSITY OF MIAMI  
ABESS CENTER  
for ECOSYSTEM  
SCIENCE & POLICY



Kenneth Broad, PhD  
Professor, Marine Ecosystems & Society  
Director, Abess Center for Ecosystem Science and Policy  
University of Miami, Miami FL 33146

December 18, 2017

Naresh Kumar, PhD  
Director  
Master of Science in Climate and Health  
Department of Public Health Sciences

Reference: Letter of support for the MSCH program.

Dear Naresh,

I am delighted to learn that the University of Miami is finally launching a new Master of Science in Climate and Health (MSCH). This highly interdisciplinary program in the Department of Public Health Sciences in partnership with the Atmospheric Sciences offers an exciting opportunity to train the future generations of leaders and researchers in climate and health. This training is critical for some of the most challenging issues that our society faces.

Not only is this program highly relevant to the teaching and research mission of the Abess Center for Ecosystem Science and Policy but also offers a tremendous opportunity for our students to engage in teaching and research experiences concerning the health effects of climate. I am also happy to be personally involved in this program and which may include (co)advising graduate students who are interested in studying the policy aspects of climate and health.

In summary, I enthusiastically support the proposed MSCH program.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'KB' followed by a stylized flourish.

Kenneth Broad

Professor, Rosenstiel School of Marine and Atmospheric Science, University of Miami  
Director, Abess Center for Ecosystem Science and Policy, University of Miami  
Co-Director, Center for Research on Environmental Decisions, Columbia University



Naresh Kumar, PhD  
Director, Master of Science in Climate and Health  
Department of Public Health Sciences  
Reference: Letter of support for MSCH program.

November 8, 2017

Dear Naresh,

I am very delighted to learn that the University of Miami is launching the much needed Masters of Science in Climate and Health. I have carefully reviewed the proposal that will train the future generations of leaders and researchers in climate and health, needed to address one of the most challenging issues that our society face today.

As you as Division Chief of two large primary care Divisions at UM (General Internal Medicine and Geriatrics), I oversee a clinical, teaching and research enterprise of 66 full time faculty including clinical operations that involve over 130,000 annual patient visits. I also have several other clinical leadership roles including serving as an Executive Member of the UM Medical Group's Executive Committee and on the Board of Directors of the South Florida Health Council which is the state designated body for regional health planning.

As a researcher, my interests have long been in minority health and health disparities with a focus on community based research among vulnerable populations. I have over twenty years of experience leading NIH funded clinical and community based research projects and to date I have been awarded over \$60 million of external support for my research projects as PI, Multiple PI and Core lead of program project or center grants. At present most of my work involves community based RCTs in various disease areas including diabetes, heart disease, stroke, HIV, and cancer.

In addition, I am also involved in several regional research consortia including the One Florida Clinical Research Consortia partially sponsored by PCORNet (all Florida academic health centers), Center on Precision Medicine and Disparities (Vanderbilt, Morehouse, UM, I direct the consortium Core), the Florida-Puerto Rico Stroke Collaboration, and most recently the South East Enrollment Center for the Precision Medicine Health Provider Organization (UM, UF, Emory, Morehouse). I serve as Medical Director of the Jay Weiss Institute for Health Equity, sit on the Board of various Community Based Organizations, and frequently appear on mainstream & ethnic media to explain general health topics and my research to national & regional audiences.

I believe these are all important strengths I bring to your program and enthusiastically look forward to advising/co-advicing students whose research interests interfaces with my research related to health disparities concerning climate and the environment. I very enthusiastically support and looking forward to making an active teaching contribution to the MSCH program.

Sincerely yours,

Olveen Carrasquillo, MD MPH  
Professor of Medicine and Public Health Sciences  
Chief, Divisions of General Internal Medicine and Geriatrics/ Palliative Care  
University of Miami, Miller School of Medicine

Department of Medicine / Division of General Internal Medicine  
Clinical Research Building room 962 Locater code C223  
1120 NW 14th Street, Miami, FL 33136, Miami, FL 33101  
Phone: Phone: (305) 243-5505 Fax: 305-243-7096



UNIVERSITY OF MIAMI  
MILLER SCHOOL  
of MEDICINE

Erin N. Kobetz, PhD, MPH  
Senior Associate Dean for Health Disparities  
Sylvester Cancer Center

Naresh Kumar, PhD  
Director  
Master of Science in Climate and Health  
Department of Public Health Sciences

Reference: Letter of support for MSCH program.

Dear Naresh,

I am very delighted to learn that the University of Miami is finally launching a new Master of Science in Climate and Health. I have carefully reviewed the proposal that will train the future generations of leaders and researchers in climate and health, needed to address one of the most challenging issues that our society face today.

I will be happy to advise and co-advise students whose research interests' interface with my research related to health disparities. Through my extensive research in the Miami metropolitan area. I have encountered a significant correlation between health disparities and the effects of climate and the environment. These marked changes are shown to contribute to an increased burden of disease thus widening the gap of health disparities.

I very enthusiastically support and looking forward to making an active teaching contribution to the MSCH program.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'Erin Kobetz'.

Erin Kobetz, PhD, MPH.  
Professor, Department of Medicine  
University of Miami Miller School of Medicine

January 12, 2018

Naresh Kumar, PhD  
Director  
Master of Science in Climate and Health  
Department of Public Health Sciences

Reference: Letter of support for MSCH program.

Dear Naresh,

I am very delighted to learn that the University of Miami is finally launching a new Master of Science in Climate and Health. I have carefully reviewed the proposal that will train the future generations of leaders and researchers in climate and health, which is needed to address one of the most challenging issues that our society faces today.

I will be happy to contribute (or co-teach) toxicology and health courses and advise and co-advise students whose research interests interfaces with my research.

The MSCH students will benefit from our current collaborative project on seasonality and cellular responses to air pollution, which are greatly affected by changing weather conditions. The students will learn cutting-edge methodologies that we are using in this project, and will develop substantial expertise in the field, which will help them in their future careers.

We would welcome trainees to become involved with our research projects and will grant them access to the laboratory and clinical facilities for their thesis work.

I very enthusiastically support the MSCH program and am looking forward to making an active teaching contribution to the program.

Sincerely,



Abigail Hackam, PhD  
Associate Professor of Ophthalmology  
Bascom Palmer Eye Institute, University of Miami  
Tel: (305) 547-3723 ahackam@med.miami.edu



UNIVERSITY OF MIAMI  
MILLER SCHOOL  
of MEDICINE

October 23, 2017

Naresh Kumar, PhD  
Director  
Master of Science in Climate and Health  
Department of Public Health Sciences  
Reference: Letter of support for MSCH program.

Dear Naresh,

I am very delighted and pleased to learn that the University of Miami is finally launching a new Master of Science in Climate and Health. This is a much needed platform to train the future generations of leaders and researchers in climate and health, in order to address one of the most challenging issues that our society face today.

I have carefully reviewed the proposal and I will be happy to advise and co-advise students whose research interests interfaces with my research. My primarily focus is in airway diseases, mostly COPD and asthma, conditions directly affected by environmental factors. Your students will also have access to my laboratory and clinical facilities for their thesis work.

I very enthusiastically support and looking forward to making an active teaching contribution to the MSCH program.

Sincerely,

Michael A. Campos  
Associate Professor of Medicine





UNIVERSITY OF MIAMI  
MILLER SCHOOL  
of MEDICINE

Mehdi Mirsaeidi MD, MPH  
Division of Pulmonary, Critical Care,  
Sleep and Allergy  
Director of Sarcoidosis Program  
Department of Medicine

Date: October 19, 2017

Naresh Kumar, PhD  
Director  
Master of Science in Climate and Health  
Department of Public Health Sciences

Reference: Letter of support for MSCH program.

Dear Naresh,

I am very delighted to learn that the University of Miami is finally launching a new Master of Science in Climate and Health. I have carefully reviewed the proposal that will train the future generations of leaders and researchers in climate and health, needed to address one of the most challenging issues that our society face today.

I will be happy to advise and co-advise students whose research interests interfaces with my research. My current research interests are focused on climate change effects on pathogenesis of non-tuberculous mycobacteria, and effects of environmental bioaerosols and other pollutants on macrophages and bronchial epithelial cells. Of course, they will also have access to my laboratory and clinical facilities for their thesis work.

I very enthusiastically support and looking forward to making an active teaching contribution to the MSCH program.

Sincerely yours,

*Mehdi mirsaeidi*

Mehdi Mirsaeidi MD, MPH  
Division of Pulmonary, Critical Care,  
Sleep and Allergy  
Director of Sarcoidosis Program  
Miami VA Medical Center  
Department of Medicine  
University of Miami, Miller School of Medicine  
1600 NW 10th Ave # 7072A  
Miami, FL 33136  
(305) 243-9227  
Email: msm249@miami.edu



UNIVERSITY OF MIAMI  
MILLER SCHOOL  
of MEDICINE

Anat Galor MD MSPH  
Associate Professor of Clinical Ophthalmology  
Bascom Palmer Eye Institute  
900 NW 17<sup>th</sup> Street  
Miami, FL 33136

October 17, 2017

Naresh Kumar, PhD  
Director  
Master of Science in Climate and Health  
Department of Public Health Sciences

Reference: Letter of support for MSCH program.

Dear Naresh,

I am very delighted to learn that the University of Miami is finally launching a new Master of Science in Climate and Health. I have carefully reviewed the proposal that will train the future generations of leaders and researchers in climate and health, needed to address one of the most challenging issues that our society face today.

I will be happy to advise and co-advise students whose research interests interfaces with my research. As you know, we have been focused on understanding the role of the personal microenvironment on ocular surface health. Our previous work has utilized large national datasets to study this question and we have found that exposures such as air pollution and low humidity increase the risk of a dry eye diagnosis. We are currently working on profiling the personal microenvironment on a local level and correlating our findings with dry eye symptoms and signs. In addition, we are setting up in vitro cell culture experiments to study these questions in a more focused manner. We would welcome trainees to become involved with our work and will grant them access to the laboratory and clinical facilities for their thesis work.

I very enthusiastically support and looking forward to making an active teaching contribution to the MSCH program.

Sincerely yours,

A handwritten signature in blue ink, appearing to read 'A Galor'.

Anat Galor, MD, MSPH



UNIVERSITY OF MIAMI  
MILLER SCHOOL  
of MEDICINE

Ami P. Raval, Ph.D., MSPH  
Research Assistant Professor  
Department of Neurology

November 11, 2017

Naresh Kumar, PhD  
Director  
Master of Science in Climate and Health  
Department of Public Health Sciences

Reference: Letter of support for MSCH program.

Dear Naresh,

I am very delighted to learn that the University of Miami is finally launching a new Master of Science in Climate and Health. I have carefully reviewed the proposal that will train the future generations of leaders and researchers in climate and health, needed to address one of the most challenging issues that our society face today.

I will be happy advise and co-advise students whose research interests interfaces with my research. I have unique training and experience in the fields of Zoology, Reproductive Physiology and Neuroscience that allowed me to investigate the impact of sex hormones on the healthy and diseased brain. My main research expertise is in the area of cerebral ischemia, which results from cardiac arrest or stroke. My research focuses on the areas of synaptic, vascular and mitochondrial dysfunction that ensue following cerebral ischemia. Since cardiac arrest or stroke disproportionately kills more women than men, the emphasis of my research is to identify risk factors and possible cellular mechanism specific for female brains that makes them more susceptible for cerebral ischemia. I am dedicated to develop this translational research topic and to conduct a future population-based study supported by our laboratory findings. My Master of Science in Public Health from the University of Miami will allow me to succeed in the aforementioned endeavors. Additionally, Public Health knowledge and background allows me to advise and co-advise students whose research interests targets understanding the effects of climate and extreme weather conditions on brain health in animals and humans. I will be happy to share my knowledge and MSCH students will have access to my laboratory for their thesis work. I will also participate in didactic and laboratory teachings.

I very enthusiastically support and looking forward to making an active teaching contribution to the MSCH program.

Sincerely yours,

A handwritten signature in blue ink that reads 'Ami Raval'.

Ami P. Raval, Ph.D., MSPH

## WMO OMM

WEATHER CLIMATE WATER  
TEMPS CLIMAT EAU



World Meteorological Organization  
President of Technical Commission  
Organisation météorologique mondiale  
Président de la Commission technique  
Organización Meteorológica Mundial  
Presidente de la Comisión Técnica

Всемирная метеорологическая организация  
Президент технической комиссии  
المنظمة العالمية للأرصاد الجوية  
رئيس اللجنة الفنية  
世界气象组织  
技术委员会主席

December 26, 2017

Naresh Kumar, PhD  
Director, Master of Science in Climate and Health  
Department of Public Health Sciences  
University of Miami, Miami, FL

Subject: Letter of support for MSCH program

Dear Dr. Kumar,

Late on October 17<sup>th</sup> of this year, after two days in Geneva discussing potential reorganization of the World Meteorological Organization, which is part of the United Nations system, I flew to the UK for a three-day meeting on the future of the Global Framework for Climate Services (GFCS). The meeting was hosted by the ECMWF. Many times during this past year the evening news described how the US weather model predicted that a storm would take a particular path while the European model predicted as somewhat different path. The ECMWF (European Centre for Medium-Range Weather Forecasts) in Reading, England is the home of the European model. ECMWF offered to host the meeting of the Management Committee of the Intergovernmental Board for Climate Services, the governing body of the GFCS, because it recognized the important role that the GFCS is serving around the world.

The GFCS in turn recognizes the important role that understanding the link between climate and health plays in providing the climate services that people all over the world will need. Indeed, if you go to the GFCS website, <http://www.wmo.int/gfcs/>, there is a clear statement of five priority areas for climate services with one of them being health.

Some people tend to think of climate and health issues as third world problems. But in reality, the entire world has climate related health issues. There are just different issues for different regions and different socio-economic conditions. The GFCS describes their climate and health concerns this way:

"Weather and climate are inextricably linked to some of the most fundamental determinants of human health such as clean air and water, adequate food and shelter, and the distribution and occurrence of disease. Heat and cold waves, tropical cyclones, floods and droughts claim many lives and heighten the transmission of diseases each year. Factors indirectly related to weather and climate – food security and non-communicable diseases, such as cardiovascular and respiratory diseases resulting from exposure to poor air quality – also cause the death and illness of many people. Furthermore, the proliferation of communicable water-borne and vector-borne diseases, due to favourable conditions particularly triggered by climate variability, result in a huge cost to society and the economy.

"Understanding the relationship between climate and health is fundamental when taking preventative action against climate related health risks. It is a challenge for the health community to access, recognize, understand, interpret and apply available climate information. Likewise, the climate services community often does not fully appreciate all public health concerns and needs, and the role climate services can play to support public health.

Naresh Kumar, PhD  
Director, Master of Science in Climate and Health  
Department of Public Health Sciences  
University of Miami, Miami, FL

December 21, 2017

Re: Letter of support for MSCH program

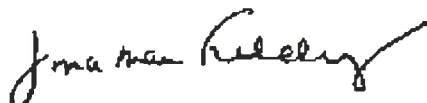
Dear Naresh,

I am very delighted to learn that the University of Miami is finally launching a new Master of Science in Climate and Health (MSCH). This highly interdisciplinary program in the Department of Public Health Sciences in partnership with the Department of Atmospheric Sciences offers an exciting opportunity to train the future generations of leaders and researchers in climate and health, needed to address one of the most challenging issues that our society faces today.

Generally most climatologists and health professionals are not trained to tease out the health effects of climate. The proposed MSCH program hosts tremendous potential to address this major gap in the labor force. The graduate program is one of a kind in the world. Our UCLA Center for Health Advancement in the Fielding School of Public Health is very interested in your pioneering academic program and expect that many public health practice and academic institutions will be looking for graduates with this background.

I very enthusiastically support the proposed MSCH program.

Sincerely yours,

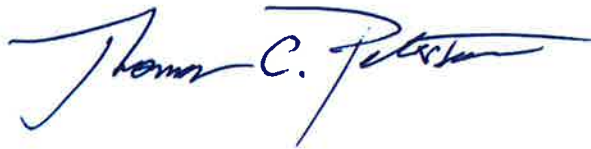


Jonathan Fielding, MD, MBA, MPH  
Distinguished Professor, Health Policy and Management  
Founder, Center for Health Advancement

"The Global Framework for Climate Services aims to help bridge these gaps. It will foster collaboration to develop reliable health and climate-related tools and services for various time scales – from months to seasons, decades and longer. These services will support health priorities such as improving disease surveillance, and extending the lead-time to prevent and prepare for climate related outbreaks and emergencies."

As it is important to prepare scientists and practitioners to provide the services that the Global Framework for Climate Services knows are needed throughout the world, I would like to voice my strong support for your institution leading the way by providing a Masters of Science degree in Climate and Health.

Yours truly,

A handwritten signature in blue ink that reads "Thomas C. Peterson". The signature is fluid and cursive, with a long horizontal stroke at the end.

Thomas C. Peterson, Ph.D.  
President, WMO Commission for Climatology

**Response to the Legislative Oversight Committee, Feb 28, 2018**

**From:** Rundek, Tatjana  
**Sent:** Tuesday, February 27, 2018 8:12 PM  
**To:** Kumar, Naresh <[NKumar@med.miami.edu](mailto:NKumar@med.miami.edu)>  
**Cc:** Bhattacharya, Sanjoy K <[SBhattacharya@med.miami.edu](mailto:SBhattacharya@med.miami.edu)>  
**Subject:** Re: MSCH Proposal

Dear Dr. Kumar,

Our Legislative Oversight Committee (LOC) Members has received your proposal for the Master of Science in Climate and Health (MSCH) graduate program developed by the Department of Public Health Sciences in partnership with Rosenstiel School of Marine and Atmospheric Sciences (RSMAS).

The LOC members have carefully and favorably reviewed your proposal. It is well prepared and presented. We believe this is a valuable interdisciplinary proposal for a degree that scientifically addresses the influence of climate change on health. The proposal is strongly supported by Dean Edward Abraham and Dean Roni Avissar as well as by other UM schools and President of the World Meteorological Organization (as evidenced by the attached letters of support).

We also believe that the multidisciplinary approach to an emerging health and environmental consequence of climate change will have a high impact on attracting a substantial pool of motivated students. This type of training is not broadly available and will place the UM at the leading edge of graduate teaching in this field. The curriculum is terrific, interesting and thoughtful. Overall LOC members are very enthusiastic for this new program.

NKR: Thank you.

The LOC members would like to suggest the following:

1. The detailed budget is not provided. Considering the number of prestigious instructors, a more detailed budget that estimates of EVU-equivalents should be provided. In the letter signed by both Deans, Abraham and Avissar, both schools agreed on the split 2:7 and 5:7 of cost and revenue between RSMAS and UMMSOM. In the current UMMSOM environment and our new compensation plan, program faculty will need to be compensated for their time (currently they need to provide income equivalents for their compensation). We do not know if the faculty compensation plan is similar at RSMAS. It is important however that these faculty compensation estimates are provided in the budget, especially for "the worst case scenario" of student enrollment. Given current stringent reality of budgets, there is a need for a detailed plan to prevent potential deficits that may jeopardize this terrific program.

NKR: We did not include detailed budget, as detailed budget was presented to both deans and both are ok even with the worst scenario. Nonetheless, it is important that your committee has access to these scenarios, I am attaching detailed budgets for your consideration. As you will see in the budget that faculty compensation is adequately included in the budget.

2. The GRE requirements represent a pretty low bar. That is fine, as long as they are expressed in percentiles, and not in raw score numbers. Likewise, the program may consider also accepting MCAT, and to provide a percentile threshold for acceptance with this exam. This may attract applicants interested in human health, who are not yet ready for medical schools.

NKR: We have included MCAT. As you suggested, these scores may be subject to change. Generally, we will like to keep 60<sup>th</sup> percentile cut off. In addition, physics and calculus background are requisite of this program.

With these changes, we would be very supportive for this proposal and recommend it to the Medical School Council for approval.

Thank you.

Sincerely,

Tatjana Rundek, for the Medical School Legislative Oversight Committee

**The University of Miami - MASTER OF SCIENCE IN CLIMATE & HEALTH (U-MSCH) – EXECUTIVE SUMMARY**

Climate change, weather and weather anomalies (C<sup>2</sup>W<sup>2</sup>) and their implications for the environment and human health are the most debated and contentious topics of the 21st century not only because they affect us all, but also because their relationships with health are intricate due to differential roles of hierarchical variables including individual, household, neighborhood and regional level variables. Tremendous uncertainty exists in the disease and disability burden associated with C<sup>2</sup>W<sup>2</sup>. Therefore, C<sup>2</sup>W<sup>2</sup> related legislation(s) often triggers political and public debates. While there has been an increasing interest in the health effects of C<sup>2</sup>W<sup>2</sup>, a new generation of manpower with a unique set of interdisciplinary skills is needed to understand, investigate and manage the burden of disease and disability associated with C<sup>2</sup>W<sup>2</sup>. Master of Science in Climate and Health (MSCH) program in the

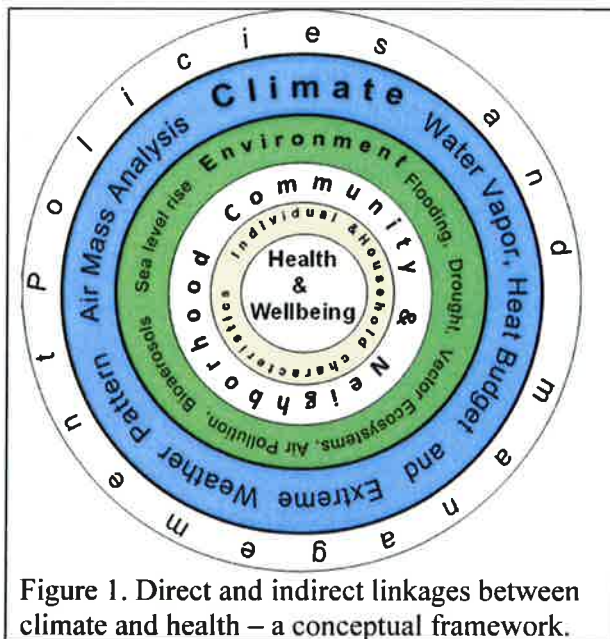


Figure 1. Direct and indirect linkages between climate and health – a conceptual framework.

Department of Public Health Sciences, Miller School of Medicine in partnership<sup>1</sup> with the Department of Atmospheric Sciences, Rosenstiel School of Marine and Atmospheric Sciences (RSMAS) will prepare future generations of *professionals, research analysts, planners, decision-makers* and *leaders* who will have a deep understanding of the intricate relationship between human health and C<sup>2</sup>W<sup>2</sup>, and ability to decipher and quantify this relationship at multiple scales ranging from gene-expression, to individual’s susceptibility to community response to region-wide morbidity and mortality burden. The MSCH program will have three specific aims:

1. Provide students with conceptual, theoretical and applied understanding of the direct and indirect impacts of C<sup>2</sup>W<sup>2</sup> on human health. This will also include the impacts of short- and long-term climate and weather changes on health and well-being,
2. Train students in understanding, evaluating, and assessing short- and long-term climate and weather changes, and their direct and indirect impact on disease and disability burden across different communities, and

<sup>1</sup> Partnership in the context of this proposal refers to the following:

- Joint venture between Department of Public Health Sciences and Atmospheric Sciences at the University of Miami.
- The program will be administratively housed and managed by the Department of Public Health Sciences, and the department will oversee CEPH (Council on Education for Public Health) requirements of the MSCH program (see CEPH competencies that MSCH will meet towards the end).
- The Program will be Directed and Co-Directed by the Department of Public Health Sciences and Atmospheric Sciences, respectively.
- Graduate faculty members from both departments will actively participate in the instruction and advising of the students.



3. Prepare students to develop adaptation, mitigation, healthcare and communication strategies in the light of adaptation and infrastructure capacity of different communities to manage the health effects of C<sup>2</sup>W<sup>2</sup>.

We have already developed several of the core courses, and our faculty members are already working in several areas related to climate and health including: a) shifting burden of vector-borne disease and climate, b) health effects of heatwaves, c) climate change and building design, d) extreme weather and unintentional injury in occupational and non-occupational settings, e) climate-mediated health effects of air pollution and f) increasing burden of infectious, allergic and immunological disorders and climate changes. This will offer research opportunities to our students in various application areas of climate and health. Moreover, we have state of the art laboratories for measurement, modeling, analysis and surveillance of climate, environment and health, and toxicological analysis. Given Miami is a live laboratory to learn, understand and examine the health effects of C<sup>2</sup>W<sup>2</sup>, including the recent Zika outbreak and changing patterns of allergy and infectious disease, the MSCH program at the University of Miami will provide students with a unique learning experience by first-hand witnessing the intricate relationship between C<sup>2</sup>W<sup>2</sup> and various health outcomes. Therefore, the program has potential to bring the University of Miami to the forefront of climate and health training and research, and to partner with the local, national, and international agencies focusing on this area, including the National Institute of Environmental Health Sciences, Environmental Protection Agency, International Panel on Climate Change, the Florida Department of Health and Florida Institute for Health Innovation. Given climate and health is a new area of training and research, the climate and health occupation category does not exist in the Department of Labor database. But job outlook between 2014-2024 in the related fields of atmospheric science, environmental science and healthcare management ranges from 9 to 17% (more than average), and median annual average pay ranges from \$65,000 to \$94,000. The MSCH graduates will have tremendous career opportunities in the both public and private sectors and academia (see letters of support [LOS]). The proposed interdisciplinary MSCH aligns with the University of Miami's mission to "educate and nurture students, to create knowledge, and to provide service to our community and beyond" by training and preparing the future generation of analytics, leaders and decision-makers needed to understand, assess and manage the burden of disease and disability in response to C<sup>2</sup>W<sup>2</sup>. Moreover, this program also aligns with the mission of the University of Miami Department of Public Health Sciences, which is "to enhance the health of the public, reduce the burden of disease, and create health equity among various segments of the population".

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## 1. RATIONALE

*1.a Climate change – an emerging challenge of the 21<sup>st</sup> century.* Climate change is one of the most debated and contentious issues of the 21st century because it has unprecedented implications for anthropogenic and natural resources<sup>1-3</sup>, sustainability of our planet<sup>4</sup>, and world economy and world order<sup>5</sup>.<sup>6</sup> Although changing climate was perceived to be a distant threat to health until recently, the Lancet Commission on Health and Climate concluded that “climate change is the biggest global health threat of the 21st century<sup>7</sup>”. Moreover, focusing on health puts a human face on the issue of climate change.<sup>8</sup> The 2015 Lancet Commission proposes the formation of an independent, international Countdown to 2030: Global Health and Climate Action coalition to monitor progress and action on the health dimensions of the climate crisis<sup>9</sup>. While the Commission calls on health professionals to lead the response to the health threats of climate change, it will require a highly interdisciplinary approach to tease out the health effects of climate change. The 2015 Lancet Commission on Health and Climate suggests that “tackling climate change could be the greatest global health opportunity of the 21st century”. The proposed Master of Science and Climate and Health (MSCH) program capitalizes on this greatest opportunity by training a new generation of professionals to: a) study intricate relationship between climate and health and b) assess and evaluate policies needed to manage health effects of C<sup>2</sup>W<sup>2</sup> across different communities and populations.

*1b. Mission Statement.* As global warming intensifies, not only will it result in a shifting burden of disease and disability, but it will also result in unprecedented changes in the physical and biochemical characteristics of the environment. The MSCH graduate program will prepare future generations of *research analysts, planners, decision-makers and leaders* who will have deep understanding of the intricate relationship between climate and health, and ability to decipher this relationship. The MSCH program will have three specific aims:

- Provide students conceptual and theoretical understanding of the direct and indirect impacts of short- and long-term climate changes on health and well-being,
- Train students in evaluating and assessing short- and long-term climate changes and their direct impact, in turn, on the burden of disease and disability, and indirect impact on burden of disease and disability through the physical and biochemical changes in the environmental characteristics due to climate changes, and
- Prepare students to evaluate (existing) and develop adaptation, mitigation, communication and healthcare strategies to manage the health effect of C<sup>2</sup>W<sup>2</sup> across different populations with respect to their differential health risks, infrastructure and adaptation capacity.

**1c. Climate and health – an intricate relationship.**

Climate and health builds at the interface of interaction among climate, health and the environment (Figure 1). As shown in Figure 1, short- and long-term climate changes and weather anomalies affect health and well-being (in)directly. Changes in climate and weather directly affect disease etiology<sup>10-12</sup>. For example, heat waves trigger heatstroke, cold air masses trigger asthma exacerbation by airway constriction, and increase in surface temperature and atmospheric pressure directly affect the circulatory system by affecting blood pressure and perspiration. Climate and weather changes also indirectly affect disease etiology by altering physical and biochemical characteristics of the environment. For example, increases in temperature and humidity prolong blooming seasons and viability of mycobacteria and mosquitoes, which are shown to be associated with an increase in the prevalence of allergic, airway and other infectious diseases, respectively<sup>13</sup>.

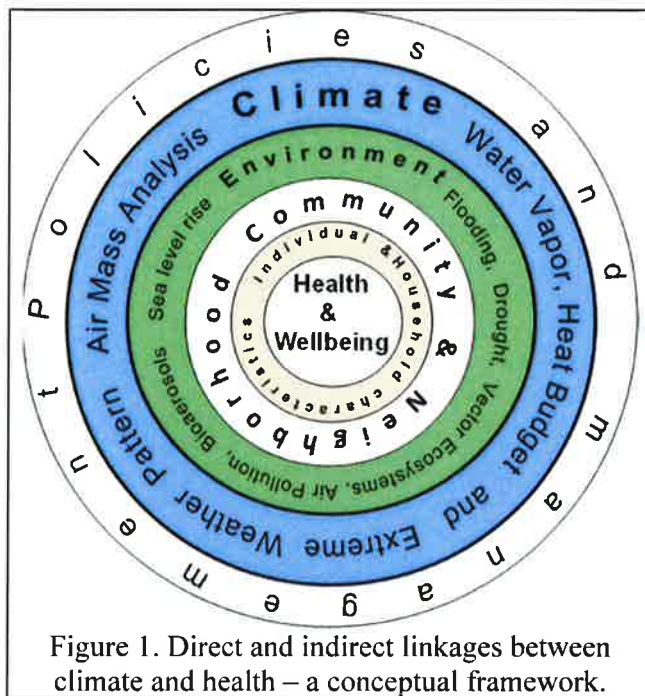


Figure 1. Direct and indirect linkages between climate and health – a conceptual framework.

**1d. UM an emerging research and training center in Climate and Health.** Our faculty members in the Division of Environment and Public Health and other departments have begun working on different areas of climate, including health and climate research projects. Faculty members within the division have been working on research projects that include: climate change and shifting burden of vector-borne diseases, unintentional climate effects on occupational health, heat waves and heat stroke, climate mediated health effects of air pollution, including asthma, allergies, and lung disease, and lastly the linkages between health, climate and the urban environment. The research within the division has recruited other faculty and research associates from other departments of UM to assist in this particular area of expertise. Such projects include: climate driven marine and atmospheric changes at RSMAS, policy-related issues concerning climate change in Ecological Sciences and Policy, novel translation and communication strategies in novel instrument sensing for the surveillance of climate and associated environmental characteristics in both the College of Engineering and the School of Communication. Tremendous expertise in different areas and different schools offers a wide range of research opportunities within the greater Miami area and throughout the nation.

The climatic and environmental conditions that Miami witnesses at present will shift to the northern parts of the US as global warming intensifies. Miami being a live laboratory offers an unprecedented opportunity to witness the intricate relationship between climate, climate change, weather and weather anomalies (C<sup>2</sup>W<sup>2</sup>) and health, including the effects of climate on vector-borne disease, water-borne disease, asthma, allergies, skin cancers and unintentional injuries, and understanding of the efficacy of different adaptation and mitigation strategies. Therefore, understanding the health effects of C<sup>2</sup>W<sup>2</sup> in Miami at present is the key to understanding the potential health effects of C<sup>2</sup>W<sup>2</sup> in the northern parts of the US. Training future generations of students in Miami with field based learning holds

the potential for UM to emerge as the pioneer research and training center of climate and health, and increase UM's visibility on the world Map.

Proposing this new program will ensure a leading research and training center in the heart of a climatic and environmental hot spot. This training center will not only make groundbreaking research in the field of climate and health, but also train students to be the leaders of their specific fields, conducting research throughout the nation and the world on how C<sup>2</sup>W<sup>2</sup> (in)directly affects health and wellbeing.

*1e. Career in Climate and Health.* Careers in climate and health range through many fields of environmental and public health, both in the public and private sectors, as well as academia. The Department of Labor does not have a specific sector for climate and health jobs. However, with an expertise in this field, students will be able to seek positions within atmospheric sciences, environmental sciences, healthcare and sciences, and public health. The job outlook between 2014-2024 in the related fields of atmospheric science, environmental science and healthcare management ranges from 9 to 17% (more than average) (see Appendix 1 for details). The median annual average pay in these sectors ranges from \$65,000 to \$94,000.

*1f. Relationship to other fields and interaction among different colleges at UM.* The proposed MSCH program will have the opportunity to enlist other specialties, academic focuses, and schools throughout the University of Miami to help solidify a strong foundation for future students. There is no graduate program in the nation that trains students with specific focus on the health effects of C<sup>2</sup>W<sup>2</sup> (see Appendix 2 for the comparison MSCH with the existing and relevant four programs). Therefore, the MSCH program will have an unprecedented advantage and help UM emerge as a pioneer institution in the area of climate and health. This program builds on the interdisciplinary and inter-department collaboration across two different colleges at UM: Miller School of Medicine and Rosenstiel School of Marine and Atmospheric Sciences (RSMAS). Moreover, colleagues from other colleges, including Law, Engineering, Arts and Sciences and Business will participate in the instruction and supervision of the students. The MSCH program will prepare students in interdisciplinary, international, and synergistic collaboration to understand health effects of C<sup>2</sup>W<sup>2</sup>. While students will be trained in (in)direct etiology of disease associated with C<sup>2</sup>W<sup>2</sup> and healthcare delivery at the Miller School of Medicine, they will have the opportunity to work with colleagues in other departments at UM concerning different application areas: extreme weather conditions and health effects in RSMAS; building design and climate related health effects in the School of Architecture; issues concerning effective translation and communication strategies to manage health effects of climate in the School of Communication and Abess Center for Ecosystem Science and Policy (ESP); issues concerning socio-physical environment in the College of Arts and Science; issues concerning the modern system of climate and weather surveillance in the College of Engineering (see section 3 for details). Students will also have the opportunity to take specialized elective courses in these colleges to develop deep understanding in different areas including atmospheric sciences, marine ecosystems and society, meteorology and physical oceanography. This inter-college collaboration will provide students with field experience and research opportunities as well.

## **2. RESOURCES**

The program will be a collaborative effort between the Miller School of Medicine Department of Public Health Sciences and the Rosenstiel School of Marine & Atmospheric Science (RSMAS) Atmospheric Science Department. Both departments have state of the art instructional and laboratory facilities needed

to successfully conduct the program. Moreover, an interdisciplinary team of colleagues from five different colleges will be available to advise students (see section "C" for details).

### ***B1. Library***

Students enrolled in the program will have access to the necessary collections and other learning resources that support the educational programs of UM at all degree levels. The University of Miami libraries include extensive print and electronic resources and offer facilities for study, research and discovery, as well as integrated systems to provide access and services on each campus, and off-campus, at all times.

### ***B2. Laboratory***

Core course instructors, including Drs. Mirsaeidi, Campos, Raval and Kumar have state of the art wet laboratory facilities as well as computing laboratory facilities to support instruction. In addition, the Department of Public Health Sciences has a computer laboratory, needed for two of the seven courses (see Appendix 1 for details; letters of support (LOS) from all collaborators).

RSMAS has archived climate model simulations from the Coupled Model Intercomparison Project 5 (CMIP5) that were performed in support of the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5). These consist of both historical climate simulations for the 19th and 20th Century as well as a set of 21st Century climate change simulations that are based on a range of future emission scenarios. These are complimented by a set of unforced climate change simulations that are used to document the internal climate variability of the models. The model simulations were performed by climate modeling centers around the world using a coordinated experimental framework and data output. These data will be available to our students for their laboratory work and thesis.

## **3. CURRICULUM**

### ***C3.1 Program objectives***

This program will train future generations of researchers, research analysts, decision-makers and leaders to: **a)** understand the intricate relationship between C<sup>2</sup>W<sup>2</sup> and health, **b)** assess anticipated disease and disability burden (across different populations) of short- and long-term climate and weather changes, and **c)** evaluate and prepare healthcare, adaptation, mitigation and communication strategies to manage disease and disability burdens of C<sup>2</sup>W<sup>2</sup> for communities in the light of their infrastructure and adaptation capacity and healthcare needs.

### C3.1 MSCH - Core competencies

Core competencies of the MSCH programs were developed to meet the program objectives. This program will train students in:

- understanding the basic physical processes that control global and regional climate, and global and regional weather patterns and extreme weather patterns,
- understanding the interplay between health and C<sup>2</sup>W<sup>2</sup>, the burden of disease/disability different communities and populations associated with weather and climate, and weather and climate-mediated changes in the environment,
- understanding the biophysiological responses with respect to short- and long-term climate changes and weather patterns,
- developing skills in collecting, managing and analyzing health, climate and associated data sets to quantify the health effects of climate incorporating hierarchical (including individual, community and region-specific) socio-physical environmental characteristics, and
- understanding the structure and administration of public health organizations and the policies that impact health programs and health services for different communities, and identifying direct and indirect roles of different stakeholders in the surveillance and management of the health effects of climate, and develop skills in evaluating the role strategies to reduce greenhouse gas emissions and associated health effects,
- understanding disparities in the health outcomes in communities and the attribution of climate change effects on vulnerable populations, and individual responses (from various socio-economic backgrounds) to different warning and surveillance of weather conditions that pose threat to health and wellbeing.

Table 1: Core courses, associated competencies and elective courses (**Total credits: 36**).

Course	Competencies
<b>Core (required courses) (3 X 7 = 21 credits)</b>	
CPH601 – An Introduction to Climate & Health (John Beier) [existing course EPH 646]	<ul style="list-style-type: none"> <li>• Develop an understanding of the public health history, philosophy and value, and its importance for climate and health.</li> <li>• Understand short- and long-term impacts of climate, weather &amp; weather anomalies on health and associated cost across different communities and regions.</li> <li>• Identify emerging research gaps concerning the health effects of climate and the role adaptation and infrastructure capacity at individual, household, community and regional level.</li> </ul>
CPH602 – Toxicology and Climate (Abigail S. Hackam; Mehdi Mirsaedi MD, MPH; Ami P. Raval, Ph.D.) [New interdisciplinary course to be developed from the existing disciplines at UM]	<ul style="list-style-type: none"> <li>• Understand general principles of toxicology</li> <li>• Developing an understanding of the mechanism of the effects of climate, weather and climate and weather mediated effects of environment on biophysiological responses.</li> <li>• Develop skills in <i>in-vitro</i> and <i>in-vivo</i> experimental designs to assess direct and indirect toxicity of climate, weather and climate and weather mediated effects of environment on biophysiological responses.</li> </ul>

	<ul style="list-style-type: none"> <li>• Characterize and quantify biophysiological responses in response to the trends and anomalies of weather and climate.</li> </ul>
<p>CPH603/ATM614 – Introduction to Weather and Climate (RSMAS Brian Soden, Ph.D.) [existing course: ATM614]</p>	<ul style="list-style-type: none"> <li>• Understand weather patterns and processes that shape these patterns.</li> <li>• Assess the trends of short- and long-term changes in weather patterns across space and time.</li> <li>• Identify potential sources of weather and climate data sets.</li> <li>• Develop skills in quantifying micro-macro scale weather and climate data sets</li> <li>• Understand the composition of the atmosphere, energy and radiation, moist processes, weather systems, and global weather patterns.</li> </ul>
<p>CPH 604/ATM653 – Climate change (RSMAS – Amy Clement, Ph.D.) [existing course: ATM653]</p>	<ul style="list-style-type: none"> <li>• Understand the physical processes that regulate earth’s climate</li> <li>• Understand climate feedbacks and sensitivity</li> <li>• Model projections of past and future climate</li> <li>• Develop an understanding of climate patterns and the role of natural (including extraterrestrial) and anthropogenic factors that affect short- and long-term climate changes</li> <li>• Evaluate potential climate prediction models</li> <li>• Types and sources of historical data and model based projections</li> </ul>
<p>CPH605/EPH727 – Climate, Environment and Health: Data Integration and Management (Naresh Kumar, Ph.D.) . [existing course: EPH 727]</p>	<ul style="list-style-type: none"> <li>• Develop an understanding of different research design.</li> <li>• Identify potential sources and types of data needed to pursue research on health and climate using different research designs.</li> <li>• Develop skills in integration (or colocation) of climate/weather, environment and health data sets.</li> <li>• Develop skill in characterizing time-space covariance structure.</li> <li>• Develop skills in quantifying error and uncertainty in the health and climate/weather data.</li> </ul>

<p>CPH 606 – Analysis of the Health Effects of Climate (Yongtao Guan, Ph.D. &amp; Naresh Kumar) [New interdisciplinary course to be developed from the existing disciplines at UM]</p>	<ul style="list-style-type: none"> <li>• Develop skills in quantifying exposure uncertainty.</li> <li>• Develop skills in qualitative and quantitative exploration and visualization of the association between health and climate/weather conditions.</li> <li>• Develop skills in conducting ANOVA and MANOVA</li> <li>• Develop skills in quantifying time-space lagged exposure to climate/weather and environmental exposures.</li> <li>• Develop skills in examining (time-space varying) health risks associated with time-space varying climate/weather exposure.</li> </ul>
<p>CPH 607 – Policies and Management of the Health Effects of Climate [New interdisciplinary course to be developed from the existing disciplines at UM]</p>	<ul style="list-style-type: none"> <li>• Developing an understanding of the existing policies and role of different stakeholders in managing health effects of climate/weather.</li> <li>• Identify potential gaps in policies and management strategies aimed at improving and protecting health effects of short- and long-term trends of climate and weather patterns for different populations and communities.</li> <li>• Develop skills in defining and assessing "vulnerability" depending different aspects of climate change and extreme weather (e.g. urban heat waves, sea level rise etc.), and Assess healthcare needs of different communities and populations in the light of their vulnerability to C2W2 and their infrastructure and adaptation capacity.</li> <li>• Discuss disease-specific management in response to short- and long-term trends of climate and extreme weather, including clinical, such as healthcare delivery (pre-, during and post-extreme weather events), and preventive strategies, such as disease-specific real-time risk surveillance, adaptations (or preventive strategies), emergency healthcare delivery and preparation.</li> <li>• Develop skills in cost-benefit analysis of various policies and/or interventions, and</li> <li>• Develop skill in evaluating (evidence-based) policies to manage health effects of environment.</li> </ul>
<p><b>Dissertation work (3 x 2 = 6 credits)</b></p>	
<p>CPH 680 – Thesis Proposal</p>	<ul style="list-style-type: none"> <li>• Develop conceptual and theoretical understanding of a “selected health outcome(s)” and linkages with a “selected” climate/weather condition(s).</li> <li>• Conduct a meta-analysis of the selected research areas.</li> </ul>
<p>CPH 681 – Thesis</p>	<ul style="list-style-type: none"> <li>• Develop skills in conducting research on the (selected) health effect(s) of the selected climate/weather condition(s).</li> </ul>



	<ul style="list-style-type: none"> <li>• Develop skills in presenting/publishing research at professional platforms/media.</li> </ul>
<p><b>Elective courses (3 x 3 = 9 credits)</b>                  MSCH program will offer specialty in four areas: public health, atmospheric and marine science, analytical and toxicology. Elective courses (9 credits) and dissertation work (6 credits) will offer opportunity to specialize in one of the above four tracks. Curriculum requirements of each of these tracks are outlined below:</p>	

**MSCH TRACKS.**

Students can choose one of the following four tracks. Each student needs to declare his/her track by the end of first year of their program. Students are encouraged to consult their faculty advisor in the selection of their tracks. If a track is not declared by the end of the first year in the MSCH program, students will automatically be assigned to the Public Health Sciences Track.

***Public Health Sciences Track***

<b>Core – Required Courses</b>		<b>21</b>
CHM 601	An Introduction to Climate & Health (existing course - EPH 646)	3
CPH 602	Toxicology and Climate	3
CPH 603	Introduction to Weather and Climate (existing course ATM 614)	3
CPH 604	Climate Change	3
CPH 605	Climate, Environment and Health: Data Integration and Management	3
CPH 606	Analysis of the Health Effects of Climate	3
CPH 607	Policies and Management of the Health Effects of Climate	3
<b>Electives – 3 courses selected from the following:</b>		<b>9</b>
<p><b>NOTE:</b> With the permission of their advisor, students may take any elective courses on any of the UM campuses, including the following. The elective courses should be chosen such that these courses can provide skills and/or advanced understanding of the areas related to the dissertation topic. In addition, students can pursue “independent climate and health topic(s) (ICHT)”. Students will need to develop one page proposal for ICHT, describing the topics covered and competencies to be achieved through ICHT. These competencies must be relevant for the dissertation topic. The proposal will need to be approved by their faculty advisor.</p>		
BST 630	Longitudinal and Multilevel Data Analysis	3
ECO 645	Regulation Economics	3
EPH 612	Global Health	3
EPH 639	Ecology and Control of Vector-Borne Diseases	3
EPH 640	Urban Environment	3
EPH 643	Introduction to Occupational Health	3
EPH 724	Molecular and genetic epidemiology	3
ATM 634	Atmospheric Chemistry	3
ATM 637	Natural Hazards: Atmosphere and Ocean	3
LAW 213	Environmental Law	3
LAW 854	Environmental Justice Clinic Practicum	3
EHP 641	Environmental Health	3
LAW 555	Climate Change	3

EPH 611	Mindfulness in Public Health and Medicine	3
PSY 371	Stress Management	3
CPH (TBD)	Independent Climate and Health Topics	3
<b>Dissertation Work - Required</b>		<b>6</b>
CPH 680	Thesis Proposal	3
CPH 681	Thesis	3
<b>TOTAL CREDITS</b>		<b>36</b>

*Marine and Atmospheric Science Track*

<b>Core – Required Courses</b>		<b>21</b>
CHM 601/EPH 646	An Introduction to Climate & Health	3
CPH 602	Toxicology and Climate	3
CPH 603/ATM 614	Introduction to Weather and Climate	3
CPH 604/ATM 653	Climate Change	3
CPH 605/EPH 727	Climate, Environment and Health: Data Integration and Management	3
CPH 606	Analysis of the Health Effects of Climate	3
CPH 607	Policies and Management of the Health Effects of Climate	3
<b>Electives – 3 courses.</b>		<b>9</b>
<p>With the permission of their faculty advisor, students may take any elective courses offered on RSMAS and/or medical campuses, including the following. The elective courses should be chosen such that these courses can provide skills and/or advanced understanding of the dissertation topic. In addition, students can pursue “independent climate and health topic (ICHT)”. Students will need to develop one page proposal for ICHT, describing the topics covered and competencies to be achieved through ICHT. These competencies must be relevant for the dissertation topic. The proposal will need to be approved by their faculty advisor.</p>		
ATM 624	Numerical Weather Prediction	
ATM 634	Applied Data Analysis	
ATM 636	Atmospheric Chemistry	
ATM 637	Hurricanes	
ATM 654	Natural Hazards: Atmosphere and Ocean	
ATM 661	Climate Variability	
ATM 662	Tropical Atmosphere and Ocean	
ATM 731	Advanced Weather Forecasting	
ATM 732	Air-Sea Interaction	
ATM 765	Climate Dynamics	
ATM 768	General Circulation of the Atmosphere	
CPH (TBD)	Independent Climate and Health Topics	3
<b>Dissertation Work - Required</b>		<b>6</b>
CPH 680	Thesis Proposal	3

CPH 681	Thesis	3
<b>TOTAL CREDITS</b>		<b>36</b>

**Climate and Health – Analytical Track**

<b>Core – Required Courses</b>		<b>21</b>
CHM 601/EPH 646	An Introduction to Climate & Health	3
CPH 602	Toxicology and Climate	3
CPH 603/ATM 614	Introduction to Weather and Climate	3
CPH 604/ATM 653	Climate Change	3
CPH 605/EPH 727	Climate, Environment and Health: Data Integration and Management	3
CPH 606	Analysis of the Health Effects of Climate	3
CPH 607	Policies and Management of the Health Effects of Climate	3
<b>Electives – 3 courses.</b>		<b>9</b>
<p>With the permission of their faculty advisor, students may take any elective courses offered from any department on medical campus, including the following. The elective courses should be chosen such that these courses can provide skills and/or advanced understanding of the areas related to their dissertation topic. In addition, students can pursue “independent climate and health topic (ICHT)”. Students will need to develop one page proposal for ICHT, describing the topics covered and competencies to be achieved through ICHT. These competencies must be relevant for the dissertation topic. The proposal will need to be approved by their faculty advisor.</p>		
BST 630	Longitudinal and Multilevel Data Analysis	3
EPH 705	Statistical Methods in Epidemiology II	3
BST 650	Topics in Biostatistics Research	3
BST 605	Statistical Principles in Clinical Trials	3
LAW 555	Climate Change	3
CPH (TBD)	Independent Climate and Health Topics	3
EPH 703	Advanced Statistical Methods I	3
EPH 705	Advanced Statistical Methods II	3
<b>Dissertation Work - Required</b>		<b>6</b>
CPH 680	Thesis Proposal	3
CPH 681	Thesis	3
<b>TOTAL CREDITS</b>		<b>36</b>

**Toxicology track**

<b>Core – Required Courses</b>		<b>21</b>
CHM 601	An Introduction to Climate & Health	3
CPH 602	Toxicology and Climate	3
CPH 603	Introduction to Weather and Climate	3

CPH 604	Climate Change	3
CPH 605	Climate, Environment and Health: Data Integration and Management	3
CPH 606	Analysis of the Health Effects of Climate	3
CPH 607	Policies and Management of the Health Effects of Climate	3
<b>Electives – 3 courses.</b>		<b>9</b>
With the permission of their faculty advisor, students may take any elective courses offered from any department on medical campus, including the following. The elective courses should be chosen such that these courses can provide skills and/or advanced understanding of the areas related to their dissertation topic. In addition, students can pursue “independent climate and health topic (ICHT)”. Students will need to develop one page proposal for ICHT, describing the topics covered and competencies to be achieved through ICHT. This may include competencies in in-vitro and in-vivo experiments. These competencies must be relevant for the dissertation topic. The proposal will need to be approved by their faculty advisor.		
PIBS 702	Scientific Reasoning	3
MBS 601	Biochemistry for the Biosciences	3
MBS 603	Gross Anatomy & Histology	3
MBS 604	Advanced Molecular and Cell Biology	3
MBS 605	Cell Physiology	3
MBS 608	Basic Pathobiology	3
MIC 728	Principles of Immunology	3
MIC 775	Advance Microbiology and Immunology	3
MIC 755	Microbiology and Immunology Research – Career Skills and Proficiencies	3
MIC 751	Advanced Topics in Immunology	3
HGG 621	Genes in Populations	3
PIBS 702	Scientific Reasoning	3
MBS 601	Biochemistry for the Biosciences	3
CPH (TBD)	Independent Climate and Health Topics	3
<b>Dissertation Work - Required</b>		<b>6</b>
CPH 680	Thesis Proposal	3
CPH 681	Thesis	3
<b>TOTAL CREDITS</b>		<b>36</b>

**Description – Core courses.**

*CPH601 – An Introduction to the Health Effects of Climate – A Review of Applications.* This course will introduce students to the intricate relationship between climate and health. A range of topics will be covered including: a) etiology of disease with respect to climate, weather, climate change and weather anomalies, b) shifting burden of disease and disability with respect to changing climate and climate-mediated changes in the environment across different communities and regions, and c) application areas of climate-health linkages: unintentional injuries and climate change, vector-borne disease and climate change, heat-related mortality, disease of metabolic syndrome and climate change, cardiopulmonary, allergy and immunology disease due to bioaerosols and air pollution.

*CPH602 – Toxicology and Climate.* The course will train students in developing an understanding of and skills in assessing the mechanism of the effects of climate, weather and climate and weather mediated effects of environment on biophysiological responses. For example, changes in levels of bronchoconstriction due to change in temperature is a direct effect of weather, and increase in allergies and asthma due to increase in bioaerosols in response to increase in precipitation and temperature is an indirect effect. Students will be exposed to general principles of toxicology and toxicological experimental design, including in-vitro and in-vivo experiments, designs needed to understand and investigate the health effects of climate, weather and climate mediated environmental conditions.

*CPH603 – Introduction to Weather and Climate.* This course will cover the structure, physics, dynamics and thermodynamics of the atmosphere; including weather analysis, weather forecasting, climate and climate change. Contemporary topics covered in this class will include global warming, the ozone hole, hurricanes, thunderstorms and other severe weather phenomena.

*CPH604 – Climate Change.* This course will provide an overview of the physical processes that regulate the earth's climate and its response to external forcings. Emphasis is placed on understanding feedback processes which determine the climate sensitivity of the climate to radiative forcings, robust responses of the climate system to external radiative forcings, historical observations of climate change, and model projections of both past and future climate change, and a critical analysis of the projection based on different models.

CPH605 – The course will introduce: **a)** different research designs needed to understand the linkages between climate/weather and health, and **b)** sources and types of data needed for different research designs. The course will train students in: **a)** the integration and management of weather/climate, environment, multi-level socio-demographic and health data sets that have different spatiotemporal scales, **b)** assessment of errors and uncertainty in the collocation/integration of these data sets, and **c)** visualization and presentation of these data.

CPH606 – The course will train students in analytical skills needed to quantify the health risks associated with climate change, weather and weather anomalies controlling for confounding factors and time-space hierarchical structures. The course will include quantification of time-space lagged exposure estimation, spatial, temporal and spatiotemporal analyses, exposure and risk uncertainty analyses.

CPH607 – Using a health-centered approach, the course will provide a critical review of the existing policies aimed at managing the health effects of climate/weather, identify potential gaps in the policies needed to improve and protect health effects of short- and long-term trends of climate and weather and extreme weather. Students will be exposed to the real-world preparation and adaption strategies to manage health effects of climate, and develop understanding of and skills in the cost-benefit analysis of evidence-based policies. As a part of the course, students will develop and evaluate (evidence-based) policies to manage a selected health outcome with respect to a selected (in)direct climate/weather related condition(s).

#### **4. FACULTY**

Given the interdisciplinary nature of the program, a highly interdisciplinary team of colleagues from difference colleges at UM will be engaged in teaching the core and elective courses, and advising students. Details on the faculty members who will be involved in the administration, teaching and supervision of the program are included in Table 1, and CV of the faculty members who will be responsible for teaching core courses are included in Appendix 4.

Table 2: Faculty members, their affiliation and role in the MSCH program.

Role/Designation	Name	Department/School	Specialty
<b>Administration</b>			
Program Director	Naresh Kumar, PhD	Public Health Sciences / Medical School	Air pollution toxicity; Climate mediated health effects of air pollution; time-space modeling;
Program Co-Director	Elliot Atlas, PhD	Atmospheric Sciences / RSMAS	Sources, transport, and transformation of atmospheric trace gases
Program Coordinator	TBA	Public Health Science / Medical School	Graduate study coordination
Faculty: core courses	John Beier	Public Health Sciences / Medical School	Ecology & vector-biology
	Mehdi Mirsaeidi	Internal Medicine / Medical School	Sarcoidosis, mycobacterial diseases, & bronchiectasis
	Ami P. Raval	Basic Science Div./ Medical School	Neurology
	Brian Soden	Atmospheric Sciences / RSMAS	Tropical climate change, climate modeling, & remote sensing
	Amy Clement	Atmospheric Sciences / RSMAS	Climate systems & mathematical modeling
	David Kelly	Economics / Business School	Environmental and policy & climate change policy under uncertainty
	Yongtao Guan	Management / Business School	Spatio-temporal processes & spatial epidemiology
Faculty: elective courses & advising	Scott Brown	Public Health Sciences / Medical School	Urban environment
	John Beier	Public Health Sciences / Medical School	Vector-borne disease & climate
	Jennifer Hu	Public Health Sciences / Medical School	Epi-genetic
	Alberto Caban-Martinez	Public Health Sciences / Medical School	Occupational Health
	TBA	Law School	Environmental law and policies
	Tony Alfieri	Law School	Environmental law and justice

	Hemant Ishwaran	Public Health Sciences / Medical School	Biostatistics & Statistical Methodology
Faculty: Advising	Roderick King	Assistant Dean of Public Health Education/ Medical School & CEO, Florida Institute for Health Innovation	Health policies for under-served communities; climate and health disparities.
	Laurence Kalkstein	Public Health Sciences / Medical School	Synoptic climatology & health effects
	James Klaus	Geology / RSMAS	Environmental microbiome & toxicity
	Helena-Solo-Gabriele	Civil & Environmental Engineering	Health effects of microbial & legacy contaminants
	David Nolan	Atmospheric Sciences / RSMAS	Hurricanes, tropical meteorology, severe storms, numerical modeling
	Ben Kirtman	Atmospheric Sciences / RSMAS	General circulation models for weather and climate prediction
	Sharanya Majumdar	Atmospheric Sciences / RSMAS	Tropical cyclones, adaptive observations, ensemble forecasting & predictability
	Joseph Prospero	Atmospheric Sciences / RSMAS	Global dust transport & health and aerosol chemistry
	Paquita Zuidema	Atmospheric Sciences / RSMAS	Clouds, radiation, climate & remote sensing
	Cassandra Gaston	Atmospheric Sciences / RSMAS	Air pollution and climate
	Douglas Fuller	Geography / Arts & Sciences	Remote Sensing, biogeography & health geography
	Justin Stoler	Geography / Arts & Sciences	Spatial analysis and health geography
	Kenny Broad	Abess Center for Ecosystem Science and Policy, & Marine Ecosystem & Society /RSMAS	Ecological anthropology, society & climate, & environmental policy
	Gina Maranto	Abess Center for Ecosystem Science and Policy	Environmental communication
David Letson	Marine Ecosystem & Society / RSMAS	Economics of climate variations and extreme weather	

	Michal Campos	Pulmonary, Allergy, Critical Care and Sleep Medicine / Medical School	Chronic obstructive pulmonary disease, & air pollution & asthma
	Gianluca Iacobellis	Endocrinology, Diabetes and Metabolism / Medical School	Epicardial in coronary artery & metabolic disease
	Anat Galor	Bascom Palmer Eye Institute/ Medical School	Ocular surface disorder and microenvironment
	Abigail Hackam	Ophthalmology / Medical School	Ocular surface disorder & environmental stressors
	Sung Jun Kim	Electrical and Computer Engineering / Engineering	Biosensor and real-time environmental sensing
	Joanna Lombard	School of Architecture	Urban design, community health

## 5. STUDENTS

**Expected Enrollment.** Given the nature and tremendous popularity and interest in climate and health, we expected to recruit 8 qualified students into our first cohort in the academic year 2018-19, followed by 16 in academic year 2019-20 and the full capacity of 24 students in 2020-21. However, we have also contemplated on average and worse scenarios in developing this program and its business model. The anticipated enrollment under the best, average and worst scenarios are presented in Table 3. Even in the worst-case scenario we expect at least 10 or more students from third year onward.

Table 2: Expected enrollment in the first five years of MSCH program

Status	Academic Year					Total
	FY19	FY20	FY21	FY22	FY23	
<b>Best Scenario</b>						
New students	8	16	24	24	24	108
Returning students	0	8	16	24	24	84
<b>Total Students</b>	<b>8</b>	<b>24</b>	<b>48</b>	<b>48</b>	<b>48</b>	<b>192</b>
<b>Average Scenario</b>						
New students	5	10	15	16	16	62
Returning students	0	5	10	15	16	46
<b>Total Students</b>	<b>5</b>	<b>15</b>	<b>25</b>	<b>31</b>	<b>32</b>	<b>108</b>
<b>Worst Scenario</b>						
New students	2	4	6	8	8	28
Returning students	0	2	4	6	8	20
<b>Total Students</b>	<b>2</b>	<b>6</b>	<b>10</b>	<b>14</b>	<b>16</b>	<b>48</b>

**Departmental history of successful graduate programs.** The department of public health sciences has a track-record in developing and launching successful graduate programs. In the very first year of the, we



enrolled 24 students in Master of Science in Public Health in 1980-81. Currently all of our graduate programs are economically viable, including MSPH, MD/MPH and MS in Biostatistics. Climate and health program is similar to our MPH/MSPH program. Moreover, this program is even more interdisciplinary and builds on the partnership between two colleges.

**Requirement.** Although students from with a bachelor degree with most traditional majors can apply to this program, we expect that most our MSCH students will be drawn from public health sciences, medicine, environmental sciences including meteorology, biology, ecology and life sciences, policy and laws. The students who will meet the following requirements will be recruited in the program:

- Completed online application.
- Bachelor's degree from an accredited US institution - or a comparable degree from an international institution—with a minimum cumulative GPA of 3.0.
- One year of calculus
- One year of Physics
- A course in biology
- Graduate Record Examination (GRE) scores  $\geq 60^{\text{th}}$  percentile (about 300 or higher in both verbal reasoning & Quantitative Reasoning) or MCAT score  $\geq 60^{\text{th}}$  percentile.
- Test of English as a foreign language (TOEFL) score for foreign students only  $> 86^{\text{th}}$  percentile.
- Two letters of recommendation.

## **6. ADMINISTRATION**

The program will be housed in the Department of Public Health Sciences, Miller School of Medicine, and managed by the program committee that will include seven faculty members, as described below.

**6.1 Program Committee:** The program committee will include Director and Co-Director and three faculty members from the Department of Public Health Sciences and three from Atmospheric Sciences Department. In the event of any conflict, department chairs of Public Health Sciences and graduate program directors of RSMAS and Department of Public Health Sciences will be involved to resolve the conflict.

**6.3 Faculty advising process.** Students will discuss their initial interest with the program director and/or co-director, who, depending on the interest of the students will refer them to faculty members who can potentially supervise their thesis. Thesis committee will include student's supervisor and another faculty member.

**6.4 Thesis topic and thesis contents.** Students have to come up with a topic of their interest and can work on ongoing projects on a topic that the project PI suggests. Thesis needs to make a novel contribution to the selected field and the quality of thesis must be such that it has the potential for a peer refereed publication.

**6.5 Admission Process.** The program director and co-director will screen the initial sets of application and the screen list will be presented to the Program Committee for final approval. Students in the approved list will then be sent offer.

**6.6 Research, Travel and Laboratory Supply Costs.** Business plan will have some funds for operation and maintenance of the laboratory, laboratory supplies and some money for students' travel and research support.

**6.7 Review.** The program review will be conducted by the program committee every three year. The program committee will develop a report of the program activities and performance of the program that will be subject to review by three external members. These members (non-UM affiliate) will visit the department and will have an opportunity to interact, meet and interview teaching faculty members, students and members of the program committee, and inspect the resources and laboratories relevant to the program. The final report of these three external reviewers, including their recommendations, will be submitted to the department, Faculty Council and the graduate school.

## **7. BUDGET**

The business model for the MSCH program is developed in partnership with the RSMAS and Department of Public Health Sciences. There are seven core courses of the MSCH program. Two of these seven will be offered by RSMAS and five of these seven by the Department of Public Health Sciences. Based on the contributions to the core courses the cost and revenue will be shared in this ratio: 2/7 for RSMAS and 5/7 for Department of Public Health Sciences. Given \$2,022/credit tuition revenue and 36 credit requirement, the program is expected to generate \$3.53 revenue for the University for five years under the best scenario and \$1.37 under the worst scenario of students' enrollment in the program. The program does not run into deficit under any of the scenarios except for Year 1 under the worst enrollment scenario. However, even under worst enrollment scenario, program is profitable to university as well as to the department and RSMAS starting from the second year of the program. Both, Miller School of Medicine and Rosenstiel School of Marine and Atmospheric Sciences have already agreed on this business plan (see LOS jointed signed by Deans Abraham and Avissar and Professor Rao).

*Cost of degree.* To pursue MSCH students will need to take 36 credits. Given \$2,022/credit, the expected total tuition for the MSCH program will be about \$72,000.

## **8. COMPARISONS**

Currently there are no programs the nation that train health professionals, environmental sciences, research analysts, lawyers and decision-makers in understanding and quantifying (in)direct health effects of climate, climate change, weather and weather anomalies, and management of the health effects associated with climate, climate change, weather and weather anomalies. Based on extensive online search, we found the following four related and relevant programs (see Appendix 4):

- Columbia University – Climate & Health MPH Certificate
- Yale – Climate Change & Health Pre-Doctoral Fellowship
- Harvard – Climate, Energy, and Health Program
- George Washington - Climate Change Management and Policy MPS Certificate

None of the above listed programs offers a master's degree. A review of these programs further suggests that these programs simply familiarize students with link between climate and health, and methods and procedures available to bioclimatologists. A major focus of these programs is on policy issues and healthy solutions. However, the students in the above programs have limited access to climatologists, meteorologists, physicians, toxicologist and time-space modelers, needed to develop understanding of and

skills in evaluating health effects of climate ranging from cellular response to heat stress to weather mediated health effects of bioaerosols and air pollutants. Moreover, none of these programs provides skills needed to understand and quantify direct and indirect health effects of climate, climate change, weather and weather anomalies, which are critically important to develop evidence of the health effects of climate, climate change, weather and weather anomalies. Not only are such evidences important to assess their disease/disability burden and associated healthcare costs, but also required to guide evidence based policies to manage disease and disability burden. Drawing on the strengths of our interdisciplinary faculty, the MSCH program offers the following unique and unparalleled strengths as detailed in section 1. This will be the first program of its kind that will provide students with an in-depth integration of biophysiology, weather, climate, time-space modeling, policy and law, offering them unique understanding and skills needed to address health effects of climate, climate change, weather and weather anomalies in the 21<sup>st</sup> century.

### 8.1 Novel aspects of MSCH at UM

- ***Cutting scale barriers*** – The MSCH program will cut-across the scale barriers, because students will be exposed to and trained in assessing micro (i.e. intra-cellular), meso and macro level (in)direct health effects of climate and weather. For example, students will learn about changes in gene-expression to heat stress and responses of different communities with respect to their adaptation and infrastructure capacity. Likewise, they will also learn about precise mortality and morbidity burden associated with heat waves in a given city or a region, and reduction in mortality burden due to effective heat warning system.
- ***Dismantling disciplinary boundaries*** – students will learn skills and understanding of multiple and intricate aspects of climate and health from multiple disciplines, including atmospheric sciences, climatologist, biology, toxicology, healthcare delivery and time-space modeling.
- ***Miami a live laboratory*** – South Florida, especially Miami, is a live laboratory to understand and witness health effects of climate and weather. Climate and weather conditions and associated disease and disability that we experience in South Florida at present, the rest of the country is likely to experience it in the future. Therefore, the understanding and evidence of the health effects of climate and weather across different communities we generate in here holds the potential to guide future policies for the nation.
- ***Florida Public Health Institute (d.b.a. Florida Institute for Health Innovation [www.flhealthinnovation.org](http://www.flhealthinnovation.org))*** - Through the collaborative partnership with the University of Miami, students will have an opportunity to pursue internship opportunities with the only statewide public health institute which has led the way in identifying the public health impacts of climate change. In 2013, FIHI led the first Health Impact Assessment on the health effects of the Southeast Florida Regional Climate Change Action Plan for regional climate change adaptation and mitigation planning to demonstrate potential population health impacts given certain climate change effect. Then from 2014-2014, FIHI and regional planning and environmental organizations reported on the impact of sea-level rise on the health of populations in South Florida.

## APPENDICES

Appendix 1: Labor Bureau – Statistics Concerning Comparable Job Market

Appendix 2: Comparable Programs in the Nation

**Appendix 3: Example Job Opportunities**

**Appendix 4: Supporting laboratory resources**

**Appendix 5: Faculty CV**

**Appendix 6: Letters of Support**

## References.

1. Kiem, A.S. and E.K. Austin, *Drought and the future of rural communities: Opportunities and challenges for climate change adaptation in regional Victoria, Australia*. Global Environmental Change-Human and Policy Dimensions, 2013. **23**(5): p. 1307-1316.
2. Mori, A.S., T.A. Spies, K. Sudmeier-Rieux, and A. Andrade, *Reframing ecosystem management in the era of climate change: Issues and knowledge from forests*. Biological Conservation, 2013. **165**: p. 115-127.
3. Rockstrom, J., M. Falkenmark, T. Allan, C. Folke, L. Gordon, A. Jagerskog, M. Kummu, M. Lannerstad, M. Meybeck, D. Molden, S. Postel, H.H.G. Savenije, U. Svedin, A. Turton, and O. Varis, *The unfolding water drama in the Anthropocene: towards a resilience-based perspective on water for global sustainability*. Ecohydrology, 2014. **7**(5): p. 1249-1261.
4. Halsnaes, K., A. Markandya, and P. Shukla, *Introduction: Sustainable Development, Energy, and Climate Change*. World Development, 2011. **39**(6): p. 983-986.
5. Grove, K.J., *Insuring oOur Common Future?o Dangerous Climate Change and the Biopolitics of Environmental Security*. Geopolitics, 2010. **15**(3): p. 536-563.
6. Dalby, S., *Climate geopolitics: Securing the global economy*. International Politics, 2015. **52**(4): p. 426-444.
7. Costello, A., M. Abbas, A. Allen, S. Ball, S. Bell, R. Bellamy, S. Friel, N. Groce, A. Johnson, M. Kett, M. Lee, C. Levy, M. Maslin, D. McCoy, B. McGuire, H. Montgomery, D. Napier, C. Pagel, J. Patel, J.A. de Oliveira, N. Redclift, H. Rees, D. Rogger, J. Scott, J. Stephenson, J. Twigg, J. Wolff, and C. Patterson, *Managing the health effects of climate change: Lancet and University College London Institute for Global Health Commission*. Lancet, 2009. **373**(9676): p. 1693-733.
8. Wang, H. and R. Horton, *Tackling climate change: the greatest opportunity for global health*. Lancet, 2015. **386**(10006): p. 1798-9.
9. Watts, N., W.N. Adger, P. Agnolucci, J. Blackstock, P. Byass, W. Cai, S. Chaytor, T. Colbourn, M. Collins, A. Cooper, P.M. Cox, J. Depledge, P. Drummond, P. Ekins, V. Galaz, D. Grace, H. Graham, M. Grubb, A. Haines, I. Hamilton, A. Hunter, X. Jiang, M. Li, I. Kelman, L. Liang, M. Lott, R. Lowe, Y. Luo, G. Mace, M. Maslin, M. Nilsson, T. Oreszczyn, S. Pye, T. Quinn, M. Svensdotter, S. Venevsky, K. Warner, B. Xu, J. Yang, Y. Yin, C. Yu, Q. Zhang, P. Gong, H. Montgomery, and A. Costello, *Health and climate change: policy responses to protect public health*. Lancet, 2015. **386**(10006): p. 1861-914.
10. Knowlton, K., M. Rotkin-Ellman, G. King, H.G. Margolis, D. Smith, G. Solomon, R. Trent, and P. English, *The 2006 California heat wave: impacts on hospitalizations and emergency department visits*. Environ Health Perspect, 2009. **117**(1): p. 61-7.
11. See, L., G. Mills, and J. Ching, *Climate modelling: Community initiative tackles urban heat*. Nature, 2015. **526**(7571): p. 43.
12. Son, J.Y., M.L. Bell, and J.T. Lee, *The impact of heat, cold, and heat waves on hospital admissions in eight cities in Korea*. Int J Biometeorol, 2014. **58**(9): p. 1893-903.
13. D'Amato, G., S.T. Holgate, R. Pawankar, D.K. Ledford, L. Cecchi, M. Al-Ahmad, F. Al-Enezi, S. Al-Muhsen, I. Ansotegui, C.E. Baena-Cagnani, D.J. Baker, H. Bayram, K.C. Bergmann, L.P. Boulet, J.T. Buters, M. D'Amato, S. Dorsano, J. Douwes, S.E. Finlay, D. Garrasi, M. Gomez, T. Haahtela, R. Halwani, Y. Hassani, B. Mahboub, G. Marks, P. Michelozzi, M. Montagni, C. Nunes, J.J. Oh, T.A. Popov, J. Portnoy, E. Ridolo, N. Rosario, M. Rottem, M. Sanchez-Borges, E. Sibanda, J.J. Sienra-Monge, C. Vitale, and I. Annesi-Maesano, *Meteorological conditions, climate*

*change, new emerging factors, and asthma and related allergic disorders. A statement of the World Allergy Organization. World Allergy Organ J, 2015. 8(1): p. 25.*

**CEPH Core Competencies  
 Master of Science in Climate and Health  
 Department of Public Health Sciences**

<b>Learning objectives</b>	<b>Describe how the SPH/PHP ensures grounding</b>
<b>Profession &amp; Science of Public Health</b>	
1. Explain public health history, philosophy and values	*Required MSCH Coursework: CPH 601 – Climate and Health *Previous completion of CEPH-accredited bachelor's degree
2. Identify the core functions of public health and the 10 Essential Services <sup>1</sup>	*Required MSCH Coursework: CPH 601 Climate and Health & CPH 607 – Policies and management of the health effects of climate  *Previous completion of CEPH-accredited bachelor's degree
3. Explain the role of quantitative and qualitative methods and sciences in describing and assessing a population's health.	*Required MSCH Coursework: CPH 605 - Climate, Environment and Health – Data Integration and Management & CPH 606 – Analysis of the Health Effects of Climate  *Previous completion of CEPH-accredited bachelor's degree
4. List major causes and trends of morbidity and mortality in the US or other community relevant to the school or program	*Required MSCH Coursework: CPH 601 – Climate and Health; CPH602 – Toxicology and Climate;  *Previous completion of CEPH-accredited bachelor's degree
5. Discuss the science of primary, secondary and tertiary prevention in population health, including health promotion, screening, etc.	*Required MSCH Coursework: CPH 607 – Policies and Management of the Health Effects of Climate;  *Previous completion of CEPH-accredited bachelor's degree
6. Explain the critical importance of evidence in advancing public health knowledge	*Required MSCH Coursework: CPH 607 – Policies and Management of the Health Effects of Climate; CPH 602 – Toxicology and Climate; CPH 606 – Analysis of the Health Effects of Climate  *Previous completion of CEPH-accredited bachelor's degree
<b>Factors Related to Human Health</b>	
7. Explain effects of environmental factors on a population's health	*Required MSCH Coursework: CPH 601- Climate and Health; CPH 602 – Toxicology and Climate  *Previous completion of CEPH-accredited bachelor's degree
8. Explain biological and genetic factors that affect a population's health	*Required MSCH Coursework: CPH602 – Toxicology and Climate; CPH 601 – Climate and Health.  *Previous completion of CEPH-accredited bachelor's degree
9. Explain behavioral and psychological factors that affect a population's health	*Required MSCH Coursework: CPH 607 – Policies and Management of the Health Effects of Climate  *Previous completion of CEPH-accredited bachelor's degree

<b>10. Explain the social, political and economic determinants of health and how they contribute to population health and health inequities</b>	<b>*Required MSCH Coursework: CPH 607 – Policies and Management of the Health Effects of Climate.</b>  <b>*Previous completion of CEPH-accredited bachelor's degree</b>
<b>11. Explain how globalization affects global burdens of disease</b>	<b>*Required MSCH Coursework: CPH 607 – Policies and Management of the Health Effects of Climate; CPH 601 – Climate and Health</b>  <b>*Previous completion of CEPH-accredited bachelor's degree</b>
<b>12. Explain an ecological perspective on the connections among human health, animal health and ecosystem health</b>	<b>*Required MSCH Coursework: CPH 601 – Climate and Health;</b>  <b>*Previous completion of CEPH-accredited bachelor's degree</b>