Exploratory Data Analysis Report
Africa Millennium Development Goals

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Case Description

The Millennium Development Goals (MDGSs) were introduced by the United Nations in September 2000 and officially implemented in 2001. According to South African History Online, these goals were considered as a life line that the United Nations and the rest of the world support Africa, saving it from sinking. The purpose of these goals was to encourage progress in the society in order to settle life-threatening and living problems in Africa.

Africa Millennium Development Goals:
Goal 1: Eradicate Extreme Poverty and Hunger
Goal 2: Achieve Universal Primary Education
Goal 3: Promote Gender Equality and Empower Women
Goal 4: Reduce child mortality
Goal 5: Improve Maternal Health
Goal 6: Combat HIV/AIDS, Malaria and other Diseases
Goal 7: Ensure Environmental Sustainability
Goal 8: Develop a Global Partnership for Development

The objective of these MDGs was to achieve these goals in 2015. With knowledge that African countries normally lose track on the records for survey, carrying the curiosity of the result and to see the performance of these MDGs in African countries, this analysis report is generated.

Data Selection

Since many websites are blocked in China, selecting data requires strict and complete compliance with China law. After careful selection and consideration, several MDG tables in excel files are available for download from the Data Catalog of The World Bank (https://datacatalog.worldbank.org). These tables were lasted updated on September 19, 2018.

In these tables, value of country code, series name, series code, calculated percentage of years from 1990 to 2015 (5 years as a range), indicator name, long definition, source and other referential information has been filed.

As the MDGs involve all countries an s states in Africa, with all needed data, the tables mentioned above is sufficient to serve for the analysis of the performance of MDGs.

Data Collection and Cleaning

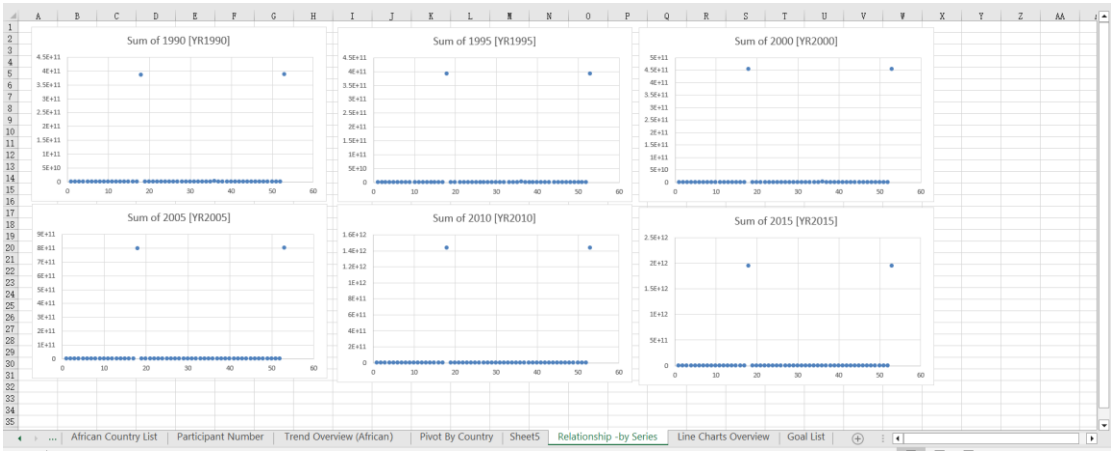
The downloaded data file includes variable values of all countries in the world. Since this analysis report focuses on African countries, the first step to pull out the relevant information is to remove those non-African countries. Since there are still many texts that are not convenient to read, next step is to categorise these text contents into second and third normal for later reference.

When sorting out the data, it is a challenge to create a table that is not only easy to identify the items, but also easy to look at the data trend for situation acknowledge and analysis. In order to reach this expectation, a pivot table is created based on the collected data and sparklines are created following all rows of data under same category for quick review. Subsequently, the table for exploration and analysis remains items – country name, series name (of the MDGs), value records of the years from 1990 to 2015(5 years as a range), trend overview, variance, and standard deviation.

Data Exploration and Analysis

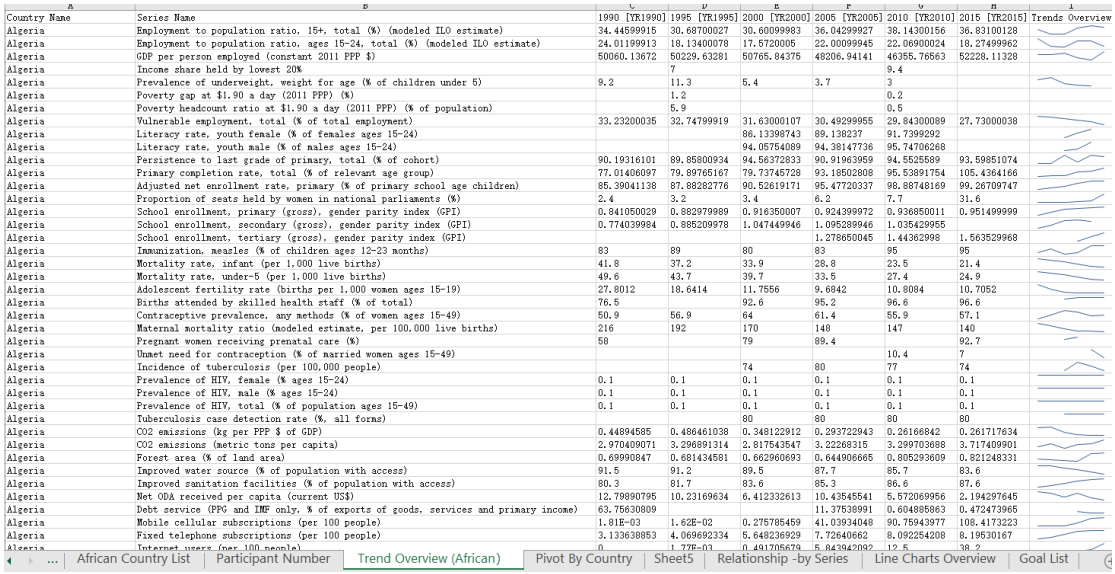
According to the African Country List updated in 2009, there are 61 countries in Africa. While in the MDGs report, 45 countries (73.77%) took part in the annual survey for MDGs.

By creating scatter graphs of all series data of each year, it is obvious that every series is independent and its result does not correlate with each other. (see Graph 1)



Graph 1

With sparklines inserted into the cells of each row of series record, a development trend of each country of each series for overview is visualized. (See Graph 2)



Country Name	Series Name	1990 [YR1990]	1995 [YR1995]	2000 [YR2000]	2005 [YR2005]	2010 [YR2010]	2015 [YR2015]	Trends Overview
Algeria	Employment to population ratio, 15+, total (%) (modeled ILO estimate)	34.44599915	30.68700027	30.60099983	36.04299927	38.14300156	36.83100128	
Algeria	Employment to population ratio, ages 15-24, total (%) (modeled ILO estimate)	24.01199913	18.13400078	17.5720005	22.00099945	22.06900024	18.27499962	
Algeria	GDP per person employed (constant 2011 PPP $)	50060.13672	50229.63281	50765.84375	48206.94141	46355.76563	52228.11328	
Algeria	Income share held by lowest 20%		7			9.4		
Algeria	Prevalence of underweight, weight for age (% of children under 5)	9.2	11.3	5.4	3.7	3		
Algeria	Poverty gap at $1.90 a day (2011 PPP) (%)		1.2			0.2		
Algeria	Poverty headcount ratio at $1.90 a day (2011 PPP) (% of population)		5.9			0.5		
Algeria	Vulnerable employment, total (% of total employment)	33.23200035	32.74799919	31.63000107	30.49299955	29.84300089	27.73000038	
Algeria	Literacy rate, youth female (% of females ages 15-24)			86.13398743	89.138237	91.7399292		
Algeria	Literacy rate, youth male (% of males ages 15-24)			94.05754089	94.38147736	95.74706268		
Algeria	Persistence to last grade of primary, total (% of cohort)	90.19316101	89.85800934	94.56372833	90.91963959	94.5525589	93.59851074	
Algeria	Primary completion rate, total (% of relevant age group)	77.01406097	79.89765167	79.73745728	93.18502808	95.53891754	105.4364166	
Algeria	Adjusted net enrollment rate, primary (% of primary school age children)	85.39041138	87.88282776	90.52619171	95.47720337	98.88748169	99.26709747	
Algeria	Proportion of seats held by women in national parliaments (%)	2.4	3.2	3.4	6.2	7.7	31.6	
Algeria	School enrollment, primary (gross), gender parity index (GPI)	0.841050029	0.882979989	0.916350007	0.924399972	0.936850011	0.951499939	
Algeria	School enrollment, secondary (gross), gender parity index (GPI)	0.774039984	0.885209978	1.047449946	1.095289946	1.035429955		
Algeria	School enrollment, tertiary (gross), gender parity index (GPI)				1.278650045	1.443629908	1.563529968	
Algeria	Immunization, measles (% of children ages 12-23 months)	83	89	80	83	95	95	
Algeria	Mortality rate, infant (per 1,000 live births)	41.8	37.2	33.9	28.8	23.5	21.4	
Algeria	Mortality rate, under-5 (per 1,000 live births)	49.6	43.7	39.7	33.5	27.4	24.9	
Algeria	Adolescent fertility rate (births per 1,000 women ages 15-19)	27.8012	18.6414	11.7556	9.6842	10.8084	10.7052	
Algeria	Births attended by skilled health staff (% of total)	76.5		92.6	95.2	96.6	96.6	
Algeria	Contraceptive prevalence, any methods (% of women ages 15-49)	50.9	56.9	64	61.4	55.9	57.1	
Algeria	Maternal mortality ratio (modeled estimate, per 100,000 live births)	216	192	170	148	147	140	
Algeria	Pregnant women receiving prenatal care (%)	58		79	89.4		92.7	
Algeria	Unmet need for contraception (% of married women ages 15-49)					10.4	7	
Algeria	Incidence of tuberculosis (per 100,000 people)			74	80	77	74	
Algeria	Prevalence of HIV, female (% ages 15-24)	0.1	0.1	0.1	0.1	0.1	0.1	
Algeria	Prevalence of HIV, male (% ages 15-24)	0.1	0.1	0.1	0.1	0.1	0.1	
Algeria	Prevalence of HIV, total (% of population ages 15-49)	0.1	0.1	0.1	0.1	0.1	0.1	
Algeria	Tuberculosis case detection rate (%, all forms)			80	80	80	80	
Algeria	CO2 emissions (kg per PPP $ of GDP)	0.44894585	0.486461038	0.348122912	0.293722943	0.26166842	0.261717634	
Algeria	CO2 emissions (metric tons per capita)	2.970409071	3.296891314	2.817543547	3.22268315	3.299703688	3.717409901	
Algeria	Forest area (% of land area)	0.69990847	0.681434581	0.662960693	0.644906665	0.805293609	0.821248331	
Algeria	Improved water source (% of population with access)	91.5	91.2	89.5	87.7	85.7	83.6	
Algeria	Improved sanitation facilities (% of population with access)	80.3	81.7	83.6	85.3	86.6	87.6	
Algeria	Net ODA received per capita (current US$)	12.79890795	10.23169634	6.412332613	10.43545541	5.572069956	2.194297645	
Algeria	Debt service (PPG and IMF only, % of exports of goods, services and primary income)	63.75630809			11.37538991	0.604885863	0.472473965	
Algeria	Mobile cellular subscriptions (per 100 people)	1.81E-03	1.62E-02	0.275785459	41.03934048	90.75943977	108.4173223	
Algeria	Fixed telephone subscriptions (per 100 people)	3.133638853	4.069693334	5.648236929	7.72640662	8.092254208	8.19530167	
Algeria	Internet users (per 100 people)	0	1.77E-03	0.491705679	5.843942092	12.5	38.2	

African Country List | Participant Number | Trend Overview (African) | Pivot By Country | Sheet5 | Relationship -by Series | Line Charts Overview | Goal List

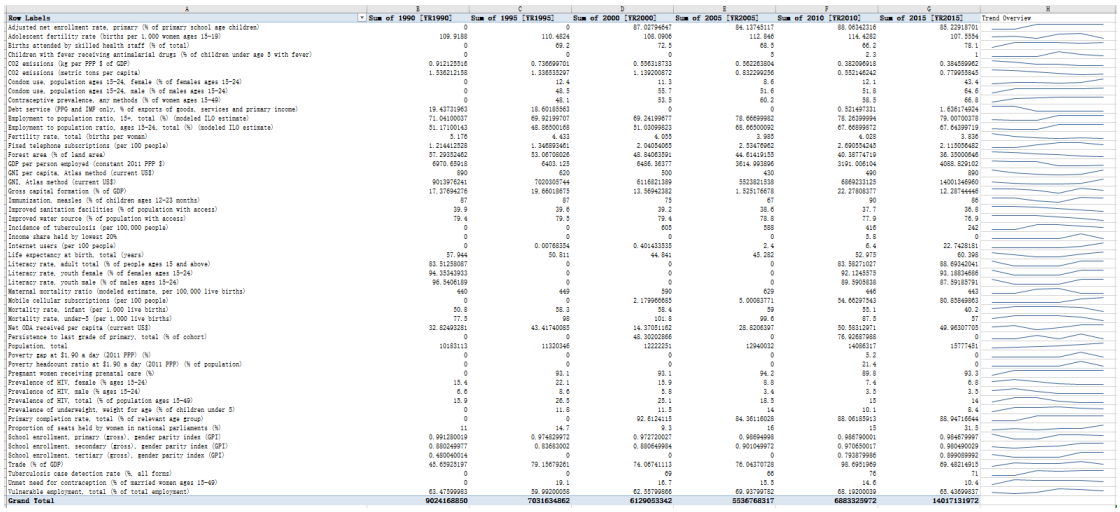
Graph 2

Interpretation and Insights

Since there are 45 countries in the list, each country toke part in different series for inspection, in order to have a detailed understanding on the performance of the MDGs, it is advisable to do sample review of one country and use the same way to review other countries.

Example: Zimbabwe

Data Overview:



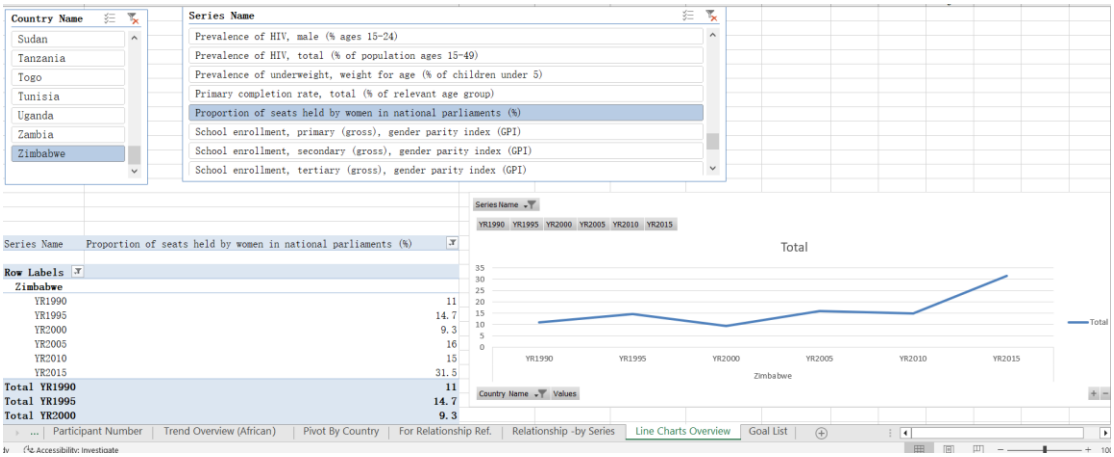
Row Labels	Sum of 1990 [YR1990]	Sum of 1995 [YR1995]	Sum of 2000 [YR2000]	Sum of 2005 [YR2005]	Sum of 2010 [YR2010]	Sum of 2015 [YR2015]	Trend Overview
Adjusted net enrollment rate, primary (% of primary school age children)	0	0	87.02794647	84.13745117	88.06342316	88.23918701	
Adolescent fertility rate (births per 1,000 women ages 15-19)	109.9188	110.4624	108.0906	112.846	114.4282	107.3554	
Births attended by skilled health staff (% of total)	0	69.2	72.5	68.5	66.2	78.1	
Children with fever receiving antimalarial drugs (% of children under age 5 with fever)	0	0	0	0	2.3	1	
CO2 emissions (kg per PPP $ of GDP)	0.912125516	0.736997701	0.556181733	0.562263804	0.382096918	0.384599962	
CO2 emissions (metric tons per capita)	1.536212158	1.336935297	1.139200872	0.832299256	0.552145242	0.779955845	
Condom use, population ages 15-24, female (% of females ages 15-24)	0	12.4	11.3	8.6	12.1	43.4	
Condom use, population ages 15-24, male (% of males ages 15-24)	0	48.5	55.7	51.6	51.8	64.6	
Contraceptive prevalence, any methods (% of women ages 15-49)	0	48.1	53.5	60.2	58.9	66.8	
Debt service (PPG and IMF only, % of exports of goods, services and primary income)	19.43731963	18.60185863	0	0	0.521497331	1.635749924	
Employment to population ratio, 15+, total (%) (modeled ILO estimate)	71.04100037	69.92199707	69.24199677	78.66699982	78.26999664	79.00700378	
Employment to population ratio, ages 15-24, total (%) (modeled ILO estimate)	51.17100143	48.86500168	51.03099823	56.66000092	57.66699982	57.64399719	
Fertility rate, total (births per woman)	5.176	4.433	4.055	3.993	4.028	3.836	
Fixed telephone subscriptions (per 100 people)	1.214412528	1.346893461	2.040540663	2.534769662	2.690554245	2.115056482	
Forest area (% of land area)	57.29323462	53.08708028	48.84061591	44.61419135	40.38774719	36.15909546	
GDP per person employed (constant 2011 PPP $)	6970.65918	6403.125	6486.38377	3614.993896	3191.006104	4088.829102	
GNI per capita, Atlas method (current US$)	890	620	500	430	490	890	
GNI, Atlas method (current US$)	9013976241	7020357744	6116821389	5523821338	6569231125	14001346960	
Gross capital formation (% of GDP)	17.37694276	19.66018675	13.36942382	1.52517678	22.27808377	12.28744448	
Immunization, measles (% of children ages 12-23 months)	87	87	75	87	90	86	
Improved sanitation facilities (% of population with access)	39.9	39.6	39.2	38.6	37.7	36.8	
Improved water source (% of population with access)	79.4	79.5	79.4	78.8	77.9	76.9	
Incidence of tuberculosis (per 100,000 people)	0	0	605	588	416	242	
Income share held by lowest 20%	0	0	0	0	5.8	0	
Internet users (per 100 people)	0	0.00768354	0.401433535	2.4	6.4	22.7428181	
Life expectancy at birth, total (years)	57.944	50.811	44.841	45.282	52.975	60.398	
Literacy rate, adult total (% of people ages 15 and above)	83.51258087	0	0	0	83.58271027	88.69342041	
Literacy rate, youth female (% of females ages 15-24)	94.35343933	0	0	0	92.1245575	93.18834686	
Literacy rate, youth male (% of males ages 15-24)	96.8406189	0	0	0	89.5905838	87.59185791	
Maternal mortality ratio (modeled estimate, per 100,000 live births)	440	449	590	629	646	443	
Mobile cellular subscriptions (per 100 people)	0	0	2.179966858	5.00083771	54.66297543	80.85849863	
Mortality rate, infant (per 1,000 live births)	50.8	58.3	58.4	59	55.1	40.2	
Mortality rate, under-5 (per 1,000 live births)	77.5	98	101.8	92.6	87.5	57	
Net ODA received per capita (current US$)	32.82493281	43.41740085	14.37051452	28.8206397	50.58312971	49.96307705	
Persistence to last grade of primary, total (% of cohort)	0	0	48.30202866	0	76.92657988	0	
Population, total	10183113	11320246	12222251	12940032	14086317	15777451	
Poverty gap at $1.90 a day (2011 PPP) (%)	0	0	0	0	5.2	0	
Poverty headcount ratio at $1.90 a day (2011 PPP) (% of population)	0	0	0	0	21.6	0	
Pregnant women receiving prenatal care (%)	0	93.1	93.1	94.2	89.8	93.3	
Prevalence of HIV, female (% ages 15-24)	15.4	22.1	15.9	8.8	7.4	6.8	
Prevalence of HIV, male (% ages 15-24)	6.6	8.6	5.8	3.4	3.5	3.5	
Prevalence of HIV, total (% of population ages 15-49)	15.9	26.5	25.1	18.5	15	14	
Prevalence of underweight, weight for age (% of children under 5)	0	11.8	11.5	14	10.1	8.4	
Primary completion rate, total (% of relevant age group)	0	0	92.61294115	84.36116028	88.06185913	88.94716544	
Proportion of seats held by women in national parliaments (%)	11	14.7	9.3	16	15	31.5	
School enrollment, primary (gross), gender parity index (GPI)	0.991280019	0.974829972	0.972729027	0.98694998	0.986790001	0.984679997	
School enrollment, secondary (gross), gender parity index (GPI)	0.880249977	0.83683002	0.880649984	0.901049972	0.970650017	0.980490029	
School enrollment, tertiary (gross), gender parity index (GPI)	0.480040014	0	0	0	0.793879986	0.899089992	
Trade (% of GDP)	45.65925197	79.13679261	74.06741113	76.04370728	98.6951969	69.46214915	
Tuberculosis case detection rate (%, all forms)	0	0	69	66	76	71	
Unmet need for contraception (% of married women ages 15-49)	0	19.1	16.7	15.5	14.6	10.4	
Vulnerable employment, total (% of total employment)	63.47399963	59.99200058	62.33799866	59.93799782	58.19200039	55.43699837	
Grand Total	**9024168850**	**7031634862**	**6129053342**	**5536768317**	**6883329972**	**14017131972**	

Graph 3

The sparklines showing that the improvement of all listed series is developing in a gentle speed.

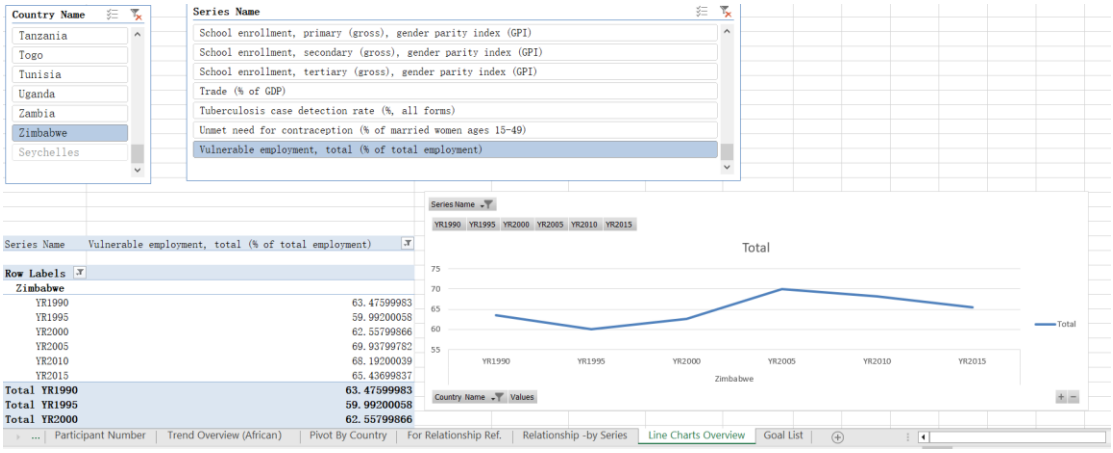
However, when choosing a specific series to look at, the trend is more revealing. For example:

In the following Graph 4, it shows the development trend of Zimbabwe in the series of "Proportion of seats held by women in national parliaments (%)". Even though the trend has been up and down during the years, the general percentage of women empowerment in the national parliaments has been increasing compared to the before the MDGs were introduced.



Graph 4

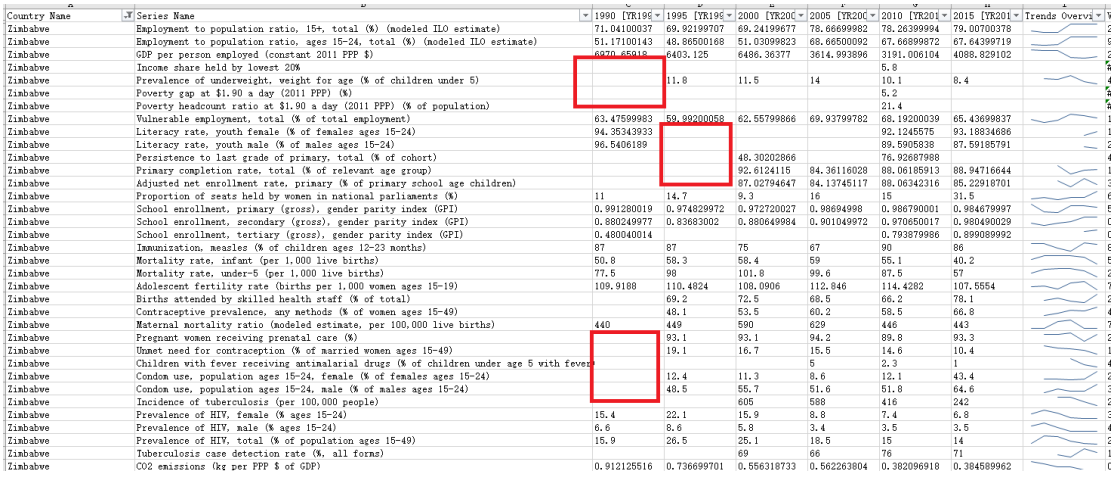
In Graph 5, it shows the development trend of Zimbabwe in the series of "Vulnerable employment, total (% of total employment)". The trend has gone down in the target year 2015. Even though the percentage of employment has increased compared to the time period when the MDGs were implemented, the record shows dropping down back to year 1990.



Graph 5

Limitations

As African countries are normally off-track with the Millennium Development Goals, the limitations to collect data as accurate and consistent as possible remain uncertain. Shown in Graph 6, there are many blanks in the data file, which confirms that some data has been lost or non-taken.



Country Name	Series Name	1990 [YR199	1995 [YR199	2000 [YR200	2005 [YR200	2010 [YR201	2015 [YR201	Trends Overvi
Zimbabwe	Employment to population ratio, 15+, total (%) (modeled ILO estimate)	71.04100037	69.92199707	69.24199677	78.66699982	78.26399994	79.00700378	
Zimbabwe	Employment to population ratio, ages 15-24, total (%) (modeled ILO estimate)	51.17100143	48.86500168	51.03099823	68.66500092	67.66899872	67.64399719	
Zimbabwe	GDP per person employed (constant 2011 PPP $)	6970.65918	6403.125	6486.36377	3614.993896	3191.006104	4088.829102	
Zimbabwe	Income share held by lowest 20%					5.8		
Zimbabwe	Prevalence of underweight, weight for age (% of children under 5)		11.8	11.5	14	10.1	8.4	
Zimbabwe	Poverty gap at $1.90 a day (2011 PPP) (%)					5.2		
Zimbabwe	Poverty headcount ratio at $1.90 a day (2011 PPP) (% of population)					21.4		
Zimbabwe	Vulnerable employment, total (% of total employment)	63.47599983	59.99200058	62.55799866	69.93799782	68.19200039	65.43699837	
Zimbabwe	Literacy rate, youth female (% of females ages 15-24)	94.35343933				92.1245575	93.18834686	
Zimbabwe	Literacy rate, youth male (% of males ages 15-24)	96.5406189				89.5905838	87.59185791	
Zimbabwe	Persistence to last grade of primary, total (% of cohort)			48.30202866		76.92687988		
Zimbabwe	Primary completion rate, total (% of relevant age group)			92.6124115	84.36116028	88.06185913	88.94716644	
Zimbabwe	Adjusted net enrollment rate, primary (% of primary school age children)			87.02794647	84.13745117	88.06342316	85.22918701	
Zimbabwe	Proportion of seats held by women in national parliaments (%)	11	14.7	9.3	16	15	31.5	
Zimbabwe	School enrollment, primary (gross), gender parity index (GPI)	0.991280019	0.974829972	0.972720027	0.98694998	0.986790001	0.984679997	
Zimbabwe	School enrollment, secondary (gross), gender parity index (GPI)	0.880249977	0.83683002	0.880649984	0.901049972	0.970650017	0.980490029	
Zimbabwe	School enrollment, tertiary (gross), gender parity index (GPI)	0.480040014				0.793879986	0.899089992	
Zimbabwe	Immunization, measles (% of children ages 12-23 months)	87	87	75	67	90	86	
Zimbabwe	Mortality rate, infant (per 1,000 live births)	50.8	58.3	58.4	59	55.1	40.2	
Zimbabwe	Mortality rate, under-5 (per 1,000 live births)	77.6	98	101.8	99.6	87.5	57	
Zimbabwe	Adolescent fertility rate (births per 1,000 women ages 15-19)	109.9188	110.4824	108.0906	112.846	114.4282	107.5554	
Zimbabwe	Births attended by skilled health staff (% of total)		69.2	72.5	68.5	66.2	78.1	
Zimbabwe	Contraceptive prevalence, any methods (% of women ages 15-49)		48.1	53.5	60.2	58.5	66.8	
Zimbabwe	Maternal mortality ratio (modeled estimate, per 100,000 live births)	440	449	590	629	446	443	
Zimbabwe	Pregnant women receiving prenatal care (%)		93.1	93.1	94.2	89.8	93.3	
Zimbabwe	Unmet need for contraception (% of married women ages 15-49)		19.1	16.7	15.5	14.6	10.4	
Zimbabwe	Children with fever receiving antimalarial drugs (% of children under age 5 with fever)				5	2.3	1	
Zimbabwe	Condom use, population ages 15-24, female (% of females ages 15-24)		12.4	11.3	8.6	12.1	43.4	
Zimbabwe	Condom use, population ages 15-24, male (% of males ages 15-24)		48.5	55.7	51.6	51.8	64.6	
Zimbabwe	Incidence of tuberculosis (per 100,000 people)			605	588	416	242	
Zimbabwe	Prevalence of HIV, female (% ages 15-24)	15.4	22.1	15.9	8.8	7.4	6.8	
Zimbabwe	Prevalence of HIV, male (% ages 15-24)	6.6	8.6	5.8	3.4	3.5	3.5	
Zimbabwe	Prevalence of HIV, total (% of population ages 15-49)	15.9	26.5	25.1	18.5	15	14	
Zimbabwe	Tuberculosis case detection rate (%, all forms)			69	66	76	71	
Zimbabwe	CO2 emissions (kg per PPP $ of GDP)	0.912125516	0.736699701	0.556318733	0.562263804	0.382096918	0.384589962	

Graph 6

Also, since different countries have different development pace and focus, comparing and combining these data for the continent Africa is unrealistic.

Conclusion and Recommendations

Instrument, environment, procedural, human, time are the common sources of survey and record filing. Survey error generally appears in coverage of the questions, sampling in questions, measurement of answers and response from different people. The size of margin of the records appears random or systematic depending on how the results are affected. I.e. when the instrument allows to file data more accurate, the margin of records by time will be less inaccurate. Environment hold factors that cannot be controlled by human activities, which will cause big data margin that might make the record invalid. Procedural, human activities and time might lose data or record during exchange or communication.

In order to have results as accurate as possible, it is recommended to make categories of variable items as detail as possible. Besides, the sample subjects should be formed a small group then gathered into a big group. For this analysis, the object was chosen in a very wide range (a continent), with the limitations to consistently get the data, it is rather reasonable to start analysis from a small subject (a country). When all small objects have been learned thoroughly, then it will mature to collect all these variables for further analysis on the bigger range object.

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