



A One-Health approach to antibiotic stewardship in Africa

Prevention, monitoring and control of Antimicrobial Resistance in the context of a One Health approach involving veterinary and human health fields

Prof Moritz van Vuuren

The need for antimicrobial stewardship across a One Health platform



MENU ▾

nature
International journal of science

Letter | Published: 31 August 2011

Antibiotic resistance is ancient

Vanessa M. D'Costa, Christine E. King, Lindsay Kalan, Mariya Morar, Wilson W. L. Sung, Carsten Schwarz, Duane Froese, Grant Zazula, Fabrice Calmels, Regis Debruyne, G. Brian Golding, Hendrik N. Poinar ✉ & Gerard D. Wright ✉

Nature **477**, 457–461 (22 September 2011) | [Download Citation](#) ↓

Abstract

The discovery of antibiotics more than 70 years ago initiated a period of drug innovation and implementation in human and animal health and

Targeted metagenomic analyses of rigorously authenticated ancient DNA from 30,000-year-old Beringian permafrost sediments identified a highly diverse collection of genes encoding resistance to β -lactam, tetracycline and glycopeptide antibiotics.

One health approach



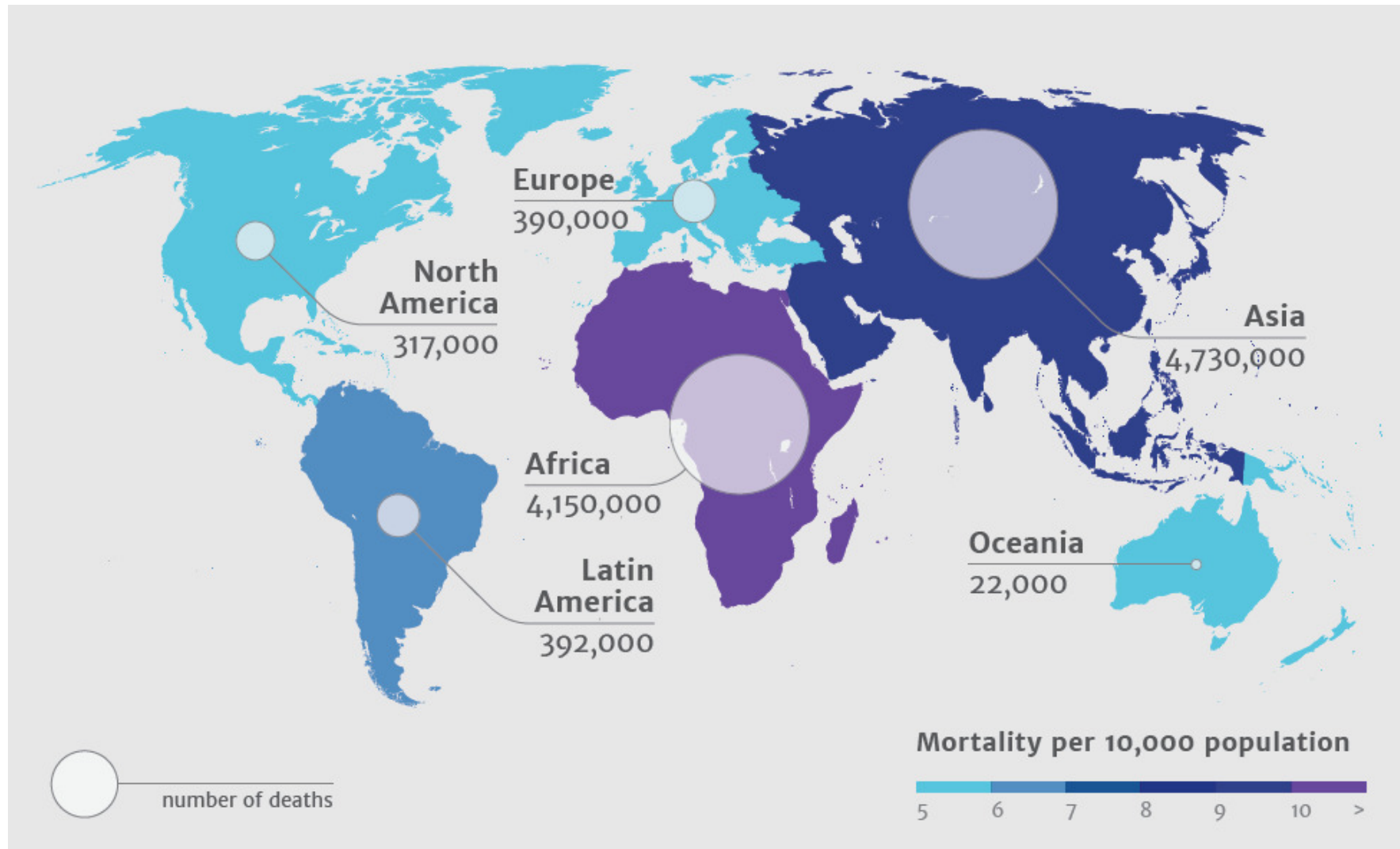
TACKLING DRUG-RESISTANT INFECTIONS GLOBALLY: FINAL REPORT AND RECOMMENDATIONS

THE REVIEW ON
ANTIMICROBIAL RESISTANCE

CHAIRER BY JIM O'NEILL

MAY 2016

The hammer blow will fall on LMICs



The review on antimicrobial resistance, chaired by Jim O'Neil, 2014

Humans - Global increase in antibiotic consumption

Global increase and geographic convergence in antibiotic consumption between 2000 and 2015

Eili Y. Klein^{a,b,c,1}, Thomas P. Van Boeckel^d, Elena M. Martinez^a, Suraj Pant^a, Sumanth Gandra^a, Simon A. Levin^{e,f,g,1}, Herman Goossens^h, and Ramanan Laxminarayan^{a,f,i}

n=76 countries over a period of 16 years

Between 2000 and 2015, antibiotic consumption, expressed in defined daily doses (DDD), increased 65% (21.1–34.8 billion DDDs), and the antibiotic consumption rate increased 39% (11.3–15.7 DDDs per 1,000 inhabitants per day).

The increase was driven by low- and middle-income countries (LMICs), where rising consumption was correlated with gross domestic product per capita (GDPPC) growth ($P = 0.004$)

Global trends in antimicrobial use in food animals

Thomas P. Van Boeckel^{a,1}, Charles Brower^b, Marius Gilbert^{c,d}, Bryan T. Grenfell^{a,e,f}, Simon A. Levin^{a,g,h,1}, Timothy P. Robinsonⁱ, Aude Teillant^{a,e}, and Ramanan Laxminarayan^{b,e,j,1}

^aDepartment of Ecology and Evolutionary Biology, Princeton University, Princeton, NJ 08544; ^bCenter for Disease Dynamics, Economics & Policy, Washington, DC 20036; ^cUniversite Libre de Bruxelles, B1050 Brussels, Belgium; ^dFonds National de la Recherche Scientifique, B1000 Brussels, Belgium; ^ePrinceton Environmental Institute, Princeton, NJ 08544; ^fFogarty International Center, National Institutes of Health, Bethesda, MD 20892; ^gBeijer Institute of Ecological Economics, 10405 Stockholm, Sweden; ^hResources for the Future, Washington, DC 20036; ⁱInternational Livestock Research Institute, 00100 Nairobi, Kenya; and ^jPublic Health Foundation of India, New Delhi 110070, India

Contributed by Simon A. Levin, February 18, 2015 (sent for review November 21, 2014; reviewed by Delia Grace and Lance B. Price)

Demand for animal protein for human consumption is rising *coli* in pigs, poultry, and cattle. Several works additionally sug-

Authors present the first global map of antibiotic consumption in livestock

They project that antimicrobial consumption will rise by 67% by 2030, and nearly double in Brazil, Russia, India, China, and South Africa

This rise is likely to be driven by the growth in consumer demand for livestock products in middle-income countries and a shift to large-scale farms where antimicrobials are used routinely

One Health approach to stewardship and AMS deliverables in South Africa



Commitments and
objectives of the AMR
National Strategy
Framework launched at
the end of 2014

Commitments and Objectives



- To collaborate as inter-sectoral interdisciplinary organisations and departments to strengthen, co-ordinate and institutionalise efforts to address AMR

MAC

- To establish a national surveillance system to track and report resistant organisms and antimicrobial use in agriculture and human health
- To promote the appropriate use of antimicrobials in human and animal health through antimicrobial stewardship in facilities and suitable enabling legislation and regulations
- To build the expertise and strengthen the competency of health and veterinary professionals and improve the staffing levels of the workforce in AMR and IPC

Intersectoral Ministerial Advisory Committee



**agriculture,
forestry & fisheries**

Department:
Agriculture, Forestry and Fisheries
REPUBLIC OF SOUTH AFRICA



**science
& technology**

Department:
Science and Technology
REPUBLIC OF SOUTH AFRICA



education

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REPUBLIC OF SOUTH AFRICA



the dti

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REPUBLIC OF SOUTH AFRICA



environmental affairs

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REPUBLIC OF SOUTH AFRICA



health

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REPUBLIC OF SOUTH AFRICA



SAASP
SOUTH AFRICAN ANTIBIOTIC
STEWARDSHIP PROGRAMME

Academia

Laboratory
networks

Professional
Societies &
Bodies

Private hospital
groups

Civil Society
& key NGOs

HPCSA/SAVC

SAHPRA

Commitments and Objectives

- To collaborate as inter-sectoral, interdisciplinary organisations and departments to strengthen, co-ordinate and institutionalise efforts to address AMR



- To establish a national surveillance system to track and report resistant organisms and antimicrobial use in agriculture and human health

AB consumption humans 2018

AB consumption animals 2015-2017

AMR maps for human and animal health

- To promote the appropriate use of antimicrobials in human and animal health through antimicrobial stewardship in facilities and suitable enabling legislation and regulations
- To build the expertise and strengthen the competency of health and veterinary professionals and improve the staffing levels of the workforce in AMR and IPC



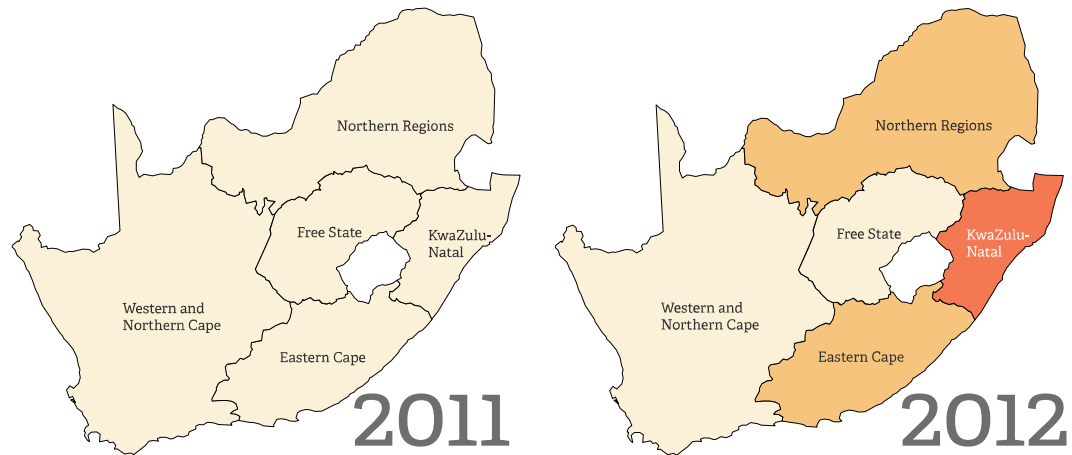
**SURVEILLANCE FOR
ANTIMICROBIAL
RESISTANCE AND
CONSUMPTION OF
ANTIBIOTICS IN SOUTH
AFRICA**

NOVEMBER 2018

NATIONAL DEPARTMENT OF HEALTH

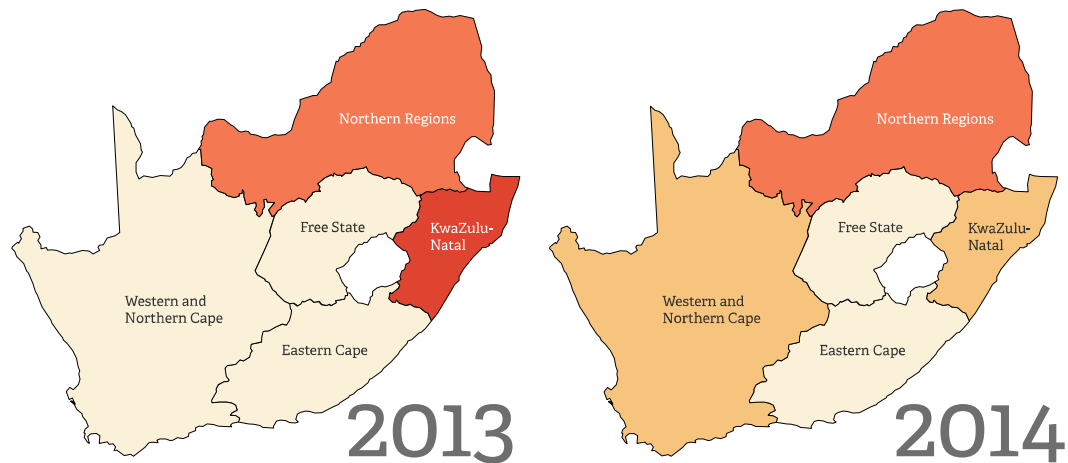
AMR maps for RSA

Escherichia coli resistance to carbapenems



Resistance rate

0%	0.1-0.3%	0.4-0.7%	0.8-1.0%	No data
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Surveillance for Antimicrobial Resistance
and Consumption of Antibiotics in South
Africa

Commitments and Objectives

- To collaborate as inter-sectoral, interdisciplinary organisations and departments to strengthen, co-ordinate and institutionalise efforts to address AMR
- To establish a national surveillance system to track and report resistant organisms and antimicrobial use in agriculture and human health
- To promote the appropriate use of antimicrobials in human and animal health through antimicrobial stewardship in facilities and suitable enabling legislation and regulations



SAASP annual workshops
SAASP Antibiotic guideline
Practical guide to AMS – One Health
Technical guide for veterinarians

**A POCKET GUIDE TO ANTIBIOTIC PRESCRIBING
FOR ADULTS IN SOUTH AFRICA, 2015**

**SEAN WASSERMAN
TOM BOYLES
MARC MENDELSON**

**ON BEHALF OF THE SOUTH AFRICAN ANTIBIOTIC STEWARDSHIP
PROGRAMME (SAASP)**



Insert Hospital logo

[Hospital] Antibiotic Stewardship Programme
Antibiotic Prescription Chart

SOUTH AFRICAN ANTIBIOTIC STEWARDSHIP PROGRAMME

Patient Label

Weight

Ward

Allergies

eGFR

Infection Episode 1 **Diagnosis**

Pneumonia UTI Meningitis Line infection
 Cellulitis Intra-abdominal infection Other _____

Source* Community acquired Hospital acquired **Indication** P = Prophylactic E = Empirical D = Definitive

SEND APPROPRIATE CULTURES BEFORE PRESCRIBING ANTIBIOTICS

Cultures Sent before antibiotics Sent after antibiotics Not Sent

*CA = Community acquired: within ≤48h, of admission
HA = Hospital-acquired: >48h after admission or within 30 days of discharge

Antibiotic Day	1	2	3	4	5	6	7	8	9	10
	Date									
↓Time			Review		Review		Review			
Indication	Medicine Approved Name or GE			Dose	Route					
<input type="checkbox"/> P	Start Date		Duration	Frequency						
<input type="checkbox"/> E	Time									
<input type="checkbox"/> D	Drs Signature & Name		Contact	Pharmacy						



A Practical Guide to Antimicrobial Stewardship in South Africa

July 2016

Draft Guideline for AMS



health

Department:
Health
REPUBLIC OF SOUTH AFRICA

A Practical Guide to Antimicrobial Stewardship in South Africa: One Health Approach and Governance 2016

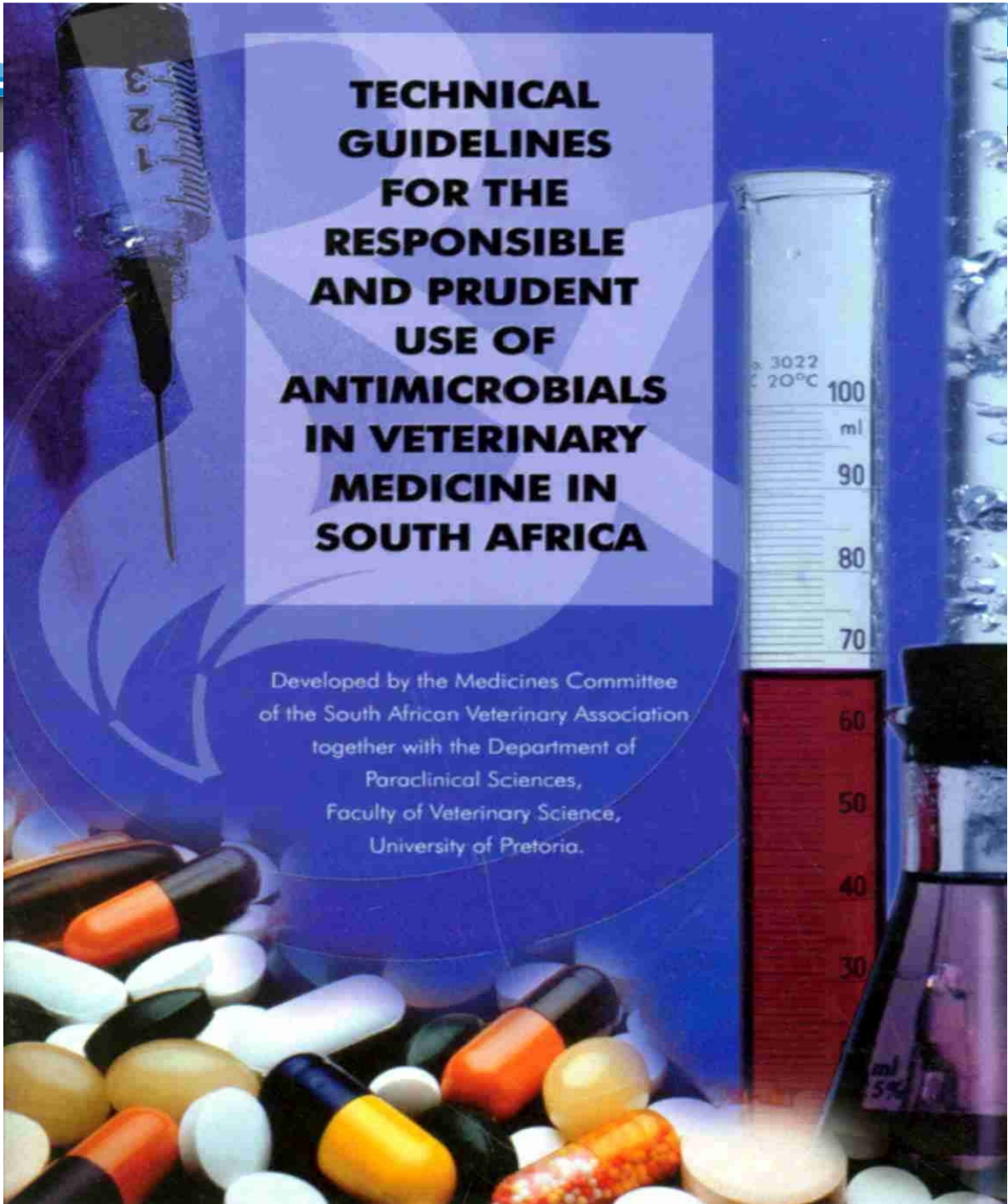
One Health approach and governance - MAC, Provincial AMS committees and district committees including veterinary, environmental aspects

AMS guidelines for Hospitals

- Leadership, accountability and structures for AMS;
- Determining baselines and defining priorities
- Improvement initiatives and activities
- Tracking and measuring improvement
- Education and training

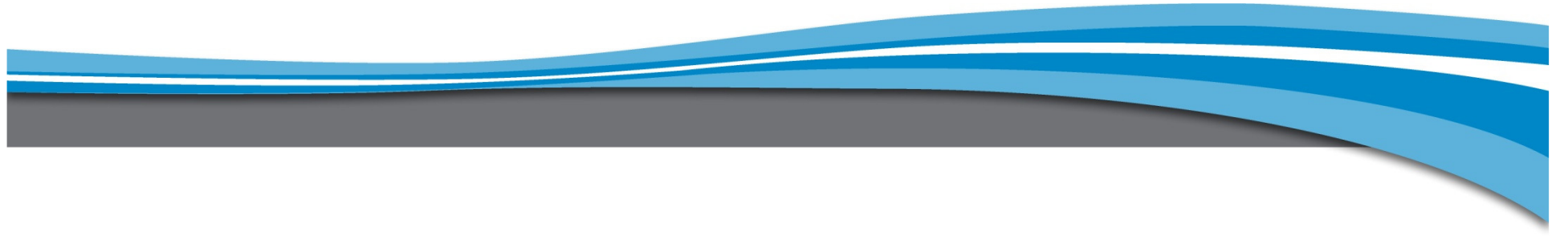
AMS guidelines for Animal Health Hospitals

AMS guidelines for Clinics and Primary health/community level



**TECHNICAL
GUIDELINES
FOR THE
RESPONSIBLE
AND PRUDENT
USE OF
ANTIMICROBIALS
IN VETERINARY
MEDICINE IN
SOUTH AFRICA**

Developed by the Medicines Committee
of the South African Veterinary Association
together with the Department of
Paraclinical Sciences,
Faculty of Veterinary Science,
University of Pretoria.



PART 2

AMS in hospital care



AMS interventions with adequate or limited ID resources

Antibiotic Stewardship Ward Rounds and a Dedicated Prescription Chart Reduce Antibiotic Consumption and Pharmacy Costs without Affecting Inpatient Mortality or Re-Admission Rates

Tom H. Boyles¹, Andrew Whitelaw^{2,3,4}, Colleen Bamford^{2,3}, Mischka Moodley^{2,3}, Kim Bonorchis^{2,3}, Vida Morris⁵, Naazneen Rawoot⁶, Vanishree Naicker⁶, Irena Lusakiewicz⁶, John Black¹, David Stead¹, Maia Lesosky⁷, Peter Raubenheimer⁸, Siphon Dlamini¹, Marc Mendelson^{1*}

An antibiotic prescription chart and weekly antibiotic stewardship ward round was **introduced** into two medical wards of an academic teaching hospital in South Africa between January-December 2012.

19.6% decrease in volume with a cost reduction of 35% of the pharmacy's antibiotic budget

Concomitant increase in laboratory tests driven by requests for biomarkers



Antimicrobial stewardship across 47 South African hospitals: an implementation study

*Adrian J Brink, Angeliki P Messina, Charles Feldman, Guy A Richards, Piet J Becker, Debra A Goff, Karri A Bauer, Dilip Nathwani, Dena van den Bergh, on behalf of the Netcare Antimicrobial Stewardship Study Alliance**

116 662 patients receiving antibiotics at 47 hospitals during 104 weeks of standardised measurement and feedback, were reviewed for 5 targeted measures, e.g.

- prolonged duration of therapy
- the use of multiple antibiotics
- redundant antibiotic coverage

Pharmacists intervened in 7 934 prescriptions (1/15), 40% of which related to an excessive duration of therapy

18% reduction in consumption was achieved



Guidelines for the
**Prevention and
Containment of
Antimicrobial
Resistance**
in South African
Hospitals

Supporting the Antimicrobial
Resistance Strategy Framework
and the Guidelines on
Implementation of the Antimicrobial
Strategy in South Africa:
One Health Approach and
Governance, 2018



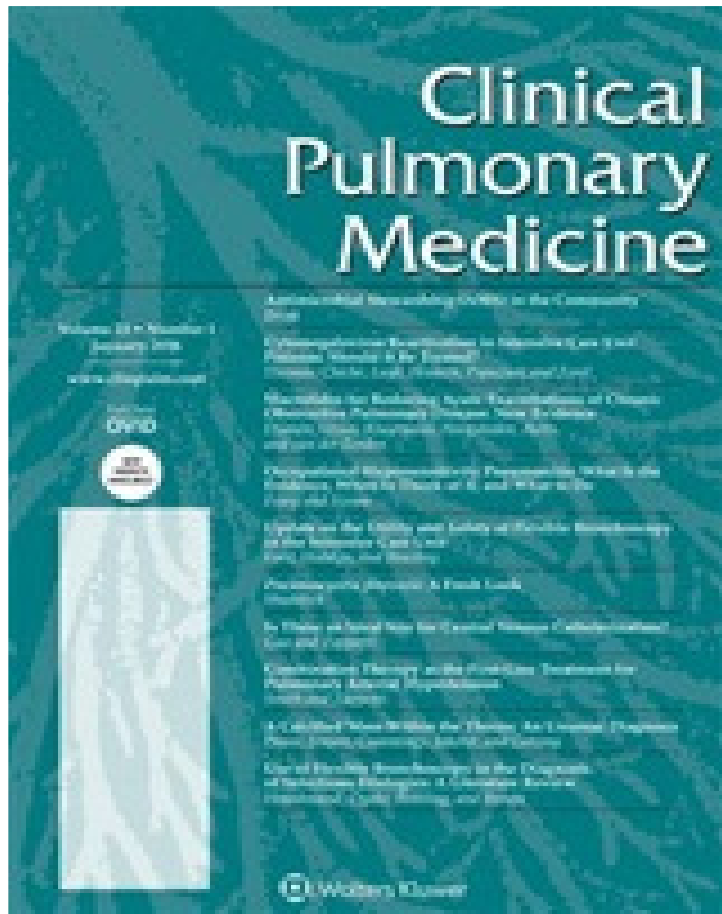
health

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REPUBLIC OF SOUTH AFRICA



AMS in primary care





Antimicrobial Stewardship (AMS) in the Community

Adrian J. Brink, MBChB, MMed (Clin Micro)

The majority (80%) of antibiotic use occurs in the community, with acute respiratory tract infections (ARTIs) the most common indication.

CLINICAL PRACTICE

The role of appropriate diagnostic testing in acute respiratory tract infections: An antibiotic stewardship strategy to minimise diagnostic uncertainty in primary care

A J Brink,¹ MB ChB, MMed (Micro); **J van Wyk**,² MB ChB, MMed (Clin Path); **V M Moodley**,² MB ChB, DTM&H, FCPATH (Micro) SA, MMed (Micro); **C Corcoran**,³ MB ChB, FCPATH (Virol), DTM&H, MMed (Virol); **P Ekermans**,⁴ MB ChB, DTMH, MMed (Clin Path); **L Nutt**,⁵ MB ChB, MMed (Clin Path); **T Boyles**,⁶ MA, BM BCh, MRCP, MD, DTM&H, Cert ID SA; **O Perovic**,^{7,8} FC Path (SA) (Micro), MMed (Micro), DTM&H, MD; **C Feldman**,⁹ MB BCh, DSc, PhD, FRCP, FCP (SA); **G A Richards**,¹⁰ MB BCh, PhD, FCP (SA), FRCP; **M Mendelson**,⁶ BSc, PhD, MBBS, FRCP, DTM&H

Knowledge, attitude and perceptions of patients & primary care prescribers in SA

SAASP 2017



South African Antibiotic Stewardship Programme Annual Workshop – 24 & 25 February 2017

BEHAVIOUR CHANGE (BC) IN ADDRESSING ANTIBIOTIC RESISTANCE	
FRIDAY 24 FEBRUARY	
HILTON HOTEL, SANDTON	
VENUE	HILTON BALLROOM FOYER
09h00 – 10h45	Registration
VENUE	HILTON BALLROOM 1 & 2
10H45 – 11H00	WELCOME
	Marc Mendelson & Adrian Brink

KAP of patients & primary care prescribers



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SAMJ RESEARCH

Antibiotic use and resistance: Knowledge, attitudes and perceptions among primary care prescribers in South Africa

E Farley,¹ MPH; A Stewart,² MPH; M-A Davies,^{1,3} PhD, MPH, MB ChB; M Govind,⁴ MB ChB;
D van den Bergh,^{5,6} EngD, MSc (Med), BPharm; T H Boyles,⁶ MA, BM, BCh, MCRP, MD, DTM&H, Cert ID (SA)

Patients (n=403); Prescribers (n = 264)

95.8% believed that ABR is a significant problem in SA

66.5% felt pressure from patients to prescribe antibiotics

Nearly 30% of 264 primary care providers reported that on about half of the occasions in which antibiotics were “not absolutely necessary,” they nonetheless prescribed the medicines



An investigation of antimicrobial usage patterns by small animal veterinarians in South Africa

John K. Chipangura^{a,b,*}, Hayley Eagar^d, Marcia Kgoete^a, Darrell Abernethy^c,
Vinny Naidoo^{a,b}

Veterinarians predominantly use antibiotics empirically before resorting to laboratory testing (91.16% of respondents)

Antimicrobial compounding and off-label use of human registered medication was common practice (86.19% of respondents)

A large number of clients attempted antibiotic treatment of their pets prior to seeking veterinary assistance

Need for standardized learning outcomes



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SAMJ RESEARCH

South African medical students' perceptions and knowledge about antibiotic resistance and appropriate prescribing: Are we providing adequate training to future prescribers?

S Wasserman,¹ MB ChB, MMed; S Potgieter,² MB ChB; E Shoul,³ MB ChB; D Constant,⁴ PhD, MPH; A Stewart,⁵ MPH; M Mendelson,¹ MD, PhD; T H Boyles,¹ MD

289 students at 3 medical schools. There are low levels of confidence with regard to antibiotic prescribing among final-year medical students in SA, and most students would like more education in this area.

Knowledge and perceptions of antimicrobial stewardship concepts among final year pharmacy students in pharmacy schools across South Africa

Marisa Burger^a, Jaco Fourie^a, Devin Loots^a, Tercia Mnisi^a, Natalie Schellack^{a*}, Selente Bezuidenhout^a and Johanna C Meyer^a

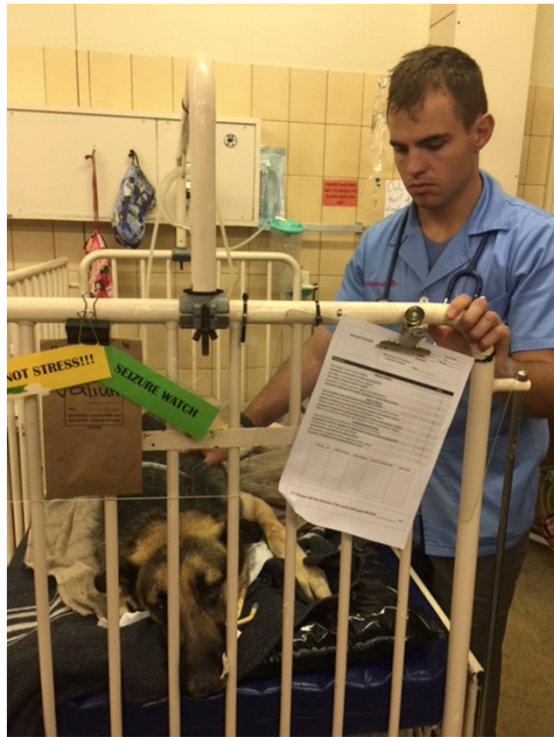
260 fourth year (final year) pharmacy students from 8 universities

90.0% indicated that they would like more training on antimicrobial stewardship at undergraduate level.

South Africa's National Training Centres for Antibiotic Stewardship



Antibiotic stewardship rounds at Onderstepoort Veterinary Hospital



Photos courtesy of Prof. Debra Goff

Need for a standardized curriculum

Standardised learning outcomes of a core consensus SA stewardship curriculum is required as a matter of urgency for all cadres of health workers



AMS initiatives in African countries





WHO AFRO

NATIONAL FOCAL POINT WORKSHOP

Process for the Development and Implementation of National Action Plans for the Prevention and Containment of Antimicrobial Resistance using the One Health Approach

21-23 March 2016

Harare, Zimbabwe

Agenda

Date & Time	Activity	Topic/s	Presenter/Facilitator	Exercis
DAY 1 Monday 21 March 08H30- 09H00	Arrival and Registration			
09H00-10H00	Opening Ceremony (Programme Director: <u>Dr JB Ndiokubwayo</u>)	Welcome to participants Opening Address	<u>Dr Okello</u> :WR/IST Coord Harare, Zimbabwe <u>MoH Official</u>	
10H00-10H30	Welcome & Introductions	Introduction to the regional AMR workshop Participant introductions and expectations. Administrative, security & housekeeping announcements	<u>Dr JB Ndiokubwayo</u>	
10H30-11H00	Break			
11H00-12H30	Overview of AMR & Action Plans	Antimicrobial Resistance: global overview, the response and the Global Action Plan on AMR The Global Action Plan and OIEs activities on AMR	Dr C Pessoa da Silva & <u>Dr A Aidara</u> <u>Dr I Merot</u> & <u>Dr A Baky</u>	



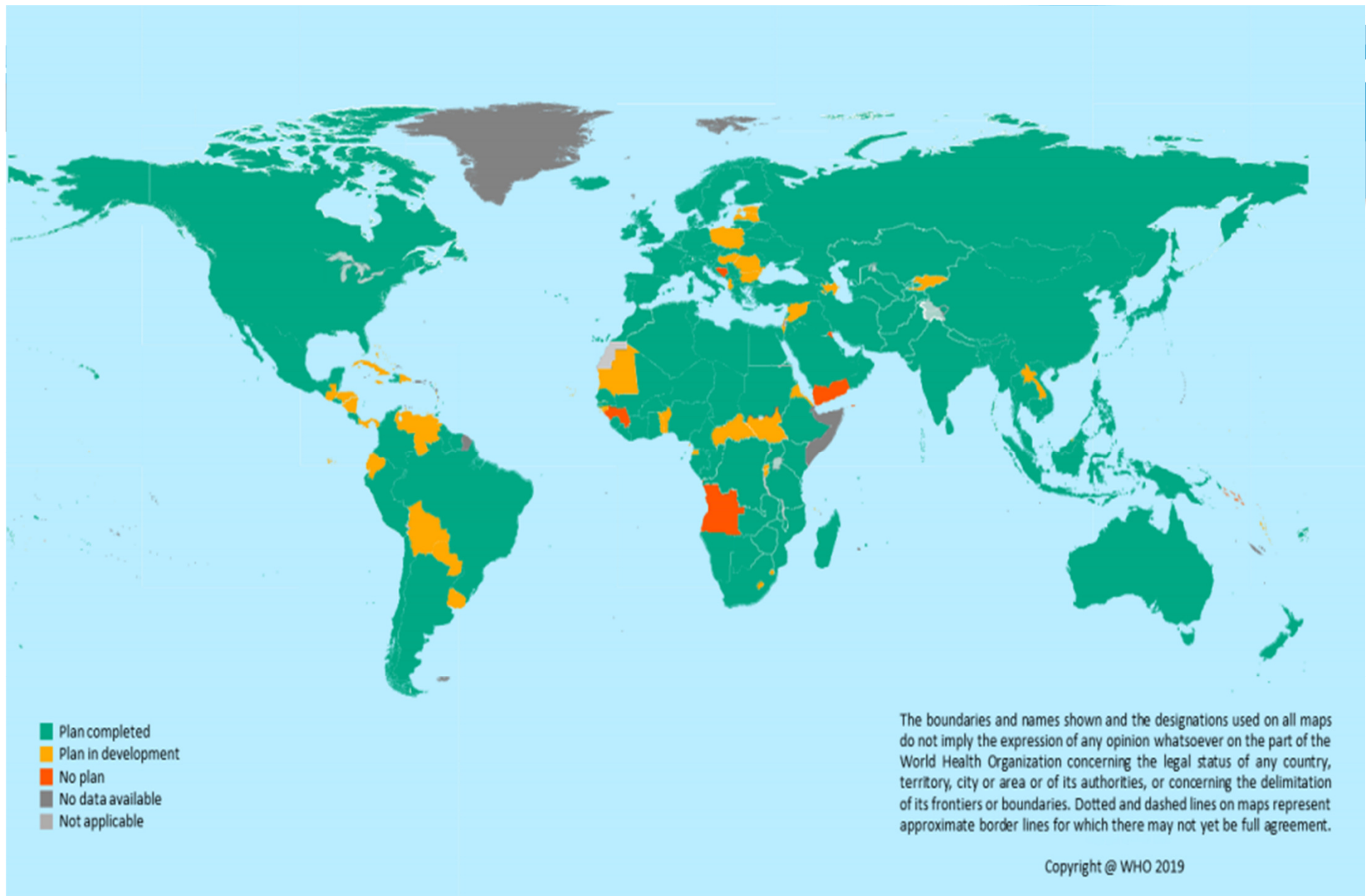
Global Database for Antimicrobial Resistance Country Self-Assessment

Information captured in this database is a result of the *annual* country self-assessment questionnaire disseminated to countries by WHO, FAO and OIE since 2016

Multi-sector and One Health collaboration/coordination

Table 2
Multisectoral coordination mechanisms based on the “One Health” approach (2018/19)

<i>2019 World Bank income category (total countries that responded in each category)</i>	<i>Countries with functional multisectoral working groups</i>	
	<i>Number</i>	<i>Percentage</i>
High-income (52)	36	69
Upper-middle-income (48)	21	44
Lower-middle-income (33)	10	30
Low-income (25)	7	28
Total (158)	74	47



Country progress with development of a NAP on AMR (116/194)



NAPs approved by national authorities (accessed from WHO AFRO office 23/01/2019)

Burkina Faso

United Republic of Tanzania

Zimbabwe

Mauritius

Mozambique

Nigeria

South Africa

Cameroon

Sierra Leone

Zambia

Malawi

Liberia

Kenya

Ghana

Gabon

Ethiopia



**WHO library of existing, publicly
available national action plans**
(accessed 04 May 2019)

Ethiopia

Sierra Leone

Kenya

Mauritius

South Africa

United Republic of Tanzania



AFRICA CDC FRAMEWORK FOR ANTIMICROBIAL RESISTANCE, 2018-2023

Derives its institutional authority from the African Union

Africa CDC will establish the Anti-Microbial Resistance Surveillance Network (AMRSNET)

AMRSNET seeks to serve as the primary coordinator for AMR surveillance and control on the African continent

Africa CDC will also need to advocate for diagnostic stewardship among animals that are reared for food

Disseminate Africa-specific antimicrobial treatment and stewardship guidelines for facilities and clinicians.