PUERTO RICO ORAL HEALTH STATUS
CARIBBEAN ORAL HEALTH INITIATIVE

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University of Puerto Rico
Background

- Unincorporated territory of the United States.
- In 1898, Spain ceded the archipelago, as well as the Philippines, to the United States as a result of its defeat in the Spanish-American War.
- Puerto Ricans were granted US citizenship in 1917 and since 1948 have elected their own governor.
- The islanders do not vote in U.S. presidential elections because the territory is not a state.
The island's current political status, including the possibility of statehood or independence, is widely debated in Puerto Rico. In November 2012, a non-binding referendum resulted in 54% of respondents voting to reject the current status under the territorial clause of the U.S. Constitution. Among respondents to a second question about alternatives, 61% voted for statehood as the preferred alternative to the current territorial status.
Puerto Rico: Socioeconomic Indicators

- 45% of the Puerto Rican population lives under the poverty level, twice as high as Mississippi's 22.4%, the state with the highest rate in the U.S.\(^1\)
- Puerto Rico has one of the slowest growth forecast in the world (2011 Economist Intelligence Unit).
- Per capita income is $15,000.00, about one-third of the level on the US mainland.\(^2\)
- Puerto Rico has the highest unemployment rate in the U.S. at 14.8%.

\(^1\)US Census Bureau, 2012
\(^2\)Puerto Rico Planning Board, June 2012
Puerto Rico: Socioeconomic Indicators

• Puerto Rico has one of the highest rate of health insurance coverage in the US at 92.5% in 2011, up from 92% in 2010\(^1\)

• However, Puerto Rico has the lowest rate of private health insurance at 40.8% in 2011, down from 42.2% in 2010 and well below the US average of 60.8 percent.\(^2\)

• More than 1.6 million Puerto Rico residents are covered by the island government’s *Mi Salud* (Medicaid) program.\(^2\)

\(^{1}\)US Census Bureau, 2012

\(^{2}\)Puerto Rico Health Insurance Administration, 2011
Puerto Rico: Socioeconomic Indicators

- Among all U.S. territories, Puerto Rico has the second highest GINI coefficient, 0.531, preceded by the District of Columbia with a coefficient of 0.534.³
- 40% of the population receives 8% of the country’s income, while the remaining 92% goes into the hands of 60% of the population, which implies an unequal distribution of wealth.
- The population of people under 18 years old fell to 17 percent in 2012.

³http://www.businessinsider.com/wyoming-income-equality-2012-9#ixzz2kMncfRDq
Puerto Rico: Population Structure

• 52% are women. ¹
• 52% have college degrees.
• 15% of the population is over 65 years old. ¹
• In 42% of the families, there is a person over 65 years old, which means that this elderly population does not have sufficient income to live alone. ¹
• Spanish is the native language of the majority of Puerto Ricans, only one in five have mastered the English language skills.

¹US Census Bureau, 2012
Age Distribution 2010

Puerto Rico: 2010

Population (in thousands)

Source: U.S. Census Bureau, International Data Base.
Age Distribution 2050

Puerto Rico: 2050

Source: U.S. Census Bureau, International Data Base.
Vulnerable Populations

• Elderly Population
• Expectant Mothers
• HIV/AIDS Patients
• Children
• People living below the poverty level
• Special Needs Patients
Puerto Rico Healthcare System

• 1954: The island was divided into six regions taking into consideration the municipalities’ different risk factors and were grouped into areas that were consistent in health conditions and health indicators.

• 1954 - 1993: Puerto Rico has a dual health system:
  • **Private:** which access depends on the financial capacity of each individual to cover the cost of health services or to buy a medical insurance.
  • **Public:** accessible to all the population through the Department (Ministry) of Health.
Puerto Rico Healthcare System

- 1993: A new government establishes a healthcare reform based on the impression that the private sector provides better quality and more efficient services.
- The island is divided into new health regions and these were assigned to different health insurance companies to manage the health of the population.
## Puerto Rico Healthcare System: Dental Coverage

<table>
<thead>
<tr>
<th><strong>Includes:</strong></th>
<th><strong>Excludes:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>• Diagnosis</td>
<td>• Molars Endodontics</td>
</tr>
<tr>
<td>• Exams, Radiographs</td>
<td>• Prosthetics</td>
</tr>
<tr>
<td>• Preventive</td>
<td>• Pre-prosthetic and Periodontal Surgical Procedures</td>
</tr>
<tr>
<td>• Restorative</td>
<td>• Oral Pathology</td>
</tr>
<tr>
<td>• Resins, Amalgams</td>
<td></td>
</tr>
<tr>
<td>• Basic Surgery</td>
<td></td>
</tr>
<tr>
<td>• Endodontics</td>
<td></td>
</tr>
<tr>
<td>• Anteriors and Premolars</td>
<td></td>
</tr>
</tbody>
</table>
Public Policy and Programs

• Responsibility of the Department of Health
  • The lack of a State Dental Officer for a long time did not allow the promotion of public policy
  • However, the Department continued offering education services to school children.
  • The recently appointed State Dental Officer has continued the education services in addition to a Fluoride Varnish Program and referrals.
Public Policy and Programs

- The Colegio de Cirujanos Dentistas also contributes and its very active in the establishment of public policy.
  - Ex. Compulsory dental examination and treatment for primary and secondary school children
  - Pharmacy Law—to eliminate dental professionals from the tax impositions on medications
  - Electronic Health Record—registration and exchange of digital health information
- “Give Kids a Smile”, initiated by the American Dental Association in 2003 as a way for dentists to join with others in the community to provide dental services to underserved children.
  - UPRSDM, CCDPR and Department of Health
## Dental Workforce 2010


<table>
<thead>
<tr>
<th>Category</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total dentists</td>
<td>1,581</td>
</tr>
<tr>
<td>Total of active dentists</td>
<td>1,574</td>
</tr>
<tr>
<td>Government</td>
<td>42</td>
</tr>
<tr>
<td>Federally Qualified Health Centers</td>
<td>24</td>
</tr>
<tr>
<td>Armed Forces and other federal institutions</td>
<td>27</td>
</tr>
<tr>
<td>Dental School Full-Time faculty</td>
<td>51</td>
</tr>
<tr>
<td>Dental School Part-Time faculty</td>
<td>51</td>
</tr>
<tr>
<td>Private Practice</td>
<td>1,362</td>
</tr>
<tr>
<td>GP/Pedo</td>
<td>1,202</td>
</tr>
<tr>
<td>Other specialties</td>
<td>160</td>
</tr>
<tr>
<td>Full time practitioners</td>
<td>1,190</td>
</tr>
<tr>
<td>Part time practitioners</td>
<td>172</td>
</tr>
</tbody>
</table>
Dental Workforce 2010

US Census Bureau, 2010

- Dentist per 100,000 habitants
  - Rate of active dentists: 42.3 active dentists
  - Rate of GP/Pedo: 32.3 GP/Pedo actives
  - Rate of specialists: 4.3 specialists

- Habituants per Dentist in Puerto Rico
  - Rate of habitants per active dentists in PR: 2,367
  - Rate of habitants per GP/Pedo in PR: 3,099
  - Rate of habitants per specialists in PR: 23,282
Dental Workforce: Auxilliary Personnel

- Dental Hygienists: Unknown. No academic program exists in PR at this time
- Dental Assistants: around 900 dental assistants according to the Puerto Rico Board of Dental Examiners. Not all of them are licensed to practice, but the Department of Health is currently working on this.
  - Dental Assistants with Expanded Functions: can work on patients in the delivery of reversible procedures
Oral Health Service Delivery System (Workforce)

• Private Services
  • 1,385 active dentists at the Colegio de Cirujanos Dentistas (State Dental Association) in 2013

• Public Services
  • In 1993 the existent Assistant Secretariat for Oral Health was restructured and most clinical staff moved to the private sector.
  • In 1999 the Puerto Rico Department of Health closed its Assistant Secretariat for Oral Health. This office became the Oral Health Program and provides education services at schools and other community settings.
  • In 2013, through a federal grant, the Department of Health appointed a State Dental Officer. Currently the Department of Health continues its education services in addition to conduct a Fluoride Varnish Program and referrals.
Oral Health Service Delivery System (Workforce)

- Most of the services are provided by private practice practitioners
- Only 42 dentists work for the government providing services. (2010)
- The rest of public services are provided by the UPR faculty & postdoctoral students using the remaining clinical facilities of the Department of Health and the University of Puerto Rico
  - Department of Health
    - University District Hospital
    - Pediatric University Hospital
  - University of Puerto Rico
    - Hospital of the UPR
    - School of Dental Medicine
Dental Education

- Only one dental school
  - Admission’s Requirement: Minimum three years of college.
- 1 doctoral program
  - 40 students/year
  - An international program for foreign-trained dentists – 10 students/year
  - DMD-PhD combined program 1 student/year
- 6 Postdoctoral Programs
  - OMFS
  - PEDO
  - ORTHO
  - PROSTHO
  - ENDO
  - Two General Practice Residency Programs (GPR & AEGD)
  - Postdoctoral Master’s degree in Clinical Research
Dental Education

• New Programs to be established
  • Periodontics
  • Geriatric Dentistry
  • Combined DMD-MPH program
  • Public Health Dentistry
Oral Health Status

• An island-wide study was conducted in school children (12 y/o) from November 2010 through May 2011 to assess the impact of the Puerto Rico health reform in the prevalence of dental caries and other oral health indicators (sealant, fluorosis, gingivitis and oral cancer).

• Caries prevalence was reduced from 81% in 1997 to 71% in 2011.

• Mean DMFT index was also reduced from 3.8 in 1997 to 2.7 in 2011.

Elias, et. al. 1998 & 2011
## Oral Health Status: Sealants

<table>
<thead>
<tr>
<th>Results</th>
<th>1997</th>
<th>2011</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prevalence of Sealed First Molars on public schools</td>
<td>3.4%</td>
<td>15.5%</td>
</tr>
<tr>
<td>Prevalence of Sealed First Molars on private schools</td>
<td>11%</td>
<td>28.0%</td>
</tr>
</tbody>
</table>

Elias, et. al.1998 & 2011
# Oral Health Status: Gingivitis

## Gingival bleeding prevalence among all, by gender, and school type

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>n</th>
<th>Gingival Bleeding</th>
<th>95% CI</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GENDER</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Males</td>
<td>599</td>
<td>200</td>
<td>85.54%</td>
<td>81.88-89.20</td>
</tr>
<tr>
<td>Females</td>
<td>666</td>
<td>217</td>
<td>86.01%</td>
<td>82.32-89.71</td>
</tr>
<tr>
<td><strong>SCHOOL TYPE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Public</td>
<td>1005</td>
<td>388</td>
<td>85.96%</td>
<td>82.68-89.25</td>
</tr>
<tr>
<td>Private</td>
<td>260</td>
<td>29</td>
<td>83.46%</td>
<td>75.62-91.30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>1265</td>
<td>417</td>
<td>85.79%</td>
<td>82.70-88.87</td>
</tr>
</tbody>
</table>

*Weighted values

Ramirez, 2012
# Oral Health Status: Bleeding on Probing

<table>
<thead>
<tr>
<th>US schoolchildren</th>
<th>Black children</th>
<th>White children</th>
<th>Hispanic children</th>
<th>PR schoolchildren</th>
</tr>
</thead>
<tbody>
<tr>
<td>58.80%</td>
<td>74.9%</td>
<td>55.10%</td>
<td>Similar to white children</td>
<td>85.49%</td>
</tr>
</tbody>
</table>

Three dentists were trained and standardized by the US National Health and Nutrition Examination Survey (NHANES) reference examiner.

A representative cohort of the Puerto Rican elderly ages 70-97, in the San Juan Area were selected.

Probing depth (PD), attachment loss (AL), and tooth mobility were assessed among the dental participants on 4 sites for all teeth excluding third molars (Montero, M., 2012).

The prevalence of moderate and severe periodontitis (CDC-AAP) was 44.5% compared to 20.7% in the NHANES 1999-2004 survey among 75 years and older (Montero, M., 2012).

Oral Health Status: Oral Cancer

- For the period of 2005-2009, oral cavity and pharynx cancer was the **fifth** most commonly diagnosed cancer among men and the **fifteenth** in women of PR.

- Each year, during 2005-2009, approximately **272** men and **84** women were diagnosed with oral cavity and pharynx cancer. For each year, during 2004-2008, **109** men and **24** women died from this cancer.

- It accounts for **4.0%** of all male cancers and **1.5%** of all female cancers between 2005-2009.

- Puerto Rico residents with intraoral lesions suspicious for oral cancer or pre-cancer, are most likely to be biopsied only after developing an invasive cancer, and therefore are not receiving the benefits of early detection.

- Main risk factors are HPV, alcohol and tobacco consumption.
Oral Health Status: Oral Cancer

- Oral Cavity and Pharynx cancer incidence was 3.9 times (CI 95%: 3.5, 4.4) higher among men than among women, during the period of 2005-2009.
- The mortality of this cancer was 6.0 times (CI 95%: 4.9, 7.3) higher among men than among women during the period of 2004-2008.
- Apparently, disparity exists in the early detection of Oral cancer in PR related to the US.
Oral Health Status: Oral Cancer

Age-adjusted Incidence rate Oral Cavity and Pharynx Cancer by sex, 2002
### Top Ten Incidence Cancer Sites, 2005-2009

<table>
<thead>
<tr>
<th>Males (N=34,060)</th>
<th>%</th>
<th>Females (N=28,482)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate</td>
<td>41.2</td>
<td>Breast</td>
<td>30.3</td>
</tr>
<tr>
<td>Colon and Rectum</td>
<td>13.1</td>
<td>Colon and Rectum</td>
<td>13.9</td>
</tr>
<tr>
<td>Lung and Bronchus</td>
<td>6.3</td>
<td>Thyroid</td>
<td>8.0</td>
</tr>
<tr>
<td>Urinary Bladder</td>
<td>4.0</td>
<td>Corpus and Uterus</td>
<td>7.1</td>
</tr>
<tr>
<td>Oral Cavity and Pharynx</td>
<td>4.0</td>
<td>Lung and Bronchus</td>
<td>4.2</td>
</tr>
<tr>
<td>Non-Hodgkin Lymphoma</td>
<td>3.3</td>
<td>Non-Hodgkin Lymphoma</td>
<td>3.9</td>
</tr>
<tr>
<td>Stomach</td>
<td>2.9</td>
<td>Cervix Uteri</td>
<td>3.8</td>
</tr>
<tr>
<td>Liver and Intrahepatic Bile Duct</td>
<td>2.8</td>
<td>Stomach</td>
<td>2.6</td>
</tr>
<tr>
<td>Kidney and Renal Pelvis</td>
<td>2.1</td>
<td>Ovary</td>
<td>2.6</td>
</tr>
<tr>
<td>Leukemia</td>
<td>2.0</td>
<td>Leukemia</td>
<td>2.0</td>
</tr>
<tr>
<td>Other Locations</td>
<td>18.3</td>
<td>Other Locations</td>
<td>21.6</td>
</tr>
</tbody>
</table>

Statistics are from an average of the years 2005-2009.
Cases with age unknown were excluded/Statistics were generated from malignant cases only
Rates are per 100,000 and age-adjusted to the 2000 PR population
Population estimates were based on the intercensal population provided by the US Census Bureau.
Data Source: Puerto Rico Central Cancer Registry, Preliminary Puerto Rico Cancer Incidence File (January, 2013)
### Top Ten Mortality Cancer Sites, 2004-2008

<table>
<thead>
<tr>
<th>Males (N=13,815)</th>
<th>%</th>
<th>Females (N=10,669)</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prostate</td>
<td>18.6</td>
<td>Breast</td>
<td>18.8</td>
</tr>
<tr>
<td>Lung and Bronchus</td>
<td>13.3</td>
<td>Colon and Rectum</td>
<td>13.4</td>
</tr>
<tr>
<td>Colon and Rectum</td>
<td>12.7</td>
<td>Lung and Bronchus</td>
<td>10.1</td>
</tr>
<tr>
<td>Liver and Intrahepatic Bile Duct</td>
<td>6.0</td>
<td>Pancreas</td>
<td>5.0</td>
</tr>
<tr>
<td>Stomach</td>
<td>5.4</td>
<td>Liver and Intrahepatic Bile Duct</td>
<td>4.9</td>
</tr>
<tr>
<td>Oral Cavity and Pharynx</td>
<td>4.0</td>
<td>Stomach</td>
<td>4.4</td>
</tr>
<tr>
<td>Pancreas</td>
<td>3.7</td>
<td>Corpus and Uterus</td>
<td>4.4</td>
</tr>
<tr>
<td>Esophagus</td>
<td>3.6</td>
<td>Ovary</td>
<td>4.4</td>
</tr>
<tr>
<td>Leukemia</td>
<td>3.6</td>
<td>Non-Hodgkin Lymphoma</td>
<td>3.5</td>
</tr>
<tr>
<td>Non-Hodgkin Lymphoma</td>
<td>3.4</td>
<td>Leukemia</td>
<td>3.5</td>
</tr>
<tr>
<td>Other Locations</td>
<td>25.7</td>
<td>Other Locations</td>
<td>27.6</td>
</tr>
</tbody>
</table>

Cases with age unknown were excluded. Statistics were generated from malignant cases only.
Rates are per 100,000 and age-adjusted to the 2000 PR population.
Population estimates were based on the intercensal population provided by the US Census Bureau.
Data Source: Puerto Rico Department of Health and National Center for Health Statistics using the Medical Mortality Data System (MMDS) for the years 2000-2008.
Oral Cavity and Pharynx Incidence by Age Groups and Sex, Puerto Rico 2005-2009

Percent (%)

Age Groups

<20
20-34
35-44
45-54
55-64
65-74
75-84
85+

Male
Female

PRCCR., 2012
Birth Prevalence Rates of Oral Clefts in Puerto Rico (1999-2010)*

*P-trend<0.05

(Puerto Rico Health Department, 2012)

Legend

Birth prevalence rates per 10,000 live births

Prevalence

- 0.00 - 6.60
- 6.61 - 14.90
- 14.91 - 22.70
- PR Rate 15.89
- 22.71 - 45.60

(Puerto Rico Health Department, 2005-2009; Buxó, 2013)
Significance:
Oral Cleft Birth Prevalence in Puerto Rico

Birth Prevalence Rates of Oral Clefts in Several Populations

- South Africa
- Tennessee, USA
- Asturias, Spain
- Venezuela
- Puerto Rico
Oral Health Research

• Mainly conducted by the University of Puerto Rico
• Emphasis on oral health disparities of the Puerto Rican population
• The university also conducts corporate clinical and public health research.
• A research pipeline exist that starts at the secondary school level to the postdoctoral level.
• The Puerto Rico Department of Health have also conducted oral health research.
UPR Oral Health Research Program

- Health Disparities
- Calibration
- Corporate Clinical Research
- Dental Public Health Unit
UPR Oral Health Research Pipeline Program

Pipeline

- High School
- College
- Dental DMD
- Post-Doctoral
- UPR-Rochester DMD/PHD
- Faculty Development
Research Funding

- Provided by private corporations and federal institutions (NIH)
- Mostly involved a grant process
Research Publications

Faculty peer reviewed publications:
Fiscal years 2002-2007 and 2007-2012

n=24    n=100
Students’ Research Opportunities

• Summer Research Programs
  • Faculty: (U of Washington)
  • Students: (U. of Rochester, Minnesota & NIH)

• Research Courses Offered at Pre-doctoral-level (DMD)

• DMD-Ph.D. Training Program (U. of Rochester)

• Publications

• Funds for research
Research Portfolio

• *Periodontitis and Pre-clinical Diabetes*, Dr. K. Joshipura (PI)

• *Pregnancy and Early Lifestyle improvement Study*, Dr. K. Joshipura (PI)

• *Clinical validation of combined ICDAS/QLF Exam for Early Caries Detection*, Dr. A. Elías (PI) & Vivaldí (Co-I) UPR and A. Zandona (PI) Indiana University

• *An Intervention Trial for Effects of Oral Health Improvement on Adverse Maternal-Fetal Outcomes of Gestational Diabetes*, Dr. L. López (Co-I) UPR & Dr. J Ebersole (PI) U Kentucky
Research Portfolio

• *Increasing oral cancer screening by dentists: qualitative research on practitioners*, Dr. A. Elías Boneta (PI)

• *Validation of chair-side biochemical screening instruments for dental caries*, Dr. W. J. Psoter (PI) & Dr. Evangelia Morou-Bermudez (PI)

• *Capacity Advancement in Research Infrastructure: UPR School of Dental Medicine*, Dr. A. Elías (PI)
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