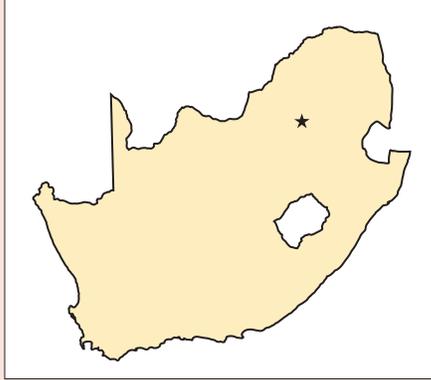


# South Africa



- **Capital:** Pretoria
- **Area:** 1,219,090 sq km
- **Population:** 48,810,427 (July 2012 est.)
- **Age Structure:** 0-14 years: 28.5% (male 6,998,726/female 6,959,542); 15-64 years: 65.8% (male 16,287,314/female 15,972,046); 65 years and over: 5.7% (male 1,125,709/female 1,660,694) (2011 est.)
- **Life Expectancy at Birth:** Total population: 49.41 years; male: 50.34 years; female: 48.45 years (2012 est.)
- **Infant Mortality Rate:** Total: 42.67 deaths/1,000 live births; male: 46.54 deaths/1,000 live births; female: 38.73 deaths/1,000 live births (2012 est.)
- **Literacy Rate:** Total population: 86.4%; male: 87%; female: 85.7% (2003 est.)
- **GDP:** \$554.6 billion (2011 est.)
- **GDP per Capita:** \$11,000 (2011 est.)

## Highlights

- The South African severe acute respiratory infection surveillance program case definition was extended at selected sentinel sites to include patients with suspected or confirmed tuberculosis to investigate the association between influenza and tuberculosis.
- Real-time PCR assays were implemented for the influenza HA and NA genes respectively, to distinguish between influenza B Brisbane and Yamagata lineages and to detect the oseltamivir resistant H275Y mutation.
- The Discovery Clinical Excellence Award was received at the Federation of Infectious Diseases Societies of Southern Africa Conference.
- An award was won for the best poster at the Seventh International Respiratory Syncytial Virus Conference in Rotterdam, held December 2–5, 2010.
- First runner-up was won for the best publication by a young researcher: University of Pretoria, 2010, for a paper on pandemic H1N1 influenza virus infections in South Africa.

## U.S. CDC Direct Country Support

The National Influenza Center (NIC) at the National Institute for Communicable Diseases (NICD) is leading the Influenza Surveillance Programme in South Africa and has both a national and regional focus, especially in the Southern African Development Community (SADC). The cooperative agreement *Preparedness and Response to Avian and Pandemic Influenza in South Africa* between the U.S. Centers for Disease Control and Prevention (CDC) and the NICD at the National Health Laboratory Services (NHLS) began in August 2007. The main purpose of this agreement is to strengthen the capacity of national health authorities for surveillance of severe acute respiratory infection (SARI) and influenza-like illness (ILI) and

the health authorities in selected countries of the SADC for the diagnosis of influenza. In 2011, a new cooperative agreement *Sustaining Surveillance Networks and Response to Seasonal and Pandemic Influenza in South Africa* was awarded for a five-year period. The key objectives of this agreement are (i) to optimize and consolidate the ILI and SARI surveillance systems and generate robust data while working toward down-scaling SARI surveillance to ensure long-term sustainability, (ii) to consolidate the laboratory capacity so as to serve as national and regional influenza reference center, and (iii) to establish additional technology and infrastructure required to obtain H5 reference center status.

## Surveillance

Influenza surveillance in South Africa consists of three main active surveillance programs. 1) The Viral Watch program has ILI sentinel surveillance in all nine provinces. This program focuses on outpatients seen mainly by general practitioners as well as pediatricians and primary health care clinics across the country. 2) The Enhanced Viral Watch program was established following the emergence of influenza A (H1N1)pdm09 with the aim of expanding Viral Watch to include hospitalized patients. Eleven hospitals in nine provinces participate and submit specimens from hospitalized patients with SARI. 3) The SARI surveillance program was established in 2009 and monitors hospitalized patients with more severe respiratory disease from whom detailed epidemiologic data are collected. This program currently includes six hospitals and covers four of the nine provinces. In addition, NICD also offers support to NHLS laboratories that perform routine testing for respiratory virus disease across the country.

### Surveillance Activities

- Regular site visits to sentinel hospitals were conducted. These focused on the following: data and process reviews, ensuring that study procedures were being followed correctly, and training for surveillance officers.
- Presentations on surveillance data results were given to clinicians at three of the sentinel surveillance sites.
- The annual SARI and rotavirus surveillance meeting for investigators was held on November 10, 2011, at NICD in Johannesburg. The purpose of the meeting was to share surveillance and research findings with stakeholders and discuss future projects.
- A SARI and rotavirus surveillance meeting for officers was held from December 5–6, 2011, at NICD in Johannesburg. The purpose of the meeting was to provide ongoing surveillance officer training, give updates on projects and introduce new projects planned for 2012.
- Annual influenza symposia were held in March 2011 at NICD in Johannesburg. This annual meeting shares data from NICD influenza surveillance programs with stakeholders and provides updates on topical issues related to influenza surveillance, diagnosis, prevention and management.



Staff from the Edendale surveillance site in South Africa. From left to right: Wendy Ngubane (Surveillance Officer), Ulenta Chetty (Surveillance Officer), Wisdom Malinga (Research Assistant), Khadija Shangase (Surveillance Officer), Wanjiru Maina (Medical Officer).

## Laboratory

The NIC in the Centre for Respiratory Diseases and Meningitis, NICD, is earmarked as a World Health Organization (WHO) Regional Reference Laboratory for Influenza and plays a key role in the support for the establishment of influenza laboratory and surveillance capacity in the SADC. The Centre is also working toward becoming a Reference Laboratory for H5 Avian Influenza human cases in the region. The NIC performs laboratory surveillance, molecular diagnosis and typing of influenza viruses and is tasked with investigation of the annual influenza molecular epidemiology, as well as resistance testing as part of the annual consultations for WHO vaccine recommendations. Influenza virus isolation and antigenic characterization using hemagglutination inhibition assays are key activities of the NIC. As part of the African Influenza Procurement program, the NIC has assisted 10 African countries with procuring reagents, consumables and sample collection materials for influenza testing during FY 2011.



*Research assistant, Wisdom Malinga collecting data.*

### Laboratory Activities

- The NIC processed 6,373 respiratory specimens from January to September 2011. Influenza A was detected in 1,321 (20.9%) specimens and influenza B in 122 (2.1%).
- The hemagglutinin gene fragment 1 (HA1) of 22 influenza A (H3N2) viruses, 41 A(H1N1)pdm09 viruses and six influenza B viruses was sequenced for the 2011 season.
- The neuraminidase (NA) genes of 19 influenza A (H3N2) viruses and 25 A(H1N1)pdm09 viruses collected in 2011 were sequenced.
- Eighty SARI and 214 ILI clinical samples tested in 2011 had the H275 wild type signature by real-time PCR.
- Using the phenotypic drug resistance assay, influenza A (H1N1)pdm09 and influenza A (H3N2) isolates from 2010 and 2011 were screened for sensitivity to oseltamivir and zanamivir; isolates from 2007 to 2009 were also screened.
- A total of 149 isolates were made, of which 83 were A(H1N1)pdm09, 12 were influenza A (H3N2) and eight were influenza B isolates.
- The NIC offered ongoing support, technical assistance and testing to the Region.
- A multiplex real-time RT-PCR assay (10 respiratory viruses) was accredited by the South African National Accreditation System.
- A method for detection of influenza subtypes using CDC real-time RT-PCR was accredited by the Department of Agriculture, Forestry and Fisheries for assisting in testing of ostriches during the influenza A (H5N2) outbreak.

### Preparedness

Much of the work to develop a pandemic influenza preparedness plan paid off as the country responded to the 2009 H1N1 pandemic. The state of the national preparedness plan for South Africa in 2010 was greatly improved and significantly more efficient compared to its pre-pandemic status. Key factors

contributing to this include the implementation of an influenza vaccination campaign steering committee, mass vaccination campaign training in every province, influenza management training in many provinces, and the capacitation of public health laboratories to enable increased access to influenza PCR testing.

The NIC hosted and participated in a laboratory management and bioinformatics training program presented by CDC for African laboratories at NICD. NHLS laboratories in Natal, Freestate and Gauteng were trained to run the multiplex real-time PCR assay of 10 respiratory viruses as part of the viral watch program. The Democratic Republic of Congo was also trained in using the 10 plex real-time PCR assay for respiratory viruses.

### **Preparedness Activities**

- Hosted meetings with the Department of Health and other stakeholders to discuss the objectives of influenza surveillance and additional data needs to guide influenza vaccination policy in South Africa.
- Attended the TEPHINET Sixth Global Scientific Conference on December 13, 2010, in Cape Town and a staff member served as a co-facilitator for the influenza workshop which included discussions of preparedness activities.
- Accredited by the Department of Agriculture, Forestry and Fisheries, the NIC supported testing for influenza A (H5N2) viruses during the avian influenza outbreak in ostriches and tested over 700 ostrich specimens.

### **Training**

- A staff member attended the sixth annual African vaccinology course at the University of Cape Town on November 8–12, 2010.
- Staff members facilitated various training sessions for laboratory staff, data clerks, surveillance officers, public health registrars and medical officers in 2010 and 2011.
- Three staff members attended the Second Annual African Network for Influenza Surveillance and Epidemiology (ANISE) Meeting held in Ghana from the January 12–13, 2011.
- A laboratorian attended a meeting with NICs on strengthening the WHO Global Influenza Surveillance and Response System (GISRS) in Tunisia, November 30–December 3, 2010.
- In collaboration with CDC, we hosted a laboratory management training course for influenza viruses at the NICD, February 28–March 4, 2011.
- Two staff members led training sessions organized by the WHO for laboratory scientists in Ndola, Zambia and Kinshasa, Democratic Republic of Congo in 2011.

### **Publications**

- Kresfelder TL, Pretorius M, Janssen R, Bont L, Venter M. Confirmation of an association between single nucleotide polymorphisms in the VDR gene with respiratory syncytial virus related disease in South African children. *Journal of Medical Virology*. 2011;83(10):1834-40.
- Van Kerkhove MD, Mounts AW, Sabine Mall, Katelijn A.H. Vandemaele, Chamberland M, Thais dos Santos, Fitzner J, Widdowson MA, Michalove J, Bresee J, Olsen SJ, Quick L, Baumeister E, Carlino L.O, Osvaldo Uez VS, Owen R, Ghani F, Paterson B, Forde A, Fasce R, Torres G, Andrade W, Bustos P, Mora J, Gonzalez C, Olea A, Sotomayor V, Manuel Najera De Ferrari, Alejandra Burgos, Darren Hunt, Sue Huang, Jennings LC, Macfarlane M, Lopez LD, McArthur C, Cohen C, Brett A, Blumberg L, Cengimbo A, Makunga C, McAnerney J, Msimang V, Naidoo D, Puren A, Schoub BD, Thomas J, Venter M for the WHO Southern Hemisphere Influenza Comparison Study Working Group. Epidemiologic and virologic assessment of the 2009 influenza A (H1N1) pandemic on

selected temperate countries in the Southern Hemisphere: Argentina, Australia, Chile, New Zealand and South Africa. *Influenza and Other Respiratory Viruses*. 2011;5(6):e487-498.

- Van Kerkhove MD, Vandemaele KA, Shinde V, Jaramillo-Gutierrez G, Koukounari A, Donnelly CA, Carlino LO, Owen R, Paterson B, Pelletier L, Vachon J, Gonzalez C, Hongjie Y, Zijian F, Chuang SK, Au A, Buda S, Krause G, Haas W, Bonmarin I, Taniguichi K, Nakajima K, Shobayashi T, Takayama Y, Sunagawa T, Heraud JM, Orelle A, Palacios E, van der Sande MA, Wielders CC, Hunt D, Cutter J, Lee VJ, Thomas J, Santa-Olalla P, Sierra-Moros MJ, Hanshaoworakul W, Ungchusak K, Pebody R, Jain S, Mounts AW, on behalf of the WHO Working Group for Risk Factors for Severe H1N1pdm Infection. Risk factors for severe outcomes following 2009 influenza A (H1N1) infection: A global pooled analysis. *PLoS Med*. 2011;8(7):e1001053.
- Van Niekerk S, Venter M. Replacement of previously circulating Respiratory Syncytial Virus (RSV) subtype B strains with the BA genotype in South Africa. *Journal of Virology*. 2011;85(17):8789-97.
- Venter M, Lassaunière R, Kresfelder TL, Westerberg Y, Visser A. Contribution of common and recently described respiratory viruses to annual hospitalisations in children in South Africa. *Journal of Medical Virology*. 2011;83(8):1458-68.

## Contacts

Marietjie Venter, PhD  
Principal Investigator  
Co-Director (Virology), Centre for Respiratory Diseases and Meningitis  
National Institute for Communicable Diseases  
Sandringham, Johannesburg, South Africa  
Email: marietjiev@nicd.ac.za

Cheryl Cohen, MBBCh, FCPATH (SA) Micro, DTM&H, MSc  
Epidemiologist  
Co-Director (Epidemiology), Centre for Respiratory Diseases and Meningitis  
National Institute for Communicable Diseases  
Sandringham, Johannesburg, South Africa  
Email: cherylc@nicd.ac.za

Shabir Madhi, MBBCh, FCPaed (SA), MMed (SA), PhD (Wits)  
Executive Director  
National Institute for Communicable Diseases  
Sandringham, Johannesburg, South Africa  
Email: shabirm@nicd.ac.za

Adam Cohen, MD, MPH  
Director, Influenza Program  
CDC-South Africa  
Sandringham, Johannesburg, South Africa  
Email: adamc@nicd.ac.za; dvj1@cdc.gov

Stefano Tempia, DVM, MSc, PhD  
Influenza Technical Adviser  
CDC-South Africa  
Sandringham, Johannesburg, South Africa  
Email: stefanot@nicd.ac.za