

State of Blood Transfusion Globally and Locally

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Blood Supply Model in South Africa

- South African National Blood Service (SANBS) and West Cape Blood Service (WCBS) are responsible for provision of transfusion services in South Africa
 - Not for profit companies operating on a fee for service basis
- SANBS Provides a vein to vein blood transfusion service in 8 of the 9 provinces in SA.
- WCBS provides this service in the Western Cape Province
- Approximately 1 million units of whole blood collected annually (100% voluntary)
- Also provides Related Services
 - Specialised Laboratory Services,
 - Cellular Therapy Services
 - Proficiency Testing programmes



SANBS Business Model

- Operates on a fee for service basis
- 59% of blood products and services to State/Public Sector hospitals and Department of Health reimburses SANBS
- 41% of blood products and services to patients in Private Hospitals – SANBS recovers fees from Medical Insurance companies and patients



Overview of the Blood Transfusion Process in South Africa

| Donation | Technical | Blood Bank |
|--|--|---|
| <ul style="list-style-type: none">• Regular donor (85% repeat donors)• Focus on recruiting (100% voluntary donors)• Focus on education• Focus on clinic risk• Measure, improve, investigate best methods | <ul style="list-style-type: none">• State of art testing<ul style="list-style-type: none">• Serology• NAT• QA schemes (external and internal)• Component Processing | <ul style="list-style-type: none">• Hierarchy• Components• Red cells• Plasma (<i>donor retested for FFP</i>)• Inventory Management – to minimise wastage |
| Human Resources | → | |
| Accreditation | → | |
| Risk Management | → | |



Blood Collection

- Collection of blood from low risk donors
 - 100% voluntary donation and high rate (85%) of returning donors
- Stringent donor selection and deferral criteria
- Implemented Collections management system to optimize blood collection to meet demand
- Focus on clinic risk and efficiency
 - Location and performance of fixed site donor centres and mobile blood drives
 - Donor education – 14 donor educators

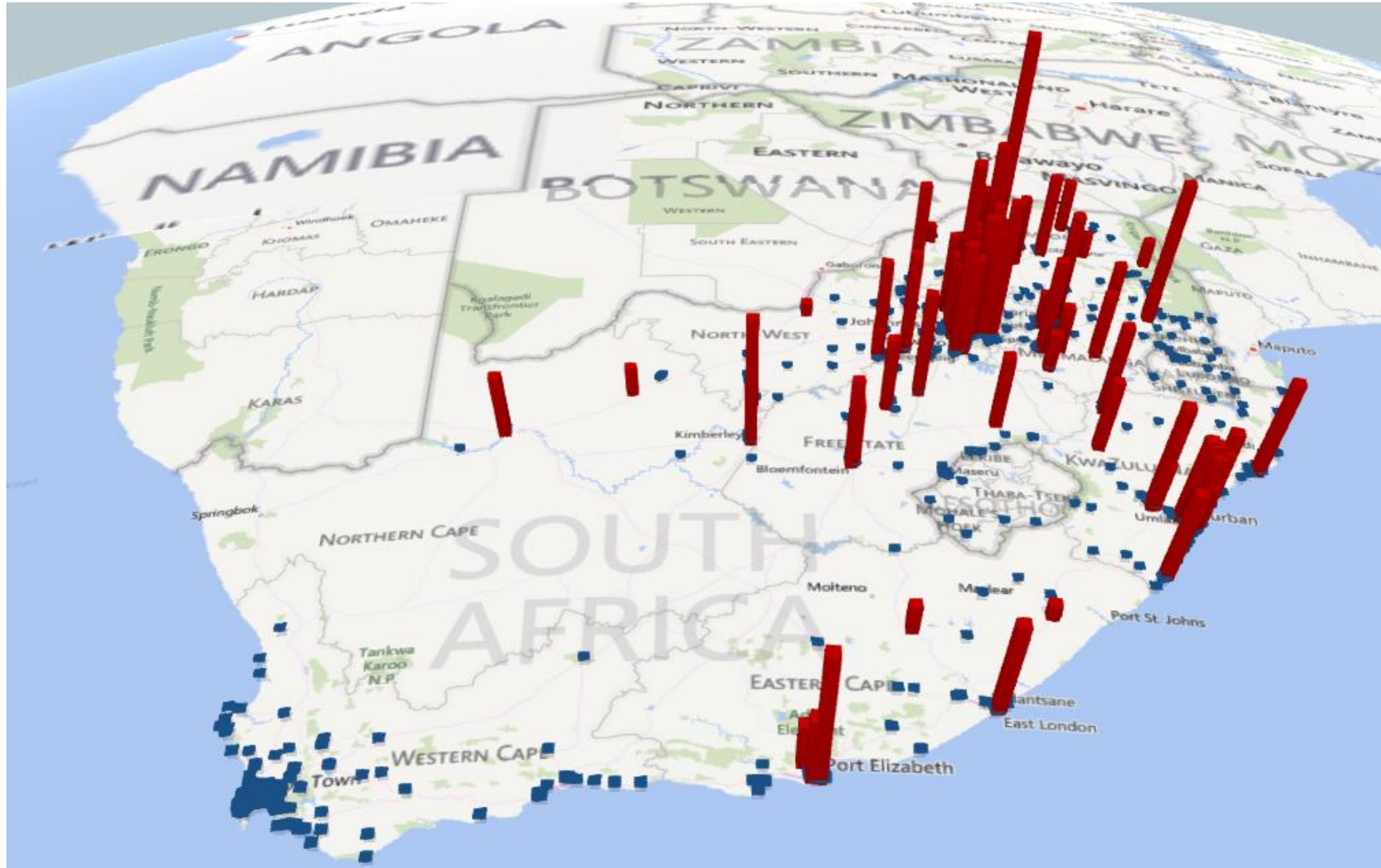


Blood Supply

- 870 000 units of whole blood collected annually by SANBS
 - 85% from regular donors and 15% from 1st time donors)
 - 100% voluntary donation
- 16 500 apheresis platelets
- 26 000 pooled buffy coats prepared
- 99.3% of whole blood made into components
- 14% of red cells are leucocyte depleted
- 127 000 units of Fresh Frozen Plasma issued for patients
- 165 000 litres of plasma for fractionation
- Blood collected at Donor Centres and Mobile Blood Drives



SANBS Donor Clinics

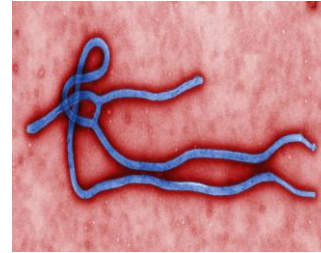


Courtesy: BI Team



Manage Blood safety and risk at appropriate/ defendable levels

- Continued pathogen surveillance:
 - Emerging pathogens
 - HTLV – decision to implement or not
 - HEV, WNV – prevalence in donors
- Review and Revise Preparedness Plans for emerging risks
 - e.g. Ebola outbreak
 - Impact on donors, staff, blood usage
- Blood Safety
 - Monitor HIV and HBV prevalence in donors
 - Risk consideration when establishing donor potential for new and existing blood drives
 - Geo-mapping of donor centres/collections and viral prevalence
- Pathogen Inactivation/Reduction for platelets



Impact of SANBS Testing Strategy

- Implemented Individual Donation Nucleic Acid (ID-NAT) testing in October 2005
 - Has had a major safety impact in South Africa
 - Detects infectious donations earlier and prevents transmission
 - Prevented significant number of potential window period transmissions over past 14 years
 - Additional testing costs
 - Reduced window period donations
 - Low viral load in the plasma pool for fractionation
- Enabled increase in donor base (Black donors from 4% in 2006 to 46% in 2019)
- Reduced litigation, enhanced reputation for blood safety,
- Plasma supply for fractionation - approximately R160 million per annum revenue to Blood Transfusion Service (BTS)



HIV rates in South Africa – 10 years

| Marker | Classification | Repeat | Lapsed | First time | Total |
|--------|--------------------|----------------|---------------|---------------|----------------|
| | Collections | 5923026 | 882452 | 956389 | 7762283 |
| HIV | Concordant | 2208 (0.037) | 2285 (0.259) | 10545 (1.103) | 15038 (0.194) |
| | NAT yield | 301 (0.005) | 44 (0.005) | 137 (0.014) | 482 (0.006) |
| | Serology yield | 3 (0) | 17 (0.002) | 186 (0.019) | 206* (0.003) |
| | Total | 2512 (0.042) | 2346 (0.266) | 10868 (1.136) | 15726 (0.203) |

- HIV prevalence 30 times higher in 1st time donors vs repeat donors
- NAT Yield (HIV incidence rate) only 2.8 times higher in 1st time vs repeat donors
- * Subsequently confirmed that large number of serology yield donors are not elite controllers but were confirmed HIV positive and on anti-retroviral drugs but still donated



Inventory Management

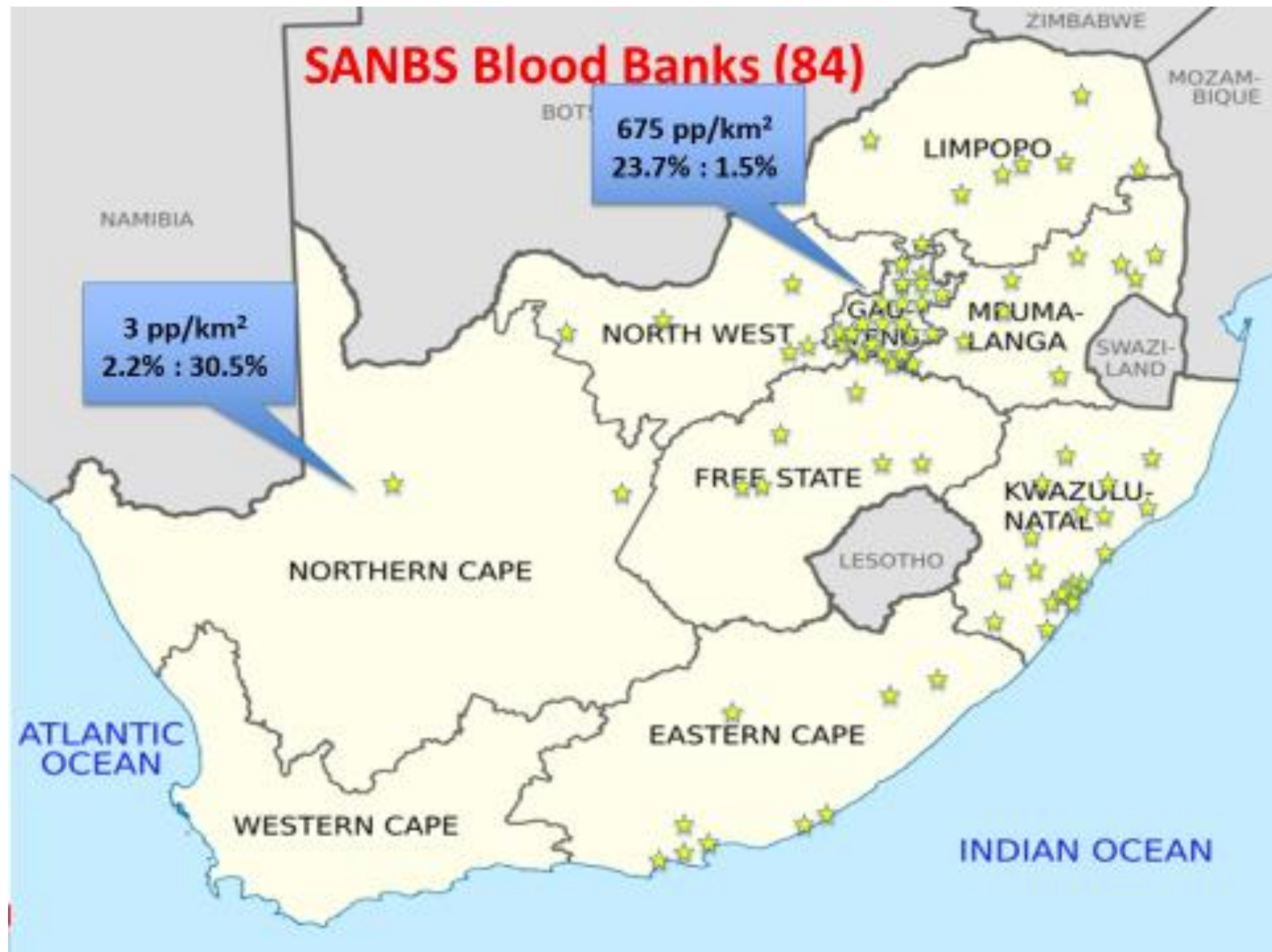
- Central Collections Planning
 - Annual Targets set Nationally and devolved to Zone level
 - Collections forecasts done 8 weeks in advance to meet demand
- Inventory is managed nationally with instructions to move blood across zones to ensure equitable blood supply
 - Days cover monitored nationally for all blood groups in real time
- Donor retested plasma programme for improved safety



Meeting Patient Needs

- SANBS manages the cross matching and issuing of blood at 83 blood banks and services more than 600 hospitals and clinics
- SANBS implemented automation in all laboratories in 2017 and the electronic cross match in 2019
- Major challenge is to provide blood to rural hospitals where usage is minimal
 - Solved this by providing emergency blood fridges to hospitals with minimal rental
 - Currently piloting Drone technology and Smart fridges for more efficient blood distribution





Innovation with Use of Drones

- Drones will enable SANBS to get Samples, Blood and Blood products to patients quicker, thereby improving patient
 - Commissioned two Vertical Take off and Landing (VTOL) drones
 - Will start testing phase in September
 - Capable of flying up to 150kms, flying beyond visual line of sight (BVLOS)
 - Will be able to transport up to 4 units of red cell concentrates from blood bank to hospital
 - Temperature maintained between 2 and 8 degrees during flight
- SANBS is training staff to qualify as Drone pilots
 - SANBS staff member Lebohang Lebogo qualified as drone pilot





Smart Fridges



- Blood Vending machines placed at hospital and interfaced with SANBS BECS
- Tests done in blood bank, Dr receives confirmation and code to collect blood from “Smart Fridge”
- Improved safety, turn-around times and reduced courier costs
- Electronic crossmatch rollout to be completed in 2019
- One “Smart Fridge” to be tested and pilot project in 2019/20



State of Blood Transfusion Globally

- Significant disparities in funding available between low, middle and high income countries
- Significant differences in blood collections per 1 000 population
- Challenges in Africa
 - Average of 4 units collected per 1 000 population in most Countries
 - Very poor infrastructure for component processing and testing
 - Limited number of voluntary repeat donors
 - Largely family replacement and first time donors
 - Significant funding challenges – limited support from Ministry of Health
 - External funding (PEPFAR, WHO, EU) being reduced



Table 1: Funding Available per Blood Collection for Countries in World Bank Income Groups

| Country Income Group | Funding per collection & median (range) in USD |
|--|---|
| High-income (19 countries reported) | 308 (84-642) |
| Upper-middle income (11 countries reported) | 67 (22-219) |
| Low- and middle-income (16 countries reported) | 50 (21-124) |
| Low-income (16 countries reported) | 36 20-143) |

Ref: WHO 2016



Table 2: Population and Blood Donations for Countries in World Bank Income Groups

| | Low-income | Low- and lower-income | Upper-middle income | High-income |
|------------------------------------|------------------|-----------------------|---------------------|---------------------|
| % of global population | 9 | 39 | 34 | 19 |
| % of global donations | 2 | 22 | 29 | 47 |
| Donations/year per 1000 population | 4.6 (0.3-9.4) | 7.8 (0.7-20.6) | 14.9 (6.7-39.7) | 32.1 (11.2-57.8) |

Ref: WHO 2016



Table 3: Percentages of Global Population and Blood Donations for Countries in WHO Regions

| | Africa (AFRO) | Americas (AMRO) | Eastern Mediterranean (EMRO) | Europe (EURO) | South East Asia (SEARO) | Western Pacific (WPRO) |
|------------------------|--------------------------|----------------------------|---|--------------------------|--|---------------------------------------|
| % of global population | 13 | 14 | 9 | 11 | 26 | 26 |
| % of global donations | 5 | 20 | 9 | 29 | 15 | 22 |

Ref: WHO 2016



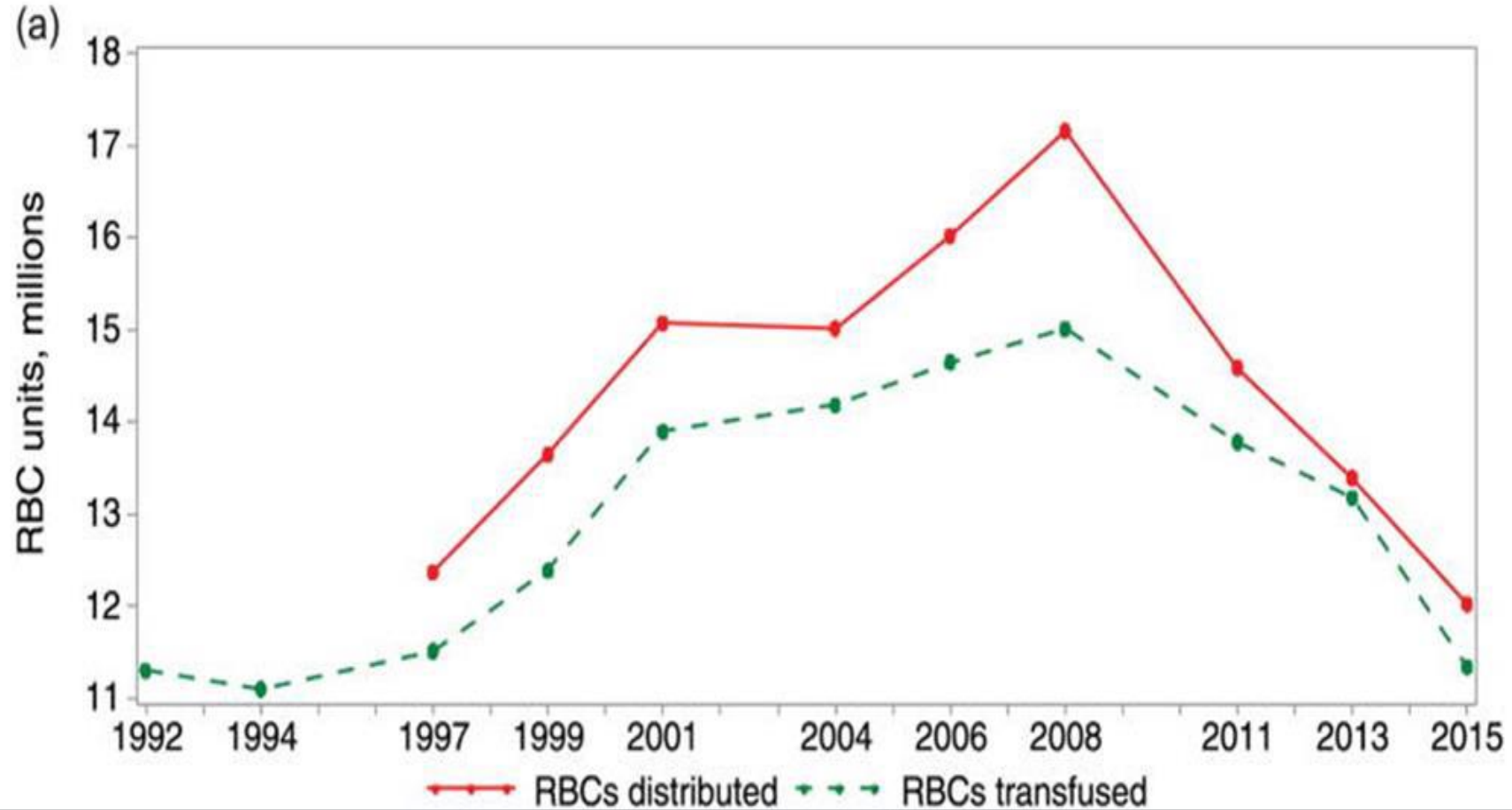
Blood Usage Globally

- Red cell usage has declined significantly in Developed Countries in the past 8 years (notably between 2009 and 2016)
 - Primarily as a result of Patient Blood Management initiatives with three broad pillars*
 - Optimise red cell mass (detect and treat anaemia, optimise erythropoiesis)
 - Minimise blood loss and bleeding (manage bleeding risk, surgical techniques)
 - Harness and optimise physiological reserve of anaemia (patient specific plan, restrictive transfusion triggers)
- PBM programmes being implemented in Developing Countries, including South Africa (will need to monitor impact)

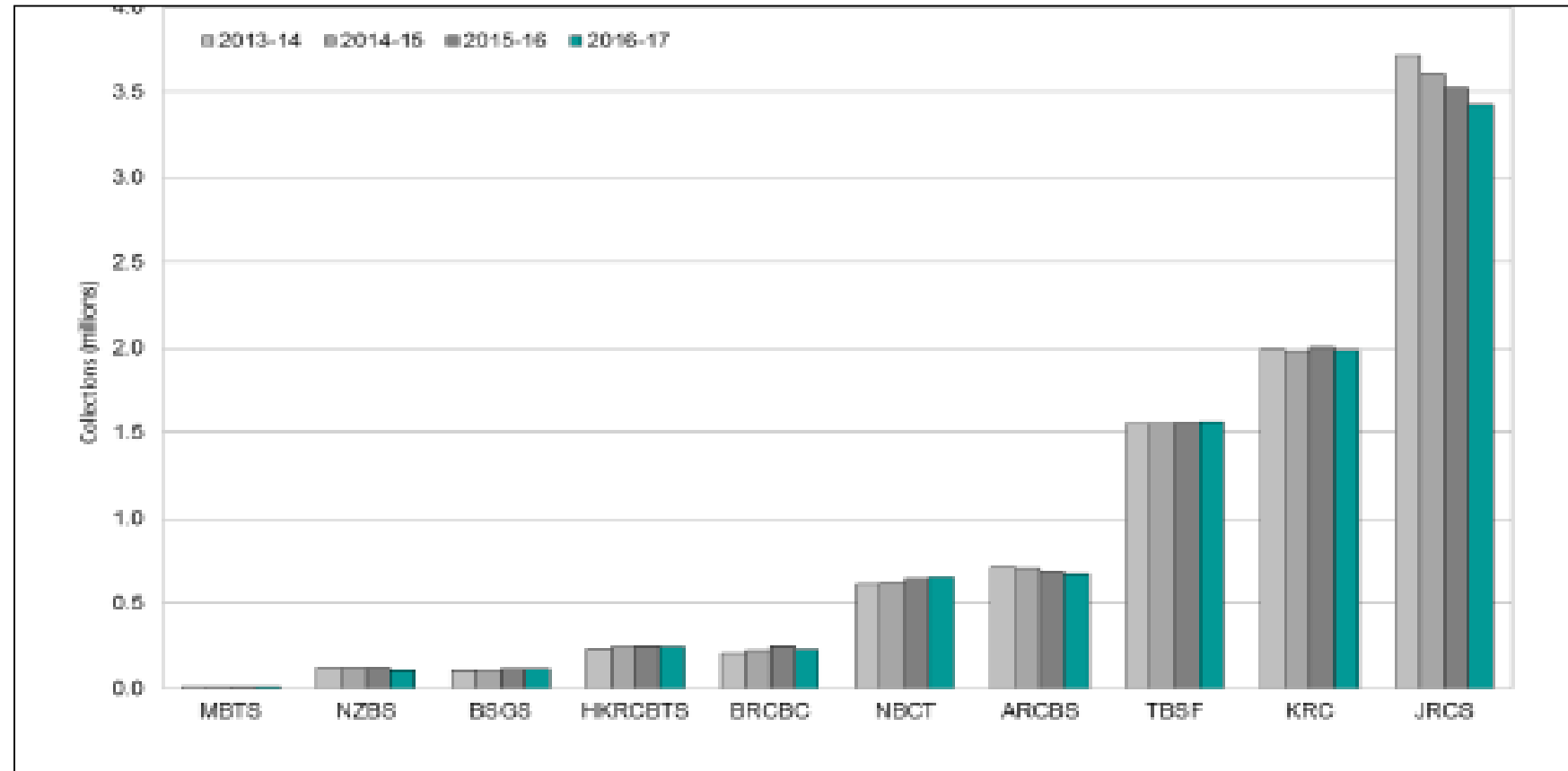
**Three-pillar matrix of PBM designed for the Western Australia Patient Blood Management Programme*



Red Cell Distribution and Transfusions in USA - increase until 2008; both rapidly decline afterwards



Red cell collections Asia Pacific Blood Network 2012 – 2017 – Decrease in Usage in Japan and Australia



MBTS = Macao Blood Transfusion Service, NZBS = New Zealand Blood Service , BSGS = Blood Services Group, Singapore, HKRCBTS = Hong Kong Red Cross Blood Service, BRCBC = Beijing Red Cross Blood Centre, NBCT = National Blood Centre, Thai Red Cross, ARCBS = Australia Red Cross Blood SEervice , TBSF == Taiwan Blood Services Foundation, KRC = Korean Red Cross, JRCs = Japanese Red Cross Society Blood Service



Other Global Opportunities/Challenges

- Demand for Plasma Derived Medicinal Products (PDMP's) increasing significantly globally (paid, volunteer)
 - SANBS started a programme to collect “Source/apheresis” plasma from donors for production of PDMP's by National Bioproducts Institute (NBI)
- Globally Supplier's & manufacturer's consolidating operations as a result of decline in red cell usage
 - Less research and innovation
- Regulatory framework may change – blood now considered a medicine and may be regulated as a medicine. Additional compliance issues may arise such as having a pharmacist on site and batch control.
- Emerging Risks – HEV
 - On-going surveillance, increasing donor base of regular donors is essential.
 - Introduction of new technology such as pathogen inactivation to reduce risk and donor deferrals



Expanding Role of Blood Services in Cellular Therapy/Tissue Banking

- Blood Services have core competencies of:
 - Collection (whole blood, apheresis)
 - Processing
 - Testing
 - Storage
- Many Blood Services have expanded services to utilise these competencies in related disciplines:
 - Tissue banking (Stem cells, Milk banks, Bone banks, etc)
 - Preparing growth factor supplement (Human Platelet Lysates) for the expansion of human cell therapy products
 - Harvesting of cells from patients



Thank You

