

## Abstract Session F4: Global Health

Association of Pre-Treatment Nutritional Status with Change in CD4 count after Initiation of Antiretroviral Therapy at 6, 12, and 24 months in Rwandan Women [Elizabeth Kiefer](#)<sup>1</sup>; Donald Hoover<sup>2</sup>; Qiuhu Shi<sup>3</sup>; Jean-Claude Dusingize<sup>1</sup>; Mardge Cohen<sup>4</sup>; Eugene Mutimura<sup>5</sup>; Kathryn Anastos<sup>1</sup>. <sup>1</sup>Montefiore Medical Center, Bronx, New York ; <sup>2</sup>Rutgers University, Piscataway, New York ; <sup>3</sup>New York Medical College, Valhalla, New York ; <sup>4</sup>Rush University, Chicago, New York ; <sup>5</sup>Kigali Health Institute, Kigali, New York . (Proposal ID # 10739)

**BACKGROUND:** HIV infection and malnutrition are prevalent in Africa. Rwandan women share a greater burden of HIV than men, and malnutrition (using World Health Organization definition of body mass index (BMI)  $< 18.5 \text{ kg/m}^2$ ) is common (approximately 19%) in our preliminary studies of HIV-positive Rwandan women. Low serum albumin and BMI have been shown to independently predict increased mortality in several African studies. However, macro- and micro-nutrient supplementation have failed to consistently show reductions in HIV mortality. It is thus unclear whether these malnutrition measures simply mark more advanced HIV disease, and there are scant data on the effect of nutritional status on response to antiretroviral therapy (ART). As ART becomes more available in the low income countries, it is crucial to understand the association between poor nutrition and response to ART. We hypothesized that poorer nutritional status would be associated with poorer gains in CD4 count after ART initiation.

**METHODS:** This analysis was done on 537 Rwandan Women's Interassociation Study and Assessment (RWISA) participants who initiated ART after study entry and had at least six subsequent months of follow up. RWISA is a population-based observational cohort study of 710 ART-naïve HIV+ and 226 HIV-negative women who enrolled in 2005 and seen at six month's visits. At these visits, health and health behavior data were collected, including whether women initiated ART (exact dates of ART initiation and medication regimen were determined), physical exams performed, and biologic specimens collected and stored. Medical care was provided by non-governmental and national health organizations, separately from the RWISA study. Following World Health Organization (WHO) and Rwandan guidelines, women were eligible for ART if they had; WHO Stage IV disease, irrespective of the CD4 cell count; WHO Stage III disease with CD4 cell counts  $< 350 \text{ cells}/\mu\text{L}$ , or CD4  $< 200/\mu\text{L}$  regardless of clinical stage. The study outcomes were changes in CD4 count at follow up visits  $6\pm 3$ ,  $12\pm 3$ , and  $24\pm 3$  months after ART initiation. Indicators of nutritional status collected from the study visit prior to ART initiation that were used in these analyses included BMI, albumin, fat adjusted for (height)<sup>2</sup>, fat free mass (FFM) adjusted for (height)<sup>2</sup>, and sum of skinfold measurements at the thigh, triceps and subscapular muscles. Resistance and reactance obtained from bioelectric impedance measurements were used in standard formulae to calculate FFM and fat. Other covariates used included age, income in Rwandan Francs (FRW), education, pre-ART CD4 count (per 100 cells/ $\mu\text{L}$ ) and history of AIDS defining illness (ADI) prior to ART initiation. Nutritional variables were examined in univariate linear regression models of CD4 change. Multivariate linear regression models of change for each nutritional variable were fit using backwards selection.

**RESULTS:** 537 women initiated ART at a mean age of 35 years. Mean (within 6 months) preART CD4 count was  $216 \text{ cells}/\mu\text{L}$ . Prior to ART, the mean BMI was  $21.6 \text{ kg/m}^2$  (18.3% of the women classified as malnourished), mean albumin  $3.4 \text{ g/dL}$ ; mean adjusted fat  $4.70 \text{ kg/m}^2$ , mean adjusted FFM  $17.1 \text{ kg/m}^2$ ; and mean sum of skinfold measurements  $0.495 \text{ cm}$ . The mean change in CD4 count from pre-ART to  $6\pm 3$ ,  $12\pm 3$ , and  $24\pm 3$  months was 71, 89 and 153 cells/ $\mu\text{L}$ , respectively. In univariate analysis, higher albumin was associated with a smaller increase in CD4 count from pre-ART to 6 months post-ART (estimate  $-17.8 \text{ cells}/\mu\text{L}$  per g/dL,  $p=0.03$ ), but not at 12 or 24 months post-ART. Thus for example, those with  $4.0 \text{ g/dL}$  albumin gained on average 17.8 fewer CD4 cells/ $\mu\text{L}$  compared to those with  $3.0 \text{ g/dL}$  of albumin. FFM was also inversely associated with change in CD4 count at 6 months ( $-6.7 \text{ cells}/\mu\text{L}$  per  $\text{kg/m}^2$ ,  $p=0.03$ , respectively), but not at 12 or 24 months. For example, those with an adjusted FFM of  $18.1 \text{ kg/m}^2$  gained 6.7 fewer CD4 cells/ $\mu\text{L}$  from pre-ART to 6 months post-ART compared to those with  $17.1 \text{ kg/m}^2$  FFM. BMI, fat, and skinfold measurements were not associated with change in CD4 count at any follow up time. In multivariate analysis after adjustment for covariates, no nutritional variables were associated with a change in CD4 count from pre-ART to 6, 12, or 24 months post-ART. Reflecting in part the regression to the mean phenomenon, higher CD4 count prior to initiation of ART was a consistent predictor of lower increase in CD4 count from pre-ART to each post-ART follow up time (estimate  $-20.52$ ,  $-23.30$ , and  $-29.05 \text{ cells}/\mu\text{L}$ , per 100 cells/ $\mu\text{L}$  higher CD4 preART, respectively for 6, 12, 24 months,  $p<0.0001$  for each).

**CONCLUSION:** In univariate analysis, higher FFM and albumin were associated with a smaller increase in CD4 count from pre-ART to 6 months, but not 12 or 24 months post-ART. However, these results did not persist in multivariate analysis at 6 months after adjustment for traditional predictors of response to ART. No marker of nutritional status predicted change in CD4 count from pre-ART to 6, 12, or 24 post-ART months in multivariate analysis.

These results show that poor pre-ART nutritional status, measured by BMI, adjusted fat, adjusted FFM, albumin, and skinfolds does not preclude a good response to ART. The associations, of higher FFM and albumin with a smaller post-ART CD4 increase seen in univariate analysis, likely reflect that these were markers of severe illness, and thus these were not significant in multivariate analysis. Low BMI, fat, FFM, albumin, and skinfolds can be associated with severe illness, and these markers should be fully investigated and interpreted with caution in further nutritional analyses.

**Projected Effect of Dietary Salt Reductions on Future Cardiovascular Disease in Argentina** Raul Mejia<sup>1</sup>; Daniel Ferrante<sup>2</sup>; Eliseo J Perez-Stable<sup>3</sup>; Kirsten Bibbins-Domingo<sup>4</sup>; Pamela Coxson<sup>5</sup>; Lee Goldman<sup>6</sup>; Andrew Moran<sup>6</sup>. <sup>1</sup>Hospital de Clinicas, Buenos Aires, N/A ; <sup>2</sup>Ministry of Health, Argentina, N/A ; <sup>3</sup>UCSF, San Francisco, California ; <sup>4</sup>University of California San Francisco, San Francisco, California ; <sup>5</sup>University of California, San Francisco, San Francisco, California ; <sup>6</sup>Columbia University, New York, New York . (Proposal ID # 11423)

**BACKGROUND:** The average per capita consumption of salt in Argentina is about 12 grams per day with the majority coming from processed foods. Reducing dietary salt may have a beneficial effect on public health by reducing consequences of elevated blood pressure because elevated blood pressure explains nearly 50,000 deaths per year.

**METHODS:** The Coronary Heart Disease (CHD) Policy Model is a national-scale computer model of CHD and stroke. We used the CHD Policy Model to Argentinean population to quantify the benefits of a 3 g per day reduction in dietary salt. Data sources for the model included vital statistics mortality data, morbidity data from clinical sites, and cost data from public and private sectors. We estimated the rates and costs of cardiovascular disease in subgroups defined by age and sex for the next ten years. Based on the assumption that the effect of salt reduction on blood pressure reduction was linear over the range of 0 to 3 g per day we determined the cost-effectiveness of salt reduction considering a high effect scenario (5.6 mmHg reduction in the systolic blood pressure) and low effect scenario (3.6 mmHg reduction in the systolic blood pressure) scenarios.

**RESULTS:** Reducing dietary salt by 3g per day is projected to reduce the incidence of CHD by 10%, stroke by 12%, and myocardial infarction by 7.3% and to reduce the annual number of deaths from any cause by 2.5%, considering the high efficacy scenario. All segments of the population would benefit. The cost of implementing a salt reduction program, including processed foods reduction through agreements with food industry and population education campaigns during 10 years would be estimated at \$14 million in US dollars. Because of the reduction in hospital admissions and other health care costs, the implementation of this program will save \$974 million US dollars in ten years (discounted). In the high efficacy scenario the salt reduction will save 262,100 Quality Adjusted Life Years (QALYs); in the low efficacy scenario this program will save 161,500 QALYs.

**CONCLUSION:** A 3 g per day reduction in dietary salt could dramatically reduce cardiovascular events and medical costs and should be a public health target. This potential impact contributes to raise this intervention in the public health policy agenda.

## **The cost-effectiveness of selective tobacco control policies in South Africa** Asaf Bitton<sup>1</sup>; Thomas Gaziano<sup>2</sup>.

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**BACKGROUND:** Tobacco use is a leading cause of cardiovascular disease (CVD) and other chronic conditions in developing countries. However, very few estimates of the financial impact of tobacco control policies on the healthcare system in these countries have been conducted. . Because South Africa instituted discrete tax and indoor air policies aimed at reducing its high rates of tobacco use, we sought to establish the cost-effectiveness of these interventions.

**METHODS:** We used a Markov model to perform a cost-effectiveness analysis on the two tobacco policy interventions separated in time. South Africa instituted a progressively increased tobacco excise tax starting in 1993, after which taxes eventually reached 52% of the retail cost. Starting in 2001, South Africa banned smoking in all indoor locations except for restaurants, which were allowed up to 25% separately ventilated smoking sections. Our model used published estimates of the effect of these interventions on tobacco prevalence, the effect on tobacco on CVD and non-CVD related mortality, South Africa-specific data on the costs of implementing and enforcing these policies, as well as CVD- and other related health care costs., To compare strategies, we report incremental cost-effectiveness ratios (ICER), in US dollars (year 2000) per disability-adjusted life-year (DALY) over a ten year window, and a variety of sensitivity analyses on the indoor air laws.

**RESULTS:** For the tobacco tax strategy, we used a conservative published estimate of the implementation cost of \$1.24 per capita which would result in an ICER of \$31/DALY averted. A threshold analysis showed that at a cost below \$1.11 per capita, the policy would be cost-saving; this is notable because some published literature suggests that the true cost in South Africa may have been as low as \$0.10 per capita. These analyses exclude any tax revenue intake associated with the policy. For the clean indoor air strategy, our base case estimate was an ICER of \$410/DALY averted. In one-way sensitivity analyses around the costs of enforcement and the effects on prevalence, the ICERs ranged from \$223 to \$643 and \$388 to \$333 per DALY averted, respectively. A probabilistic sensitivity analysis around the intervention costs, enforcement costs, intervention benefits, and risk reduction on non-CVD mortality found a mean ICER value of \$472/DALY averted with 95% Confidence Intervals ranging from cost saving to \$601/DALY averted.

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**Building A Community-Based Academic Primary Care And Chronic Disease Management Program In Western Kenya: Approach And Initial Results** William Michael Tierney<sup>1</sup>; Sylvester N. Kimaiyo<sup>2</sup>; Joseph J. Mamlin<sup>3</sup>; Winstone M. Nyandiko<sup>2</sup>; Thomas S. Inui<sup>4</sup>; Abraham M. Siika<sup>2</sup>; Robert M. Einterz<sup>5</sup>. <sup>1</sup>Regenstrief Institute, Indiana University School of Medicine, Indianapolis, Indiana ; <sup>2</sup>Moi University School of Medicine, Eldoret, N/A ; <sup>3</sup>Indiana University School of Medicine, Eldoret, N/A ; <sup>4</sup>Indiana University School of Medicine, Indianapolis, Indiana ; <sup>5</sup>Indiana University, Indianapolis, Indiana . (Proposal ID # 11471)

**BACKGROUND:** Through the Presidential Emergency Plan for AIDS Relief (PEPFAR), the U.S. has committed \$60 billion for HIV/AIDS care in developing countries. Indiana University in partnership with Moi University in Kenya and a consortium of more than a dozen North American universities launched the Academic Model Providing Access to Healthcare (AMPATH). AMPATH has established HIV/AIDS clinics in 50 rural and urban health centers and hospitals that serve a catchment population of 2 million. To date, with more than \$85 million in PEPFAR funding, AMPATH has enrolled more than 130,000 HIV-infected patients who have made more than 2.5 million visits to AMPATH clinics. In 2007, AMPATH decided to expand its mission to include community- and facility-based primary care and chronic disease management (CDM), focusing initially on heart and lung disease, cancer, diabetes, and mental health. In 2010, PEPFAR expanded its mission beyond HIV/AIDS to focus on strengthening health care infrastructure in selected developing countries and was renamed the Global Health Initiative. We discuss the approaches AMPATH has taken, to tools it has developed, progress to date, and future plans.

**METHODS:** AMPATH's approach is termed FLTR: find, link, treat, retain. Focusing on a subpopulation of 500,000, HCT and a network of community health workers identifies patients with HIV, TB, pregnancy, and chronic conditions and refers them to AMPATH clinics. AMPATH employs more than 150 counselors in a home counseling and testing (HCT) program. Working with local community facilitators, counselors contact all households in a community and attempt to register each member, interview and screen each adult, and enter data into Android phones linked to a sophisticated electronic health record (EHR). They screen those 13 and older for HIV and those coughing for TB, deworm children, issue bednets, and refer those HIV+, pregnant, or with medical problems to AMPATH clinics. A new EHR module captures primary care and CDM data from HCT and clinic encounter forms. The EHR provides data for patient care and clinic management including patient summaries, protocol-based reminders, and drug and visit adherence data. Treatment is mostly by physicians' assistants and nurses using standard protocols and encounter forms. An aggressive outreach program traces no-shows.

**RESULTS:**

To date, HCT counselors have approached 454,598 persons: 98% agreed to be interviewed and 96% of these were screened for HIV (2.5% or more than 5000 were HIV+) and TB (45 new cases found). Of those referred to AMPATH clinics, only 17% have visited to date, but >90% of pregnant women have kept visits. The primary care EHR has been initially installed in 3 rural primary care clinics which have enrolled and have visit data for more than 50,000 patients. At clinics affiliated with the national Moi Teaching and Referral Hospital (MTRH), more than 130,000 patients have been enrolled, and visit data are being collected at TB, Antenatal, and Pediatric Clinics. Existing cardiology, pulmonary, oncology, diabetes, and mental health primary care and referral clinics at MTRH are being enhanced by training health care providers, expanding the available tests and treatments, and providing clinic-specific encounter forms. To improve care and outcomes, the AMPATH Research Network supports >70 active research projects funded by grants totaling >\$30 million.

**CONCLUSION:** : A large, established academic HIV/AIDS partnership in western Kenya is expanding to include primary care and CDM. HCT has been successfully performed on almost half a million persons to identify those needing HIV/AIDS care, primary care, and CDM. However, referring patients to clinic-based care has proved challenging, yet success among pregnant women is encouraging. HCT is adding community-based screening for hypertension and diabetes to screening for HIV and TB, and AMPATH clinics are expanding to care for heart and lung disease, cancer, diabetes, and mental health. AMPATH is training a core of community health workers who will implement future community-based public health programs. Maturation of EHRs and collecting a core set of data are necessary for managing care systems of this size and for providing data for monitoring and improving care. The research component serves the care system by providing the knowledge base for care improvement.

**Association of Media Literacy with Cigarette Smoking among Indigenous Youth in Argentina** Eliseo J Perez-Stable<sup>1</sup>; Maria Victoria Salgado<sup>2</sup>; Brian Primack<sup>3</sup>; Celia Kaplan<sup>4</sup>; Raul Mejia<sup>5</sup>; Steven Gregorich<sup>4</sup>; Ethel Alderete<sup>6</sup>. <sup>1</sup>UCSF, San Francisco, California ; <sup>2</sup>University California San Francisco, San Francisco, California ; <sup>3</sup>University of Pittsburgh School of Medicine, Pittsburgh, Pennsylvania ; <sup>4</sup>University California San Francisco, San Francisco, California ; <sup>5</sup>Hospital de Clinicas, Buenos Aires, N/A ; <sup>6</sup>ICTER, Jujuy, N/A . (Proposal ID # 11481)

**BACKGROUND:** Latin America has the highest prevalence of tobacco use by youth. Media literacy, defined as the ability to analyze and evaluate media messages, has been associated with lower smoking among youth in the US. To determine whether media literacy related to smoking is independently associated with current smoking and susceptibility to future smoking in a sample of mostly indigenous youth in Jujuy, Argentina.

**METHODS:** In 2006, a survey was conducted among eighth grade students in class and from a random sample of 27 urban and rural schools stratified by region in Jujuy. Standard items adapted from the CDC global youth tobacco surveys were used and including those assessing previously identified risk factors for smoking such as peer smoking, adult smoking at home, use of alcohol, depression, school performance and thrill-seeking attitudes. Survey items measured smoking behavior (ever, never, and current), susceptibility to future smoking among never smokers ("definitely not" likely to smoke or in the future) and five items assessing smoking media literacy (SML) adapted and translated from an existing 18-item measure. The SML scale included items such as "There are often hidden messages in cigarette ads" with 4 ordered response options ranging from 1 (strongly disagree) to 4 (strongly agree). Average score of  $\geq 3$  was considered high media literacy.

**RESULTS:** Of the 3470 respondents, 53% were girls, and the majority of respondents were of indigenous (67%) or mixed indigenous/European (21%) ethnicity. About half had had at least one parent who smoked, having 5 or more friends who smoke (57%), depressive symptoms in the previous year (38%), and having consumed alcohol in the previous week (36%) were common. 1170 (34%) reported having smoked in the previous 30 days and were defined as current smokers. Of the 1430 students who had never smoked a cigarette, 912 (64%) were susceptible to future smoking. High media literacy was present in 38% of the sample. Unadjusted models showed a significant association of SML with current smoking (OR=0.83; 95% CI 0.73 - 0.95) and susceptibility to future smoking (OR=0.79; 95% CI 0.65- 0.97). Fully adjusted models for age, gender, race, parent's education level, parent's employment status, two parents household, parental smoking, friends smoking, depressive symptoms, thrill seeking orientation, alcohol use in the past week, work during class period, and ever repeated a grade showed that high SML was significantly associated with lower odds of being current smoker (OR=0.81; 95% CI 0.67-0.97) and of being susceptible to future smoking (OR=0.73; 95% CI 0.58-0.92) among those who had never smoked.

**CONCLUSION:** Among youth in Jujuy, higher SML was significantly associated with both lower current smoking and among never smokers less susceptibility to future smoking. There is sufficient evidence now to evaluate the incorporation of a media literacy curriculum as a standard component of school-based education and to investigate the efficacy of smoking media literacy interventions among diverse populations.

## **Impact and cost effectiveness of the implementation of a new tobacco control law in Argentina** Raul Mejia

<sup>1</sup>; Eliseo J Perez-Stable <sup>2</sup>; Pamela Coxson <sup>3</sup>; Andrew Moran <sup>4</sup>; Lee Goldman <sup>4</sup>. <sup>1</sup>Hospital de Clinicas, Buenos Aires, N/A ; <sup>2</sup>UCSF, San Francisco, California ; <sup>3</sup>University California San Francisco, San Francisco, California ; <sup>4</sup>Columbia University, New York, New York . (Proposal ID # 11433)

**BACKGROUND:** In Argentina 27% of the population smokes regularly and second hand smoke exposure affects 70% of homes. Tobacco use is responsible for 16% of adult mortality. As in the US, there is no national and comprehensive tobacco control law, but only regional laws with variable components. In 2010, Argentina's lower chamber of congress passed a tobacco control law mandating 100% smoke free environments for the country, strong pictorial health warnings on packaging of tobacco products and a comprehensive advertising ban. However, Argentina's senate has not approved the law to date. Our objective is to estimate the impact and cost-effectiveness of the implementation of this law from 2010 to 2020.

**METHODS:** The Coronary Heart Disease(CHD) policy model, a national-scale computer model of CHD and stroke, was adapted with data from Argentina and used to project future clinical outcomes and costs. Data sources for the model included vital statistics mortality data, morbidity data from clinical sites, and cost data from public and private sectors. The 2005 National Risk Factor Survey provided tobacco use estimates. Based on previous studies, the effectiveness of interventions was estimated: 60% reduction of second hand smoke exposure due to 100% smoke free policies, 1% yearly reduction of tobacco consumption due to health warnings and, 2% yearly reduction of tobacco consumption due to the comprehensive ban on advertising, promotion and sponsorship. Results were expressed as lives saved, quality adjusted life years saved (QALYs), and coronary heart disease and strokes avoided yearly and in the 10-year period between 2010 and 2020. For the cost-effectiveness analysis, the incremental cost effectiveness ratio was reported, considering the current scenario of no national law, current level of tobacco use and second-hand smoke exposure.

**RESULTS:** In the 2010-2020 period, 180,000 all cause deaths, 45,000 coronary heart disease deaths, 110,000 myocardial infarctions and 177,000 strokes could be avoided due to the full implementation and enforcement of this law. 756,000 QALYs could also be saved. The yearly reduction could be 21.9% for myocardial infarctions, 21% for stroke, 14.2% for CHD death and 7% for all cause deaths. With full implementation of the interventions, net savings from the health system perspective could be \$951million (discounted) in ten years, even after including the intervention costs.

**CONCLUSION:** The final enactment of this law would produce significant public health benefits in Argentina similar to the experience in California. Strong advocacy is needed at national and international level to get these laws approved and enforced.